



# **GOVERNMENT POLYTECHNIC, KOLHAPUR**

(An Autonomous Institute of Government of Maharashtra)

*Curriculum Document* – 1<sup>st</sup> & 6<sup>th</sup> Semester with

**CURRICULUM: MPECS-2023**

(Outcome Based Curriculum)

For

**DIPLOMA IN CIVIL ENGINEERING**

**Secretary**

**Chairman**

Programme-wise Board of Studies (PBOS)  
Civil Engineering Programme  
Government Polytechnic, Kolhapur

**GOVERNMENT POLYTECHNIC KOLHAPUR**  
**CIVIL ENGINEERING DEPARTMENT**  
**SAMPLE PATH - H SCHEME -FIRST SEMESTER**

Sr.no	Course Title	Abbreviation	Course Type	Course Code	Level	Total IKS Hrs. for Sem	Learning Scheme					Assessment Scheme					Based on LL & TL				Based on Self Learning		Total Marks			
							Actual Contact					Theory					Practical									
							CL	TL	LL	Self Learning (Activity/Assignment/MicroProject)	Notional Learning Hrs/Week	Credits	Paper Duration(Hrs)	FA-TH	SA-TH	Total	FA-PR	SA-PR		SLA						
							Max	Max	Max	min	Max	min	Max	min	Max	min										
1	CIVIL WORKSHOP PRACTICES	HWCE	SEC	CEH101	1	6	0	0	4	0	4	2	0	0	0	0	0	50	20	50	@	20	0	0	100	
2	ENGINEERING CHEMISTRY-B	HCHB	DSC	CCH104	1	4	4	0	2	2	8	4	1.5	30	70	**	100	40	25	10	25	@	10	25	10	175
3	BASIC MATHEMATICS	HBMT	AEC	CCH105	1	4	4	2	0	2	8	4	3	30	70		100	40	0	0	0		0	25	10	125
5	ENGINEERING GRAPHICS	HGRB	DSC	CCH106	1	2	2	0	4	0	6	3	4	30	70		100	40	50	20	0		0	0	0	150
4	COMMUNICATION SKILLS (ENGLISH)	HCMS	AEC	CCH201	2	0	4	0	2	2	8	4	3	30	70		100	40	25	10	0		0	25	10	150
6	FUNDAMENTALS OF ICT	HICT	SEC	CCH202	2	0	1	0	2	1	4	2		0	0		0	0	25	10	25	@	10	25	10	75
7	YOGA AND MEDITATION®	HYAM	VCE	CCH203	2	1	0	0	1	1	2	1		0	0		0	0	25	10	0		0	25	10	50
		<b>TOTAL</b>				17	15	2	15	8	40	20		120	280		400	160	200	80	100	0	40	125	50	825

@ INTERNAL ASSESMENT  
# EXTERNAL ASSESMENT

**COURSE ID: ME**

**Course Name : ENGINEERING DRAWING -1 (CE/ME/MT)**  
**Course Code : CCH106**  
**Course Abbreviation: HGRB**  
**Course Type : DSC**

**A. LEARNING SCHEME:**

**Pre-requisite Course(s): Nil**

**Teaching Scheme:**

Scheme component	Actual Contact Hours / week	Credits
Classroom Learning (CL)	02	3
Tutorial Learning (TL)	-	
Laboratory Learning (LL)	04	
Self-Learning Hours (SLH)	-	
Notional Learning (NLH)	06	

**B. ASSESSMENT SCHEME:**

Theory				Based on LL & TL				Based on Self Learning		Total Marks
				Practical				SLA		
FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
30	70	100	40	50	20	-	-	-	-	150

**Total IKS Hrs for Sem: 2 Hrs**

**C. ABBREVIATIONS:** CL- Classroom Learning, TL- Tutorial Learning, LL-Laboratory Learning,

SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment,

SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment **Legends:**

@ Internal Assessment, # External Assessment, \*# On Line Examination, @\$ Internal Online Examination

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course, then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL) hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all 5 assignments here in tabular format)

**D. i) RATIONAL:**

Engineering graphics is the language of engineers. The concepts of graphical language are used in expressing the ideas, conveying the instructions, which are used in carrying out the jobs on the sites, shop floor etc. This course is useful in developing drafting and sketching skills in the student. It covers the knowledge & application of drawing instruments & also familiarizes the

learner about Bureau of Indian Standards related to engineering drawing. The curriculum aims at developing the ability to draw and read various engineering curves, projections and dimensioning styles. The subject mainly focuses on use of drawing instruments, developing imagination and translating ideas into sketches. The course also helps to develop the idea of visualizing the actual object or part on the basis of drawings and blue prints. This preliminary course aims at building a foundation for the further courses related to engineering drawing and other allied courses in coming semesters

## ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the student to attain the following industry identified outcome through various learning experiences:

Prepare simple engineering drawing manually using drawing instruments.

## E. COURSE LEVEL LEARNING OUTCOMES (CO'S)

**CCH106-1** Understand various fundamentals in engineering drawing.

**CCH106-2** Produce different types of engineering curves.

**CCH106-3** Produce the projection of point & lines inclined to one reference plane.

**CCH106-4** Produce the projection of different planes.

**CCH106-5** Produce orthographic drawing and sectional orthographic drawing from given pictorial view.

### Competency, course outcomes and programme outcomes/programme specific outcomes (CP-CO-PO/PSO) matrix

[ Note: Correlation levels: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0"]

Competency and COs	Programme outcome POs and PSO's								
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO3 Design/development of solutions	PO 4 Engineering Tools, Experimentation & testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long learning	PSO1 Work in mfg & service sector	PSO 2 Start entrepreneurial activity
CCH106-1	3	-	-	-	-	-	-	-	-
CCH106-2	3	-	1	-	-	-	-	-	-
CCH106-3	3	-	-	1	1	-	-	-	-
CCH106-4	3	-	1	-	-	-	-	-	-
CCH106-5	3	-	1	1	-	-	-	-	-

## F. CONTENT:

### i) Practical exercises

Practical Exercises and related skills to be developed:

The following practical exercises shall be conducted in the *Drawing Hall for Engineering drawing* in practical sessions of batches of about 20- 22 students:

Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
1	Draw horizontal, vertical, 30-degree, 45 degrees, 60 & 75-degrees lines using Tee and Set squares/ drafter.	2	CO1
2	Draw different types of lines, dimensioning styles	2	CO1
3	Draw one figure showing dimensioning techniques, two problems on redraw the figures. (Sketch Book)	2	CO1
4	Draw one figure showing dimensioning techniques, two problems on redraw the figures and one problem on Scales. (01 Sheet)	4	CO1
5	Draw any four Engineering Curves (Sketchbook)	2	CO2
6	Draw any four Engineering Curves – (01 Sheet)	4	CO2
7	Draw any four problems on Line parallel to both the principal planes Line parallel to one principal planes & perpendicular to other Principal planes using first angle method of projection. (Sketchbook)	2	CO3 CO5
8	Draw any four problems on Line parallel to one principal plane & inclined to other principal planes using first angle method of projection - (01 Sheet)	4	CO3 CO5
9	Draw any four problems on Plane parallel to one principal plane & perpendicular to another Principal plane, Plane perpendicular to both the principal planes using first angle method of projection. (Sketchbook)	4	CO4 CO5
10	Draw any four problems on Plane inclined to one principal plane and perpendicular to other principal plane using first angle method of projection - (01 Sheet)	4	CO4 CO5
11	Draw two problems on orthographic projections using first angle method of projection having plain surfaces, slanting surfaces and slots etc.	2	CO5
12	Draw two problems on orthographic projections using first angle method of projection having cylindrical surfaces, ribs etc. (Sketchbook)	2	CO5

13	Draw two problems on orthographic projections using first angle method of projection having plain surfaces, slanting surfaces cylindrical surfaces, ribs and slots etc.- (01 Sheet)	2	CO5
14	Draw different types of sections of simple objects (Sketchbook)	2	CO5 CO6
15	Draw two problems on sections of solids having ribs, cylindrical surface etc. (01 Sheet)	4	CO5 CO6
16	Correlate ancient Indian sculptures, Indian temples, Monuments, etc. with Engineering Graphics. (IKS)	2	CO1 CO2 CO3 CO4 CO5 CO6

**ii) THEORY**

**SECTION – I**

Sr. No	Topics	Teaching (Hours)	Theory Evaluation Marks
<i>Course Outcome CCH106-1 Understand various fundamentals in engineering drawing</i>			
<b>1.</b>	<b>INTRODUCTION TO ENGINEERING DRAWING</b> 1.1 Drawing Instruments and their uses 1.2 Standard sizes of drawing sheets as per ISO-A series, Layout of sheet. 1.3 Letters and numbers (single stroke vertical) Convention of lines and their applications. 1.4 Scale (reduced, enlarged & full size) Plain scale and Diagonal scale. 1.5 Dimensioning technique as per SP-46 (Latest Edition), Elements of dimensioning, Types and applications of chain, parallel and Co-ordinate dimensioning	<b>04</b>	<b>06</b>
<i>Course Outcome CCH106-2 Produce different types of engineering curves</i>			
<b>2.</b>	<b>ENGINEERING CURVES</b> 2.1 Conic sections and their applications 2.2 Ellipse by Arc's of circle method & Concentric circles method. 2.3 Parabola by Directrix and focus method & Rectangle method 2.4 Hyperbola by Transverse Axis focus Method & Rectangular hyperbola (Inclined axes). 2.5 Involute of circle, & pentagon, hexagon 2.6 cycloid, epicycloids, hypocycloid 2.7 Helix & Archimedean spiral.	<b>09</b>	<b>18</b>

<b>Course Outcome CCH106-3 Produce the projection of point &amp; lines inclined to one reference plane</b>			
<b>3.</b>	<b>PROJECTION OF POINT AND LINES</b> 3.1 Projection of points when point is in first quadrant only 3.2 Orientation of Line with respect to principal planes (Both ends of line should be in first quadrant) <ul style="list-style-type: none"> <li>• Line parallel to both the principal planes</li> <li>• Line parallel to one principal planes &amp; perpendicular to other Principal planes</li> <li>• Line parallel to one principal plane &amp; inclined to other principal planes</li> </ul>	<b>05</b>	<b>10</b>

**SECTION – II**

Sr. No	Topics	Teaching (Hours)	Theory evaluation Marks
<b>Course Outcome CCH106-4 Produce the projection of different planes.</b>			
<b>4.</b>	<b>PROJECTION OF PLANES</b> 4.1 Types of Planes - Circular, Square, Triangular, Rectangular, Pentagonal, Hexagonal. 4.2 Orientation of plane with respect to principal planes (Planes in First Quadrant Only) – <ul style="list-style-type: none"> <li>• Plane parallel to one principal planes &amp; perpendicular to another Principal plane</li> <li>• Plane perpendicular to both the principal planes</li> <li>• Plane inclined to one principal plane and perpendicular to other principal plane</li> </ul>	<b>03</b>	<b>10</b>
<b>Course Outcome CCH106-5 Produce orthographic drawing and sectional orthographic drawing from given pictorial view.</b>			
<b>5.</b>	<b>ORTHOGRAPHIC PROJECTIONS</b> 5.1 Introduction to Orthographic Projections -First and Third angle Projection Method, their symbols 5.2 Conversion of Pictorial view into Orthographic Views. (First angle Projection Method Only)	<b>05</b>	<b>14</b>
<b>Course Outcome CCH106-5 Produce orthographic drawing and sectional orthographic drawing from given pictorial view</b>			
<b>6.</b>	<b>SECTIONAL VIEWS</b> 6.1 Types of sections 6.2 Conversion of pictorial view into sectional Orthographic views. (First Angle Projection Method only)	<b>04</b>	<b>12</b>
<b>Total</b>		<b>30</b>	<b>70</b>
1. Summative assessment – Theory paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.			

**\*\* No questions will be asked on IKS learning subtopics in any question papers.**

**G. SUGGESTED MICRO PROJECTS / ASSIGNMENTS/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING) UNDER SLA**  
- NOT APPLICABLE

## H. SPECIFICATION TABLE FOR SETTING QUESTION PAPER FOR SEMESTER END THEORY EXAMINATION

Topic No.	Name of topic	Distribution of marks (Cognitive level-wise)			Course Outcome	Total Marks
		Remember	Understand	Application		
1	Introduction To Engineering Drawing	00	06	00	CCH106-1	06
2	Engineering curves	00	12	06	CCH106-2	18
3	Projection of Point and Lines	00	10	00	CCH106-3	10
4	Projection of Planes	00	00	10	CCH106-4	10
5	Orthographic Projection	00	00	14	CCH106-5	14
6	Sectional Views.	00	00	12	CCH106-5	12
	<b>Total</b>	00	28	42		70

### I. Assessment Criteria

#### Formative Assessment of Practical: -

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

### J. Instructional Methods:

- i) Lectures cum Demonstrations,
- ii) Class room practices.
- iii) Use of projector and soft material for demonstration

### K. Teaching and Learning resources:

Chalk board, Power Point presentations and Demonstrative kits.

### L. REFERENCE MATERIAL:

Sr. No.	Author	Title	Publisher
1.	N. D. Bhatt	Engineering Drawing	Charotar Publishing House 2010
2.	Amar Pathak	Engineering Drawing	Dreamtech Press, 2010
3.	D. Jolhe	Engineering Drawing	Tata McGraw Hill Edu., 2010
4.	M. B. Shah, B. C. Rana	Engineering Drawing	Pearson, 2010
5.	K. Venugopal	Engineering Drawing and Graphics + AutoCAD	New Age Publication, Reprint 2006
6.	IS Code, SP – 46	Engineering Drawing Practice	Bureau of Indian Standards

**M. LEARNING WEBSITE & SOFTWARE: -**

- i) <http://www.design-technology.info/IndProd/drawings/>
- ii) <http://graphicalcommunication.skola.edu.mt/syllabus/engineering-drawing/>
- iii) [http://en.wikipedia.org/wiki/Engineering\\_drawing](http://en.wikipedia.org/wiki/Engineering_drawing)
- iv) <http://www.engineeringdrawing.org/>
- v) [http://www.teachengineering.org/view\\_activity](http://www.teachengineering.org/view_activity)
- vi) [www.howtoread.co.in/2013/06/how-to-read-ed.html](http://www.howtoread.co.in/2013/06/how-to-read-ed.html)
- vii) <http://www.slideshare.net/akhilrocker143/edp>
- viii) <http://www.24framesdigital.com/pstulpule>

\* \* \*

**COURSE ID: 06**  
**COURSE NAME : FUNDAMENTALS OF ICT (CE/ME/EE/MT/ET/IT)**  
**COURSE CODE : CCH202**  
**COURSE ABBREVIATION : HICT**

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	01	2
	Tutorial Learning	-	
	Laboratory Learning	02	
	SLH-Self Learning	01	
	NLH-Notional Learning	04	

**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Practical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
--	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	75
	--	--	--	--	25	10	25@	10	25	10	

**(Total IKS Hrs for Sem:00 Hrs)**

**C: ABBREVIATIONS:-** CL-ClassRoom Learning, TL-Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA -Self Learning Assessment

**Legends:** @Internal Assessment, #External Assessment, \*#OnLine Examination, @\$Internal Online Examination

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for these semester are (CL+LL+TL+SL) hrs. \*15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \*Self learning hours shall not be reflected in the Time Table.

\*Self learning includes micro project/ assignment/other activities.

## D. i) RATIONALE:-

In any typical business setup in order to carry out routine tasks related to create business documents, perform data analysis and its graphical representations and making electronic slide show presentations, the student need to learn various software as office automation tools like word processing applications, spreadsheets and presentation tools. They also need to use these tools for making their project reports and presentations. The objective of this course is to develop the basic competency in students for using these office automation tools to accomplish the job. This course also presents an overview of emerging technologies so that students of different discipline can appraise the applications of these technologies in their respective domain.

### ii) INDUSTRY/EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the student to attain the following industry identified outcome through various teaching learning experiences: 1) Use computers for Internet services, Electronics Documentation, Data Analyze and Slide Presentation. 2) Appraise Application of ICT based Emerging Technologies in different domain

## E. COURSE LEVEL LEARNING OUTCOMES (COS)

CCH109-1 - Use computer system and its peripherals for given purpose

CCH109-2 - Prepare Business document using Word Processing Tool

CCH109-3 - Analyze Data and represent it graphically using Spreadsheet

CCH109-4 - Prepare professional Slide Show presentations

CCH109-5 – Illustrate the Use different types of Web Browsers, Apps and Emerging Technologies

### Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/ps) matrix

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “0”

Competency and Cos	Programme Outcomes POs and PSOs								
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 Design and Development	PSO2 Networking and Database Management
<b>Competency:</b> Use ICT based Emerging Technologies.in different domain.	3	2	2	2	2	2	2	3	2
CCH109-1 Use computer system and its peripherals for given purpose	1	-	-	-	-	-	1	1	1
CCH109-2 Prepare Business document	-	-	-	3	-	-	1	2	-

Competency and Cos	Programme Outcomes POs and PSOs								
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 Design and Development	PSO2 Networking and Database Management
using Word Processing Tool									
CCH109-3 Analyze Data and represent it graphically using Spreadsheet	-	2	1	3	-	-	1	2	-
CCH109-4 Prepare professional Slide Show presentations	-	-	-	3	-	-	1	2	-
CCH109-5 Use different types of Web Browsers and Apps	1	-	-	3	-	-	3	-	1
CCH109-6 Explain concept and applications of Emerging Technologies	1	-	-	3	-	-	3	1	1

## F. CONTENT:

### I) Practical exercises

The following practical exercises shall be conducted in the *Laboratory for Fundamentals of ICT* developed by the Institute in practical sessions of batches of about 20- 22 students:

Sr. no	Laboratory experiences	CO
1	Identify various Input/output devices, connections and peripherals of computer system. Work with Computer System, Input/output devices, and peripherals for Manages files and folders for data storage.	CCH109-1
2	Create and manage word document. Apply formatting features on text at line, paragraph and page level.	CCH109-2
3	Insert and edit images, shapes in a document file	CCH109-2
4	Insert table and apply various table formatting features on it.	CCH109-2
5	Apply page layout features in word processing. Print a document by applying various print options. Use mail merge in word processing.	CCH109-2
6	Enter and format data in a worksheet. Insert and delete cells, rows and columns. Apply alignment feature on cell	CCH109-3

Sr. no	Laboratory experiences	CO
7	Create formula and “If” condition on cell data. Apply various functions and named ranges in worksheet.	CCH109-3
8	Implement data Sorting, Filtering and Data validation features in a worksheet.	CCH109-3
9	Create charts using various chart options in spreadsheet.	CCH109-3
10	Print the worksheet by applying various print options for worksheet.	CCH109-3
11	Apply design themes to the given presentation. Insert pictures text/images/shapes in slide. Use pictures text/images/shapes editing options.	CCH109-4
12	Add tables and charts in the slides. Run slide presentation in different Modes. Print slide presentation as handouts/notes.	CCH109-4
13	Apply animation effects to the text and slides. Add/set audio and video files in the presentation.	CCH109-4
14	Configure internet connection on a computer system. Use different web services on internet	CCH109-5
15	Configure different browser settings. Use browsers for the given purpose.	CCH109-5
16	Create web forms for survey using different options.	CCH109-6
17	Create web forms for Quiz using different options.	CCH109-6

## II) Theory

### Section I

Sr. no.	Topics/Subtopics	Learning (Hours)
1	<p><b>Unit - I Introduction to Computer System</b></p> <p><b>1.1 Basics of Computer System:</b> Overview Hardware and Software Block diagram of Computer System: Input/Output unit CPU, Control Unit, Arithmetic logic Unit (ALU), Memory Unit</p> <p><b>1.2 Internal components:</b> processor, motherboards, random access memory (RAM), read-only memory (ROM), video cards, sound cards and internal hard disk drives)</p> <p><b>1.3 External Devices:</b> Types of input/output devices, types of monitors, keyboards, mouse, printers: Dot matrix, Inkjet and LaserJet, plotter and scanner, external storage devices CD/DVD, Hard disk and pen drive</p> <p><b>1.4 Application Software:</b> word processing, spreadsheet, database management systems, control software, measuring software, photo-editing software, video-editing software, graphics manipulation software System Software compilers, linkers, device drivers, operating system.</p> <p><b>1.5 Network environments:</b> network interface cards, hubs, switches, routers and modems, concept of LAN, MAN, WAN, WLAN, Wi-Fi and Bluetooth</p> <p><b>1.6 Working with Operating Systems:</b> Create and manage file and folders, Copy a file, renaming and deleting of files and folders, Searching files and folders, application installation, creating shortcut of application on the desktop.</p>	2

Sr. no.	Topics/Subtopics	Learning (Hours)
2	<p><b>Unit - II Word Processing</b></p> <p><b>2.1 Word Processing:</b> Overview of Word processor Basics of Font type, size, colour, Effects like Bold, italic, underline, Subscript and superscript, Case changing options, Previewing a document, Saving a document, Closing a document and exiting application.</p> <p><b>2.2 Editing a Document:</b> Navigate through a document, Scroll through text, Insert and delete text, Select text, Undo and redo commands, Use drag and drop to move text, Copy, cut and paste, Use the clipboard, Clear formatting, Format and align text, Formatting</p> <p><b>2.3 Changing the Layout of a Document:</b> Adjust page margins, Change page orientation, Create headers and footers, Set and change indentations, Insert and clear tabs</p> <p><b>2.4 Inserting Elements to Word Documents:</b> Insert and delete a page break, Insert page numbers, Insert the date and time, Insert special characters (symbols), Insert a picture from a file, Resize and reposition a picture</p> <p><b>2.5 Working with Tables:</b> Insert a table, Convert a table to text, Navigate and select text in a table, Resize table cells, Align text in a table, Format a table, Insert and delete columns and rows, Borders and shading, Repeat table headings on subsequent page</p> <p><b>2.6 Working with Columned Layouts and Section Breaks:</b> a Columns, Section breaks, Creating columns, Newsletter style columns, Changing part of a document layout or formatting, Remove section break, Add columns to remainder of a document, Column widths Adjust.</p>	3
3	<p><b>Unit - III Spreadsheets</b></p> <p><b>3.1 Working with Spreadsheets:</b> Overview of workbook and worksheet, Create Worksheet Entering sample data, Save, Copy Worksheet, Delete Worksheet, Close and open Workbook.</p> <p><b>3.2 Editing Worksheet:</b> Insert and select data, adjust row height and column width, delete, move data, insert rows and columns, Copy and Paste, Find and Replace, Spell Check, Zoom In-Out, Special Symbols, Insert Comments, Add Text Box, Undo Changes, - Freeze</p> <p><b>3.3 Formatting Cells and sheet:</b> Setting Cell Type, Setting Fonts, Text options, Rotate Cells, Setting Colors, Text Alignments, Merge and Wrap, apply Borders and Shades, Sheet Options, Adjust Margins, Page Orientation, Header and Footer, Insert Page Breaks</p> <p><b>3.4 Working with Formula:</b> Creating Formulas, Copying Formulas, Common spreadsheet Functions such as sum, average, min, max, date, In, And, or, mathematical functions such as sqrt, power, applying conditions using IF.</p> <p><b>3.5 Working with Charts:</b> Introduction to charts, overview of different types of charts, Bar, Pie, Line charts, creating and editing charts. Using chart options: chart title, axis title, legend, data labels, Axes, grid lines, moving chart in a separate sheet.</p> <p><b>3.6 Advanced Operations:</b> Conditional Formatting, Data Filtering, Data Sorting, Using Ranges, Data Validation, Adding Graphics,</p>	3

Sr. no.	Topics/Subtopics	Learning (Hours)
	Printing Worksheets, print area, margins, header, footer and other page setup options.	

## Section –II

Sr. no.	Topics/Subtopics	Learning (Hours)
<b>4</b>	<p><b>Unit - IV Presentation Tool</b></p> <p><b>4.1 Creating a Presentation:</b> Outline of an effective presentation, Identify the elements of the User Interface, Starting a New Presentation Files, Creating a Basic Presentation, Working with textboxes, Apply Character Formats, Format Paragraphs, View a Presentation.</p> <p><b>4.2 Inserting Media elements:</b> Adding and Modifying Graphical Objects to a Presentation - Insert Images into a Presentation, insert audio clips, video/animation, Add Shapes, Add Visual Styles to Text in a Presentation, Edit Graphical Objects on a Slide, Format</p> <p><b>4.3 Working with Tables:</b> Insert a Table in a Slide, Format Tables and Import Tables from Other Office Applications.</p> <p><b>4.4 Working with Charts:</b> Insert Charts in a Slide, Modify a Chart, Import Charts from Other Office Applications.</p>	<b>4</b>
<b>5</b>	<p><b>Unit - V Basics of Internet and Emerging Technologies</b></p> <p><b>5.1 World Wide Web:</b> Introduction, Internet, Intranet, Cloud, Web Sites, web pages, URL, web servers, basic settings of web browsers- history, extension, default page, default search engine, creating and retrieving bookmarks, Use of search engines.</p> <p><b>5.2 Web Services:</b> e-Mail, Chat, Video Conferencing, e-learning, e-shopping, e-Reservation, e-Groups, Social Networking</p> <p><b>5.3 Emerging Technologies:</b> IOT, AI and ML, Drone Technologies, 3D Printing.</p> <p><b>5.4 Tools:</b> Docs, Drive, forms, quiz, Translate and other Apps</p>	<b>3</b>

**\*\* No Questions will be asked on IKS learning subtopics in any question papers.**

**G: List of Assignments under SLA**  
(Assignments Marked in \* are compulsory)

Sr.No	List of Assignment (under SLA)	Hrs Allotted										
1*	Prepare a chart showing different generations of computer along with advantages & disadvantages.	02										
2*	Prepare survey report for: There is usually a positive side and a negative side to each new technological improvement. 1. Select a technology you use every day and consider its benefits and risks. 2. What benefits does the technology provide? 3. Are there any risks involved and, if so, how can they be minimized?	02										
3	The following are the marks obtained by the students in three subjects Assume suitable data in following table: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>ROLLNO</th> <th>NAME</th> <th>ME</th> <th>QT</th> <th>IOM</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table> Using Conditional Formatting list out students who secured( a) Less than 50 in QT, ( b ) More than 65 in IOM, ( c ) Between 60 and 80 in ME	ROLLNO	NAME	ME	QT	IOM						02
ROLLNO	NAME	ME	QT	IOM								
4*	Principal Amount 2, 00,000Rate of Interest 5%Time Period 10 YearsAmount to be Paid? From the above , Calculate the amount payable per annum and also show the effect on amount by changing a) Rate of Interest to 3% and 8%b) Time Period to 5 Years and 3 Years	02										
5	Prepare a PowerPoint presentation of at least 5 slide & perform 1. Add 2.delete 3.copy& paste 4.edit slide.	02										
6*	A person wants to start a business and he has four schemes to invest money according to profit and years. Find out which scheme is the most profitable. Investment Amount                      Percentage for Profit                      No of years 20000    10%    6 years 40000 20%                      5 years 14000 30%    4 years 12000 15%    5 years	02										
7*	Conduct Survey of different IT Industry and prepare list of New Technology Trends in IT Industries.	02										
8*	Prepare a list and compare different desktop publishing software available in market.	04										

**H : Specification table for setting question paper for semester end theory examination**

Nil

## **I :-Assessment Criteria**

### **i) Formative Assessment of Practical:-**

Every assignment shall be assessed for 25 marks as per following criteria:

<b>Domain</b>	<b>Particulars</b>	<b>Marks out of 25</b>
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

### **ii) Summative Assessment of Practical:**

Every practical assignment shall be assessed for 25 marks as per following criteria:

<b>Sr.no</b>	<b>Criteria</b>	<b>Marks allotted</b>
1	Attendance at regular practical	05
2	Preparedness for practical	05
3	Neat & complete Diagram.	05
4	Observations & handling of instrument.	05
5	Oral Based on Lab work and completion of task	05
<b>TOTAL</b>		<b>25</b>

### **J) Instructional Methods:**

1. Lectures cum Demonstrations,
2. Classroom practices.
3. Use of projector and soft material for demonstration

### **K) Teaching and Learning resources:**

Chalk board, LCD presentations, Demonstrative kits, Demonstrative charts.

### **L) Reference Books:**

<b>S.N.</b>	<b>Name of Book</b>	<b>Author</b>	<b>Publication</b>
1	Goel Anita	Computer Fundamentals	Pearson Education, New Delhi, 2014, ISBN-13: 978-8131733097
2	Miller Michael	Computer Basics Absolute Beginner's Guide, Windows 10	QUE Publishing; 8th edition August 2015, ISBN: 978-0789754516

3	Alvaro Felix	Linux: Easy Linux for Beginners	CreatevSpace Independent Publishing Platform- 2016, ISBN-13: 978-1533683731
4	Johnson Steve	Microsoft Office 2010: On Demand	Pearson Education, New Delhi India, 2010. ISBN :9788131770641
5	Schwartz Steve	Microsoft Office 2010 for Windows: Visual Quick Start	Pearson Education, New Delhi India, 2012, ISBN : 9788131766613

### M) Learning Website & Software

- a. <https://www.microsoft.com/en-in/learning/office-training.aspx>
- b. <http://www.tutorialsforopenoffice.org/>
- c. [https://www.tutorialspoint.com/computer\\_fundamentals/index.htm](https://www.tutorialspoint.com/computer_fundamentals/index.htm)
- d. <https://www.javatpoint.com/powerpoint-tutorial>
- e. <https://www.techtarget.com/iotagenda/definition/Internet-of-Things-IoT>
- f. <https://www.skillrary.com/blogs/read/introduction-to-drone-technology>
- g. <https://support.google.com/a/users/answer/9389764?hl=en>

**COURSE ID : CE**  
**Course Name : CIVIL WORKSHOP PRACTICES**  
**Course Code : CEH101**  
**Course Abbreviation : HWCE**

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	00	02
	Tutorial Learning	00	
	Laboratory Learning	04	
	SLH-Self Learning	00	
	NLH-Notional Learning	04	

**B. ASSESSMENT SCHEME :-**

Theory				Based on LL & TL				Based on Self Learning		Total Marks
				Practical						
FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
-	-	-	-	50	20	50@	20	-	-	100

**(Total IKS Hrs for Sem. : 06 Hrs)**

**C. ABBREVIATIONS :-** CL-ClassRoom Learning, TL-Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA -Self Learning Assessment

**Legends:**@Internal Assessment,#External Assessment,\*#OnLine Examination,  
 @\$Internal Online Examination .

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL) hrs.\*15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \*Self learning hours shall not be reflected in the Time Table.

\*Self learning includes microproject/ assignment/ other activities.(Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

### D. i) RATIONALE:

Civil Workshop Practices mainly deals with Fitting, Plumbing, Welding and Wood working. A technician has to work in such an environment with his peers, superiors and subordinates for a major part of his life. Therefore, the emphasis on the practical work is needed for the primary experience of working in the team.

### ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

Use different engineering tools for performing site activities.

### E. COURSE OUTCOMES:

**CEH101-1:** Practice safety in workshop and Use fire fighting tools and equipment.

**CEH101-2:** Prepare job using different tools in fitting shop

**CEH101-3:** Perform various operations using plumbing tools.

**CEH101-4:** Preparing simple components using carpentry tools.

**CEH101-5:** Produce simple job using different sheet metal operations.

**CEH101-6:** Produce simple job using different welding operations.

### F. COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX:

[Note: Correlation levels: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-”: no correlation]

Competency and COs	Programme Outcomes POs and PSOs									
	PO 1 Basic and discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design /development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering practices for society, sustainability and environment	PO 6 Project Management	PO 7 Life-long learning	PSO 1 Plan for collection of data prepare, design drawing & Estimate	PSO 2 Develop Supervisory & Middle Level Management Skills	PSO 3 Identify and solve problems on construction sites.
<b>Competency</b>	1	-	-	3	-	-	-	-	2	-
<b>CEH101-1</b>	1	-	-	3	-	-	-	-	2	-
<b>CEH101-2</b>	1	-	-	3	-	-	-	-	2	-
<b>CEH101-3</b>	1	-	-	3	-	-	-	-	2	-
<b>CEH101-4</b>	1	-	-	3	-	-	-	-	2	-
<b>CEH101-5</b>	1	-	-	3	-	-	-	-	2	-
<b>CEH101-6</b>	1	-	-	3	-	-	-	-	2	-

## G. CONTENT - PRACTICAL WORK:

The students will submit the following.

Workshop record book showing the details of the job viz. Drawing, Raw material size, time required for completing the job. The journal consisting of the neat sketches, specifications, use of the hand tool, and hand operations based on the demonstration in all the trades during the practical work.

## H. ASSESSMENT CRITERIA

### i) Formative Assessment of Practical:-

Every practical assignment shall be assessed for 50 marks as per following criteria:

Domain	Particulars	Marks out of 50
Cognitive	Understanding	10
	Application	10
Psychomotor	Operating Skills	10
	Drawing / drafting skills	10
Affective	Discipline and punctuality	10
<b>TOTAL</b>		<b>50</b>

### ii) Summative Assessment of Practical:

Every student has to perform one practical within 2 hours at term end practical which shall be assessed as per following criteria.

Sr. no	Criteria	Marks allotted
1	Preparedness for practical	10
2	Correct figures / diagrams	10
3	Skill (Finishing in dimensions)	20
4	Safety / use of proper tools	10
	Total	50

## I. INSTRUCTIONAL STRATEGIES: -

- i) Demonstration during Practical's.
- ii) Workshop Record Book

## J. TEACHING AND LEARNING RESOURCES: -

- i) Shop Demonstration

Sr. No.	Topics/ Sub-Topics	Skills/ Competencies to be developed	Practical (Hours)/ Evaluation (Marks)
<b>Course outcome: CEH101-1</b>			
01	<b>General Workshop Practice</b> 1.1 Safety Practices, Causes of accidents, General safety rules, Safety signs and symbols 1.2 First Aid 1.3 Fire, Causes of Fire, Basic ways of extinguishing the fire, Classification of fire, Class A,B,C,D, Fire fighting equipment, fire extinguishers, and their types. 1.4 Workshop Layout 1.5 Issue and return system of tools, equipment and consumables	A. Follow safety practices B. Explain the different types of fire extinguisher and their uses C. Use fire fighting equipment D. Locate various machines and equipment in workshop E. Follow good housekeeping	04/–
<b>Course outcome: CEH101-1 and 2</b>			
02	<b>Fitting Shop</b> 2.1 Demonstration of different fitting tools-holding tools, marking & measuring tools, cutting tools, finishing tools, drilling and power tools and their specifications 2.2 Demonstration of different operations like marking, filing, cutting, drilling, tapping, dieing, chipping, scraping, grinding, sawing, reaming etc. 2.3 Demonstration of bending bars. 2.4 Demonstration of stirrups. 2.5 One simple job in aluminum window frame. 2.6 One job in stirrups. 2.7 Window frame.	A. Study of fitting tools, identifying materials B. Measuring dimensions C. Interpretation of drawing D. Selection of tools E. Time management and observing safety habits F. Operate drilling machine, saw machine G. Prepare utility article	12/10
<b>Course outcome: CEH101-1 and 3</b>			
03	<b>Plumbing shop</b> 3.1 Demonstration of Plumbing tools -pipe vice, pipe bending equipment, pipe wrenches, dies and their Specifications 3.2 Pipe fittings- bends, elbows, tees, cross, coupler, socket, reducer, cap, plug, nipple and their Specifications 3.3 Operation of Machineries in plumbing shops- pipe bending machine there specifications and maintenance. Basic process cutting, threading. 3.4 Demonstration of PVC pipe joint with various PVC fittings & accessories 3.5 One job on simple pipe joint with nipple coupling for Standard pipe, Pipe threading using standard die set (One job per one group of 04 students)	A. Study of plumbing tools, identifying materials B. Interpretation of drawing C. Threading with dies on pipe D. Time management and observing safety habits E. Selection of pipe joint & fittings.	12/10

	3.6 One job on T joint/elbow joint pipe fitting job as per given drawing.(One job per one group of 04 students)		
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**Course outcome:** CEH101-1 and 4

<b>04</b>	<p><b>Wood Working shop: -</b></p> <p>4.1 Demonstration of types of artificial woods such as plywood, block board, hardboard, laminated board, Veneer, fiber boards and their applications</p> <p>4.2 Demonstration of different wood working tools such as carpentry vice, marking and measuring tools, holding tools, planing tools, cutting tools, drilling and boring tools saws, claw hammer, mallet, chisels, jack plane, smoothing plane, etc.</p> <p>4.3 Demonstration of different wood working processes like marking, sawing, planing, chiseling, grooving, boring, Turning of wood etc.</p> <p>4.4 Operate different machines &amp; equipments in carpentry shop, their specifications and maintenance, safe practices.</p> <p>4.5 One simple job involving measuring, marking, cutting, assembly etc. operations. (One job per one group of 04 students)</p> <p>4.6 One simple job involving cutting, planing, wood turning, joining, finishing, varnishing, etc. operations (One job per one group of 04 students)</p>	<p>A. Study of wood working tools, Identifying materials</p> <p>B. Measuring dimensions</p> <p>C. Interpretation of drawing</p> <p>D. Operating planing, cutting, drilling machines.</p> <p>E. Time management and observing safety habits</p> <p>F. Prepare furniture or article with carpentry joints</p>	12/10
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**Course outcome:** CEH101-1 and 5

<b>05</b>	<p><b>Sheet Metal Shop</b></p> <p>5.1 Demonstration of different sheet metal tools and machines.</p> <p>5.2 Demonstration of sheet metal operations like Sheet cutting, Bending, Edging, End curling, Lancing, Riveting etc.</p> <p>5.3 One Job involving sheet metal operations from Dustbin, Letter Box, Tray, Bucket etc. (One job per one group of 04 students)</p>	<p>A. Study of sheet metal tools, identifying materials</p> <p>B. Measuring dimensions</p> <p>C. Interpretation of drawing</p> <p>D. Operating sheet cutting bending machines</p> <p>E. Time management and observing safety habits</p> <p>F. Prepare utility article</p>	12/10
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**Course outcome: CEH101-1 and 6**

<b>06</b>	Welding shop :- a) Demonstration of various welding tools, joints of metals, type of welding machines. b) Demonstration of arc welding techniques. c) How to use current setting, earthing connection etc. and any one job composite job involving Butt, Lap joint from the following pieces of work - i) Window frame. ii) Grill. iii) Sanitary window frame. iv) Supporting frame. v) Stool frame. vi) Bench frame etc.	a) Study of welding tools, Identifying materials b) Measuring dimensions c) Interpretation of drawing d) Operating welding machines. e) Time management and observing safety habits	12/10
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ii) ii) Hands on training on machine

**K. REFERENCE BOOKS:**

Author	Title	Publisher
S. K. Hajra Chaudhary, Bose, Roy	Elements of workshop Technology – Volume I & II	Media Promoters and Publishers limited
B.S. Raghuvanshi	Elements of workshop Technology – Volume I & II	Dhanpat Rai & Co.

**L. LEARNING WEBSITE & SOFTWARE**

- i) <http://nptel.ac.in>
- ii) <https://www.vlab.co.in/>
- iii) <https://ecoursesonline.iasri.res.in/>
- iv) [www.egr.msu.edu/~pkwon/me478](http://www.egr.msu.edu/~pkwon/me478)

\* \* \*

**COURSE ID:**  
**COURSE NAME** : **YOGA &MEDITATION.**  
**COURSE CODE** : **CCH203**  
**COURSE ABBREVIATION** : **HYAM**

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	00	01
	Tutorial Learning	00	
	Laboratory Learning	01	
	SLH-Self Learning	01	
	NLH-Notional Learning	2	

**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Practical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
-NA-	-NA--	--NA-	--NA-	-NA-	25	10	--NA-	--NA-	25	10	50

(TotalIKSHrsforSemester:01Hr)

**C: ABBREVIATIONS:-** CL-Class-Room Learning, TL-Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA -Self Learning Assessment

**Legends:** @Internal Assessment, #External Assessment, \*#OnLine Examination, @\$Internal Online Examination( TNR 12 font)

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for these semester are (CL+LL+TL+SL) hrs.\*15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \*Self learning hours shall not be reflected in the Time Table.

\*Self learning includes micro project/assignment/other activities.(Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

## D. i) RATIONALE

Diploma Graduate needs a sound body and mind to face the challenging situations in career as employee or as an entrepreneur. Yoga and Meditation brings about the holistic development of an individual and equips with necessary balance to handle the challenges. The age of polytechnic student is appropriate to get introduced to yoga practice as this will help them in studies as well as his professional life. Moreover, Yoga inculcates discipline in all walks of the life of student. Pranayama practice regulates breathing practices of the student to improve stamina, resilience. Meditation empowers a student to focus and keep calm to get peace of mind. World Health Organization (WHO) has also emphasized the role of yoga and meditation as stress prevention measure. National Education Policy-2020 highlights importance of yoga and meditation amongst students of all ages. Therefore, this course for Diploma students is designed for the overall well being of the student and aims to empower students to adopt and practice Yoga in daily life.

## ii) INDUSTRY/EMPLOYER EXPECTED OUTCOME

By practicing basic yoga and pranayam in daily life, candidate should have attained the state of sound physique and balance mind to execute daily duties.

## E. COURSE LEVEL LEARNING OUT-COMES (COs)

Students will be able to achieve & demonstrate the following

On completion of course based learning-

CCH110\_1 Practice basic Yoga and Pranayam in daily life to maintain physical and mental fitness.

CCH110\_2- Practice meditation regularly for improving concentration and better handling of stress and anxiety.

CCH110\_3- Follow healthy diet and hygienic practices for maintaining good health.

## Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/ps) matrix

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0"

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	
CO1	-	-	-	-	3	-	1	-	-	
CO2	-	-	-	-	3	-	1	-	-	
CO3	-	-	-	-	3	-	1	-	-	

Legends: -High:03,Medium:02,Low:01,No Mapping:-  
\*PSOs are to be formulated at institute level

## F. CONTENT:

### I) Practical exercises

Sr No	Laboratory Experiment/Practical Titles/Tutorial Titles	Learning hrs.	Relevant COs
1	<p>Introduction:-</p> <p>1.1 Introduction to AshtangYog</p> <p>1.2 Presentations on Introduction to Yoga and its History, Omkar chanting, prayer, Padmasan, Siddhasan &amp; Vajrasan</p> <p>1.3 Lab Exp: 1. Perform warming up exercises to prepare the body from head to toe for Yoga -</p> <p>i) Neck Movement ii) Shoulder Movement iii) Trunk Movement iv) Knee Movement v) Ankle Movement</p>	03	CCH110-1
2	<p>Lab Exp: 2. After warmup, perform all the postures of Surya Namaskar one by one in a very slow pace,</p> <p>Lab Exp 3. Perform multiple Surya-Namaskar (Starting with three and gradually increasing it to twelve) in one go.</p> <p>(Experiment 2 to 4 must be followed by shavasana for self relaxation.)</p>	4	CCH110-1, CCH110-2
3	<p>Lab Exp: 4</p> <p>Perform Sarvangasana, Halasana, Kandharasana (setubandhasana), Uttanpadasan, Pavanmuttasan.</p> <p>Lab Exp: 5 Perform Bhujangasana, Naukasana, Mandukasana.</p> <p>Lab Exp: 6 Perform Shalabhasana, Dhanurasana, Vakrasana, Gomukhasana, Paschimottasana, Ardhamasendrasana</p> <p>Lab Exp: 7 Perform Veerasana, Veer-Bhadrasana, Vrukshasana, Trikonasana.</p> <p>(Follow up experiment 5 to 7 with shavasana for self relaxation)</p>	4	CCH110-2
4	<p>Lab Exp: 8 Perform Deepbreathing, Anulom Vilom Pranayam Kriya</p> <p>Lab Exp: 9 Practice Kapalbhatai Pranayam Kriya, Bhastrika</p> <p>Lab Exp: 10 Practice Bhramary Pranayam and Sheetali Pranayam</p>	2	CCH110-3
5	<p>Lab Exp: 11 Perform sitting in Dhyana Mudra and meditating. Start with five minute and slowly increasing to higher durations.</p> <p>Introduction to Vipassana, Anapan &amp; Chakras.</p> <p>(Trainer will explain the benefits of Meditation before practice)</p>	2	CCH110-3

## II) Theory : (Not Applicable )

Section I NA

Section –II NA

\*\* No questions will be asked on IKS learning subtopics in any question papers.

### G: List of Assignments under SLA

**\*\*Candidate has to complete at least one major assignment from the given during his or her a single semester.**

Maintain a diary indicating date wise practiced one by the student with a photograph of self in yogi c posture. Prepare Diet for and nutrition chart self

#### Assignment:

- Prepare Diet for and nutrition chart for your self
- Self-Learning
  - Practiceatleast thrice aweek.
  - Read books on different methods to maintain health, wellness and to enhance mood
  - WatchvideosonYogaPractices.

### H: Specification table for setting question paper for semester end theory examination: NA

#### I:-Assessment Criteria

Sr.No.	List of Assignment (under SLA)	Hrs Allotted
1	Maintain a diary indicating date-wise practice done by the student with a photograph of self-yogi c posture	02
2	Prepare Diet for and nutrition chart self	01
3	Practice at least thrice a week.	02
4	Read books on different methods to maintain health, wellness and to enhance mood	02
5	Watch videos on Yoga Practices.	01
6	Post your selfie with one asana on social media	02
7	Post your selfie with meditation posture on social media FB	02
8	Create your short video clip while performing one or two asanas	02
9	Create your short video performing Sun Salutation (Suyranamaskar)	01
	Total	15hrs

**i) Formative Assessment of Practical:-**

Every assignment shall be assessed for 25 marks as per the following criteria

<b>Domain</b>	<b>Particulars</b>	<b>Marks out of 25</b>
Cognitive	Understanding	05
	Application	05
Psychomotor	Performance Skills	10
Affective	Discipline and Mind Balance	05
	<b>TOTAL</b>	<b>25</b>

**ii) Summative Assessment of Practical: NA**

Every practical assignment shall be assessed for - marks as per following criteria:

<b>Sr.no</b>	<b>Criteria</b>	<b>Marks allotted</b>
NA	NA	NA
<b>TOTAL</b>		<b>NA</b>

**J) Instructional Methods:**

1. Lectures cum Demonstrations
2. Laboratory practices.
3. Use of third party audio visual material for demonstration
4. Demonstration Chart

**K) Teaching and Learning resources:**

Presentations, Yoga kits, Demonstrative charts, Actual Practice demonstration

## L) Reference Books:

S.N.	Name of Book	Author	Publication
1	Patanjalis Yoga Sutras	Swami Vivekananda	Fingerprint Publishing (2023) Prakash BooksIndiaPvtLtd,NewDelhiISBN-13?:?978-9354407017
2	Yoga for Every Body: A beginner's guide to the practice of yoga postures, breathing Exercises and me	Luisa Ray, Angus Sutherland	VitalLifeBooks (2022) ISBN-13?:?978-1739737009
3	Mudras for Modern Living: 49inspiring cards to boost your health, enhance your yoga and deepen your mind	Swami Saradananda	WatkinsPublishing(2019) ISBN-13?:?978-1786782786
4	The Relaxation and Stress Reduction Workbook	Martha Davis, Elizabeth Robbins, MatthewMcKay, Eshelman MSW	ANewHarbingerSelf-HelpWorkbook(2019)
5	Science of Yoga: Understand the Anatomy and Physiology to Perfect Your Practice	Ann Swanson	ISBN-13?:?978-1465479358

## M) Learning Website & Software

1. <https://onlinecourses.swyam2.ac.in/aic23ge09/preview> - Yoga for Creativity
  2. [https://onlinecourses.swyam2.ac.in/aic19\\_ed28/preview](https://onlinecourses.swyam2.ac.in/aic19_ed28/preview)- introduction to Yoga and Applications of Yoga
  3. [https://onlinecourses.swyam2.ac.in/aic23\\_e05/preview](https://onlinecourses.swyam2.ac.in/aic23_e05/preview)- Yoga for Creativity
  4. <https://onlinecourses.nptel.ac.in/noc2lhs29/preview>- Psychology of Stress, Health and Well-being
  5. <https://onlinecourses.swyam2.ac.in/ncel9sc04/preview>-Food Nutrition for Healthy LivingCourse —Swayam
  6. <https://onlinecourses.swyam2.ac.in/aic23e06/> preview- yoga for memory development
-

**COURSE ID** : CCH201  
**COURSE NAME** : COMMUNICATION SKILLS  
**COURSE CODE** : CCH201  
**COURSE ABBREVIATION** : HCMS

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	04	4
	Tutorial Learning	00	
	Laboratory Learning	02	
	SLH-Self Learning	02	
	NLH-Notional Learning	08	

**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Practical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	150
03	30	70	100	40	25	10	-	-	25	10	

**(Total IKS Hrs for Sem. : 00 Hrs)**

**C: ABBREVIATIONS:-** CL- Class Room Learning , TL- Tutorial Learning, LL- Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

**Legends:** @ Internal Assessment, # External Assessment, \*# On Line Examination, @\$ Internal Online Examination.

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

## D. i) RATIONALE:-

Communication, being an integral part of every human activity, plays a fundamental role in education, science and technology. The communication skills are essential for engineering professionals to carry out routine tasks at workplace. These skills are also required for professional activities like dialogue, persuasion and negotiation. Considering the age group and socio-economical background of the students of the Institute, this course has been designed with a skill-oriented content with some necessary theoretical foundation. Thus, this course has been designed to enhance the skills to communicate effectively and skillfully at workplace.

### ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the student to attain the following industry identified outcome through various learning experiences:

1. “Communicate in written and oral form of English effectively at workplace.”

## E. COURSE LEVEL LEARNING OUTCOMES (COs)

CCH201-1 Use Contextual words in English appropriately.

CCH201-2 Comprehend the concept of communication and identify communication barriers.

CCH201-3 Prepare and participate in dialogue, conversation, elocution and debate.

CCH201-4 Make effective use of body language & graphical communication.

CCH201-5 Write letters, reports, e-mails and technical description in correct language.

CCH201-6 Prepare and present effective media aided presentation.

## COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX:

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “0”

	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineerin g Tools, Experiment ation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Manage ment	PO 7 Life- long Learnin g	PSO1	PSO2
<b>Competency:</b> Industry/Employer Expected Outcome-Communicate in written and oral form of English effectively at workplace.	2	-	-	-	-	1	2		
CCH201-1 Use Contextual words in English appropriately.	1	1	-	-	-	2	1		
CCH201-2 Comprehend the concept of communication and identify communication barriers	2	1	-	-	-	2	2		
CCH201-3 Prepare and participate in dialogue,	2	1	-	-	-	2	1		

conversation, elocution and debate.									
CCH201-4 Make effective use of body language & graphical communication.	2	-	-	-	-	2	2		
CCH201-5 Write letters, reports, e-mails and technical description in correct language.	2	-	-	-	-	2	1		
CCH201-6 Prepare and present effective media aided presentation.	1	1	-	-	-	1	1		

## F. CONTENT:

### I) Practical Exercises

The following practical exercises shall be conducted in the Laboratory for *Communication Skills* developed by the Institute in practical sessions of batches of about 20- 22 students:

Sr No.	Title of Practical Exercise	Course Outcome
1.	Vocabulary Building: Affixation	CCH201-1
2.	Vocabulary Building: Homophones	CCH201-1
3.	Vocabulary Building: Synonyms-Antonyms and Collocations	CCH201-1
4.	Communication Cycle and Communication Barriers	CCH201-2
5.	Oral Communication: Transcription	CCH201-3
6.	Oral Communication: Prepared Speech	CCH201-3
7.	Oral Communication: Conversation	CCH201-3
8.	Oral Communication: Group Discussion	CCH201-3
9.	Oral Communication: Group Debate	CCH201-3
10.	Non-verbal Communication: Graphic Communication	CCH201-4
11.	Non-verbal Communication: Body Language	CCH201-4
12.	Written Communication: Writing formal Letters	CCH201-5
13.	Written Communication: Writing Reports	CCH201-5
14.	Written Communication: Drafting of E-mail	CCH201-5
15.	Written Communication: Technical Writing	CCH201-5

16.	Presentation Aids	CCH201-6
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## II) Theory

### Section I

Sr. No.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO: CCH201-1 Use Contextual words in English appropriately.			
1	Vocabulary Building 1.1 Affixation: Prefix and Suffix, Definition and Examples, List of common Prefixes and Suffixes 1.2 Synonyms and antonyms: Vocabulary Expansion, Context and Usage 1.3 Homophones: Identifying Homophones, Meaning and Contest, Vocabulary Expansion 1.4 Collocation: Definition and Identification, Types of Collocations	8	08
CO: CCH201-2 Comprehend the concept of communication and identify communication barriers.			
2	Introduction to Communication 2.1 Definition and Importance of Communication 2.2 Model of Communication 2.3 Principles of Effective Communication 2.4 Types of Communication: Formal, Informal, Oral, Written, Verbal, Non-Verbal, Horizontal, Upward, Downward and Diagonal Communication 2.5 Barriers to communication: Physical, Mechanical, Psychological and Language Barriers	14	16
CO: CCH201-3: Prepare and participate in dialogue, conversation, elocution and debate.			
3	Oral Communication 3.1 Characteristics of Oral Communication. 3.2 Phonetics: IPA, Vowels(12), Consonants(24) and Diphthongs (12) 3.3 Tone, Pronunciation and Accents. 3.4 Spoken English: Prepared and Extempore speeches 3.5 Role Play: Conversation and Dialogue 3.6 Group Discussion and Debate	8	10

## Section II

Sr. No.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO: CCH201-4: Make effective use of body language & graphical communication.			
4	Non-verbal Communication 4.1 Importance of Non-Verbal Communication. 4.2 Aspects of Body Language: Facial Expressions, Eye Contact, Vocalics, Gestures, Posture, Dress, Appearance and Personal Grooming and Haptics. 4.3 Non-Verbal Codes: Proxemics, chroemics, artefacts 4.4 Graphical Communication: 4.4.1 Advantages and Disadvantages of Graphical Communication. 4.4.2 Tabulation of Data and its depiction in the form of Bar Graphs and Pie Charts	08	12
CO: CCH201-5 Write letters, reports, e-mails and technical description in correct language.			
5	Written Communication 5.1 Characteristics of Written Communication. 5.2 Letter Writing: Application with Resume, Enquiry Letter, Order Letter and Complaint Letter 5.3 Writing Reports: Accident, Fall in Production Reports and Micro Project 5.4 Email Writing 5.5 Technical Writing: Object Description, Picture Description, Diary Writing 5.6 Paragraph Writing: Narrative, Descriptive and Technical	16	20
CO: CCH201-6 Prepare and present effective media aided presentation.			
6	Media-Aided Presentations 6.1 Media aids for Presentation: Strengths and Precautions 6.2 Planning, Preparing and Making a Presentation 6.3 Use of Presentation Media	06	04

\*\* No questions will be asked on IKS learning subtopics in any question papers.

## G : List of Assignments/Activities/Micro-project under SLA

\*\*A learner should complete at least on major activity mentioned in the above list under the guidance of subject teacher.

Sr. No	List of Assignment (under SLA)	Hrs Allotted
1	Report different types of episodes and anecdotes	02
2	Seminar preparation and Presentation	04
3	Make a pod cost episode based on Indian freedom fighters.	02
4	Present summary of the editorial column of English news paper	02
5	Write review of on any one: short story, novel, film	02
6	Prepare a booklet on Indian scientist/ eminent persons	04
7	Prepare blog, vlogs and pod cast	04
8	Prepare questionnaire for interview on any one: industry personnel, social worker, entrepreneur and conduct interview.	02
9	Prepare charts/tables of vowels, diphthongs, consonant, organs of speech, vocabulary in English	02
10	Prepare charts/tables of types of communication, barrier in communication, aspects of body language	02
11	Prepare a micro project on a given topic.	04

## H: Specification Table for Setting Question Paper for Semester End Theory Examination

Section/ Topic No.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	Vocabulary Building	02	02	04	08	CCH201-1
I / 2	Introduction to Communication	04	06	06	16	CCH201-2
I / 3	Oral Communication	04	02	04	10	CCH201-3
II / 4	Non-verbal Communication	04	02	06	12	CCH201-4
II / 5	Written Communication	04	04	12	20	CCH201-5
II / 6	Media-aided Presentations	-	02	02	04	CCH201-6
Total Marks					70	

## I:-Assessment Criteria

### i) Formative Assessment of Practical:-

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Discipline and punctuality	05

<b>TOTAL</b>	<b>25</b>
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**ii) Summative Assessment of Practical:**

Every practical assignment shall be assessed for 25 marks as per following criteria:

<b>Sr. No.</b>	<b>Criteria</b>	<b>Marks allotted</b>
1	Attendance at regular practical	NA
2	Preparedness for practical	NA
3	Neat & complete Diagram.	NA
4	Observations & handling of instrument.	NA
5	Oral Based on Lab work and completion of task	NA
<b>TOTAL</b>		

**J) Instructional Methods:**

1. Lecture cum Demonstration,
2. Class room practices.
3. Use of projector and soft material for demonstration

**K) Teaching and Learning Resources:**

Chalk board, LCD presentations, Demonstrative kits, Demonstrative charts.

**L) Reference Books:**

<b>S.N.</b>	<b>Name of Book</b>	<b>Author</b>	<b>Publication</b>
1	Communication Skills	Sanjay Kumar ad Pushp Lata	Oxford University Press
2	Personality Development and Soft Skills	Brun K. Mitra	Oxford University Press
3	Effective Communication Skills	M Ashraf Rizvi	Tata McGraw-Hill
4	Human Communication	Burgoon Michael	SAGE Publication Inc.
5	101 Ways to Better Communication	Elizabeth Hiemey	Pustak Mahal
6	Technical Writing and Professional Communication	Thomas Huckin and Leslie	McGraw-Hill Division College

**M) Learning Website & Software**

- [www.nptel.com/iitm/](http://www.nptel.com/iitm/)
- <https://www.britishcouncil.in/english/learn-online>
- <https://www.vocabulary.com>
- [www.newagegolden.com](http://www.newagegolden.com)

e. <https://www.internationalphoneticassociation.org>

**COURSE ID** : CCH 104  
**COURSE NAME** : ENGINEERING CHEMISTRY.  
**COURSE CODE** : CCH 104  
**COURSE ABBREVIATION** : HCHB

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	04	4
	Tutorial Learning	00	
	Laboratory Learning	02	
	SLH-Self Learning	02	
	NLH-Notional Learning	08	

**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL		
	FA-TH	SA-TH	TOTAL		Practical				MAX	MIN			
			MAX	MIN	FA -PR	SA-PR							
03	30 *#	70*#	100	40	MAX	MIN	MAX	MIN	25 @	10	25	10	175

**(Total IKS Hrs for Sem. : 04 Hrs)**

**C: ABBREVIATIONS:-** CL- Class Room Learning , TL- Tutorial Learning, LL- Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

**Legends:** @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination.( TNR 12 font)

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL) hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

## **D. i) RATIONALE:-**

Basic science such as Chemistry is the fundamental of Engineering & technology. It is most essential to learn the basic science to understand the fundamental concepts in Engineering & technology. Engineering chemistry deals with the study of structure, composition & properties of the materials, which form the core of the fundamental science. Many processes are based on principle of Chemistry in various industries. Topics such as Water, Electrochemistry, Corrosion, & protection of metals from corrosion are some of the direct applications of chemistry in engineering. Hence, the knowledge of chemistry is essential to the aspiring engineers of all branches in their field. Engineering materials like Steel, Rubber, Plastic, Thermocole, Glass wool, Paints, Lubricants are the backbone of various industries, machines, equipment & processes.

### **ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME**

Apply principles of advanced chemistry to solve engineering problems.

**Cognitive:** Understanding concepts of chemistry for applications in the area of engineering.

**Psychomotor:**

- i) Sketching and labeling the diagrams for extraction of copper
- ii) Experimentally analyzing the water samples for preparing portable water by different methods.
- iii) Preparing chart of showing percentage, composition, properties and industrial applications of solders.
- iv) Handling & use of glassware & chemicals.

**Affective:** i) Accuracy ii) Safety iii) Punctuality iv. Attitude.

## **E. COURSE LEVEL LEARNING OUTCOMES (COS)**

**CCH104-1** Apply the basic knowledge of atom, molecules and compounds in Engineering Chemistry.

**CCH104-2** Apply the concepts of Electrochemistry to interpret the reasons of corrosion with its remedies.

**CCH104-3** Select the relevant catalyst, alloys, insulators, adhesives, composite materials, plastic and rubber for different applications in the field of engineering.

**CCH104-4** Use of water in Domestic purpose, Industrial purpose and its relevant treatment to solve industrial problems.

**CCH104-5** Explain the method of Extraction of Iron.

**CCH104-6** Choose appropriate with relevant method of lubrication to solve industrial problem and applications of Paint and Varnish.

**Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/ps) matrix**

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “0”

Competency and Cos	Programme Outcomes POs and PSOs								
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1	PSO2
CCH104-1 CO-1 Apply the basic knowledge of atom, molecules and compounds in Engineering Chemistry.	3.0	2.0	-	1.0	3.0	1.0	3.0	1.0	1.0
CCH104 - 2 CO-2 Apply the concepts of Electrochemistry to interpret the reasons of corrosion with its remedies.	3.0	2.0	-	1.0	2.0	1.0	3.0	-	-
CCH104 -3 CO-3 Select the relevant catalyst, alloys, insulators, adhesives, composite materials, plastic and rubber for different applications in the field of engineering.	3.0	1.0	-	-	2.0	1.0	3.0	-	-
CCH104 – 4 CO-4 Use of water in Domestic purpose, Industrial purpose and its relevant treatment to solve industrial problems.	3.0	2.0	-	1.0	3.0	1.0	3.0	-	-
CCH104-5 CO-5 Explain the method of Extraction of Iron.	3.0	1.0	-	-	2.0	1.0	3.0	-	-
CCH10- 6CO-6 Choose appropriate with relevant method of lubrication to solve industrial problem and applications of Paint and Varnish.	3.0	2.0	-	1.0	2.0	1.0	3.0	-	-

## F. CONTENT:

### I) Practical exercises

The following practical exercises shall be conducted in the *Laboratory for Engineering Chemistry developed* by the Institute in practical sessions of batches of about 20- 22 students:

Sr. no	Laboratory experiences	CO
1	Introduction to Chemistry laboratory	CCH104-1
2	Volumetric analysis of solution.	CCH104-1
3	Preparation of 1 N, 0.5 N & 0.1 N Solutions of different chemicals like NaOH, HCl, Oxalic acid, FeSO <sub>4</sub> , etc.	CCH104-1
4	Titration of strong acid and strong bases ( HCl X NaOH)	CCH104-1
5	Double titration of strong acid, strong base & weak acid (HCl X NaOH X H <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .H <sub>2</sub> O)	CCH104-1
6	Titration of weak base , strong acid & strong base (Na <sub>2</sub> CO <sub>3</sub> X H <sub>2</sub> SO <sub>4</sub> X KOH)	CCH104-1
7	Estimation of chloride content in water by Mohr' s method	CCH104-4
8	Determination of amount of Ca and Mg ions present in given sample of water by E.D.T.A method	CCH104-4
9	Estimation of viscosity of oils/solutions by Ostwald's method	CCH104-6
10	Estimation of Ca in limestone.	CCH104-5
11	Titration of KMnO <sub>4</sub> & FeSO <sub>4</sub> (Redox titration)	CCH104-5
12	Estimation of % of Fe in given sample of steel.	CCH104-3
13	Determination of alkalinity of water.	CCH104-4
14	Determination of Electrochemical equivalent (ECE) by copper volt meter.	CCH104-2
15	To estimate volumetrically the percentage of copper in a given sample of Brass.	CCH104- 5
16	To demonstrate the different types of Solders.	CCH104-3

### II) Theory

#### Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO - CCH104-1 Apply the basic knowledge of atom, molecules and compounds in Engineering Chemistry.			
1	<b>ATOMIC STRUCTURE AND CHEMICAL BONDING</b> 1.1 Philosophy of atom by Acharya Kanad. 1.2 Atom, Fundamental particles, Nature of atom. 1.3 Atomic Number, Mass Number, Isotopes and isobars. 1.4 Bohr's theory of atom. 1.5 Statement of Aufbau's principle, Hund's rule of maximum multiplicity, Pauli's exclusion principle.	<b>07</b>	<b>08</b>

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	1.6 Lewis and Langmuir's concept of stable electronic configuration. 1.7 Electrovalency and Co-valency. 1.8 Formation Of electrovalent compounds- NaCl, CaCl <sub>2</sub> . 1.9 Formation of Covalent compounds- H <sub>2</sub> O, CO <sub>2</sub>		
CO - CCH104-2 Apply the concepts of Electrochemistry to interpret the reasons of corrosion with its remedies.			
2	<b>ELECTROCHEMISTRY AND CORROSION.</b> 2.1 Definitions- Cathode, Anode, Conductor, Electrolyte, Electrode, Ionisation, Electrolysis. 2.2 Arrhenius Theory Of Ionisation. 2.3 Degree of Ionisation & Factors affecting degree of ionisation. 2.4 Statement of Faraday's first and second law of electrolysis. 2.5 Relation between CE and ECE. 2.6 Electrolysis of molten NaCl. 2.7 Electrolysis of CuSO <sub>4</sub> solution by using Cu-Electrodes. 2.8 Industrial applications of electrolysis. 2.8.1 Electroplating. 2.8.2 Electro refining of Cu. 2.9 Definition & types of corrosion. 2.10 Dry or Atmospheric corrosion , Oxide Film Formation & its types, Factors affecting atmospheric corrosion. 2.11 Wet or electrochemical corrosion 2.12 Factors influencing immersed corrosion 2.13 Methods of protection of metal from corrosion - Hot dipping (Galvanizing & Tinning) ,Metal spraying, Metal cladding, Cementation or sherardizing.	10	10
CO - CCH104-3 Select the relevant catalyst, alloys, insulators, adhesives, composite materials, plastic and rubber for different applications in the field of engineering.			
3	<b>CHEMISTRY OF ENGINEERING MATERIALS AND CATALYSIS.</b>  <b>3.1 INSULATORS</b> 3.1.1 Definition & Characteristics of insulator. 3.1.2 Preparation, properties & uses of Glass wool, Thermocole.  <b>3.2 COMPOSITE MATERIALS</b> 3.2.1 Definition. 3.2.2 Classification, Properties & Application of composite materials.	13	16

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	<p><b>3.3 PLASTICS</b>  3.3.1 Definition of Polymer, Polymerization.  3.3.2 Types of polymerization –  Addition &amp; Condensation polymerization.  3.3.3 Classification of plastic - Thermosoftening &amp;  Thermosetting plastic.  3.3.4 Engineering properties &amp; applications of plastic.</p> <p><b>3.4 RUBBER</b>  3.4.1 Elastomer  3.4.2 Drawbacks of Natural rubber.  3.4.3 Vulcanization of rubber.  3.4.4 Engineering properties &amp; uses of rubber.</p> <p><b>3.5 ADHESIVES</b>  3.5.1 Definition of adhesives.  3.5.2 Characteristics of good adhesive.  3.5.3 Properties of adhesive.</p> <p><b>3.6 CATALYSIS</b>  3.6.1 Definition.  3.6.2 Types of Catalyst with example.  - Positive catalyst  - Negative catalyst  3.6.3 Types of Catalysis.  - Homogeneous catalysis.  - Heterogeneous catalysis  3.6.4 Catalytic Promoters.  3.6.4 Catalytic Inhibitors  3.6.5 Autocatalysis.</p>		

### Section –II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO - CCH104-4 Use of water in Domestic purpose, Industrial purpose and its relevant treatment to solve industrial problems.			
4	<p><b>WATER</b>  4.1 Impurities in natural water.  4.2 Hard water &amp; Soft water.  4.3 Hardness of water- Temporary &amp; Permanent.  4.4 Reactions of hard water with soap.  4.5 Disadvantages of hard water for domestic &amp; Industrial</p>	09	12

	<p>purpose - Textile Industry, Sugar Industry, Paper Industry Dying Industry.</p> <p>4.6 Sterilization of water - Chlorination -by Cl<sub>2</sub>, bleaching powder, Chloramines with chemical reactions.</p> <p>4.7 Ion Exchange method to remove total hardness of Water.</p>		
CO - CCH104-5 Explain the method of Extraction of Iron.			
5	<p><b>METALLURGY AND ALLOYS</b></p> <p>5.1 Occurrence of metals, Definition of minerals, Ore, Flux, Gangue &amp; Slag.</p> <p>5.2 Flow chart of metallurgical processes.</p> <p>5.3 Concentration of ores - Physical methods -</p> <ol style="list-style-type: none"> <li>1. Gravity separation method</li> <li>2. Electromagnetic separation method</li> <li>3. Froth floatation method</li> </ol> <p>Chemical methods -</p> <ol style="list-style-type: none"> <li>1. Calcination</li> <li>2. Roasting</li> </ol> <p>5.4 Ores of Iron.</p> <p>5.5 Extraction of Iron from its ore - Blast furnace - Construction, working, reactions &amp; Products.</p> <p>5.6 Definition of alloys.</p> <p>5.7 Classification &amp; purposes of making of alloys.</p> <p>5.8 Composition, properties &amp; engineering application of - <b>Non-ferrous alloys</b> - Duralumin, Monal metal &amp; Woods metal. <b>Ferrous alloys</b> - Heat resisting steel, magnetic steel, Stainless steel.</p>	12	14
CO - CCH104-6 Choose appropriate with relevant method of lubrication to solve industrial problem and applications of Paint and Varnish.			
6	<p><b>LUBRICANTS, PAINT AND VARNISH</b></p> <p>6.1.1 Definition, Classification &amp; Functions of lubricants.</p> <p>6.1.2 Characteristics of lubricants - Viscosity, Viscosity index, Oiliness, Volatility, Cloud point &amp; Pour point, Flash &amp; Fire point, Acid value.</p> <p>6.2 Oil paint - Definition &amp; characteristics of oil paint.</p> <p>6.3 Purpose of using oil paint.</p> <p>6.4 Ingredients of oil paint with suitable example &amp; its fuctions - Drying oil (Vehicle), Drier, Pigment, Thinner, Filler (Extenders),</p>	09	10

	Plasticizer. 6.5 Varnish – Definition, types, constituents, Properties & applications. 6.6 Distinction between paint & varnish.		
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\*\* No questions will be asked on IKS learning subtopics in any question papers.

## G : List of Assignments under SLA

**\*\* From the above any two assignments to be completed by the students.**

Sr.No	List of Assignment (under SLA) (Any one of the following)	Hrs Allotted
1	Prepare distinguish chart for Isotopes & Isobars, Electrovalent & Covalent bond	02
2	Prepare Charts of Bohr's Theory, Lewis & Langmuir's theory.	02
3	Faraday's First & Second law statements & formula.	02
4	Electroplating & Electrorefining with diagram	02
5	Note on corrosion due to Oxygen & its types	02
6	With neat labelled diagram explain the process of 1. Galvanizing, 2. Tinning, 3. Metal spraying, 4. Metal Cladding, 5. Sherardizing	02
7	Properties of Plastics, rubber, insulator, composite materials & adhesives.	02
8	Uses/Applications of Plastics, rubber, insulator, composite materials & adhesives.	02
9	Draw diagram of Ion Exchange method	02
10	Note on Impurities present in Natural Water.	02
11	Disadvantages of hard water in Domestic purposes	02
12	Disadvantages of hard water in Industrial purposes	02
13	Flow chart of Metallurgical processes	02
14	With neat labelled diagram explain 1. Gravity separation method. 2. Electromagnetic separation method. 3. Froth floatation method.	02
15	Explain ingredients present in Paints	02

## H : Specification table for setting question paper for semester end theory examination

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	Atomic Structure and Chemical Bonding	4	2	2	08	CCH104-1
I / 2	Electrochemistry & Corrosion	4	4	2	10	CCH104-2
I / 3	Chemistry of Engineering materials & catalysis	6	6	4	16	CCH104-3
II / 4	Water	4	4	4	12	CCH104-4
II / 5	Metallurgy & Alloys	6	4	4	14	CCH104-5
II / 6	Lubricants, Paints & Varnish	4	4	2	10	CCH104-6
Total Marks					70	

## I :-Assessment Criteria

### i) Formative Assessment of Practical / Self learning assessment :-

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

### ii) Summative Assessment of Practical :-

Every practical assignment shall be assessed for 25 marks as per following criteria:

Sr. no	Criteria	Marks allotted
1	Attendance at regular practical	05
2	Preparedness for practical	05
3	Neat & complete Diagram.	05
4	Observations & handling of instrument.	05
5	Oral Based on Lab work and completion of task	05

<b>TOTAL</b>	<b>25</b>
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**J) Instructional Methods:**

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration
4. Charts
5. Simulation videos

**K) Teaching and Learning resources:-**

Chalk board, LCD presentations, Demonstrative kits, Demonstrative charts.

**L) Reference Books:**

Sr. No.	Author	Title	Publisher
1.	Jain & Jain	Engineering chemistry	Dhanpatrai publishing co.
2.	S. C. Rangawala	Engineering materials	Engineering publication
3.	Jain & Agarwal	Metallurgical Analysis	Agarwal publications
4.	O. P. Khanna	Material science & technology	Khanna publication on 2006
5.	Rollason	Metallurgy for Engineers	ASM publication
6.	J. C. Kuriacose	Chemistry in Engineering & Vol. 1 & 11	-
7.	P. C. Jain	Chemistry of Engineering Materials	-
8.	S. S. Dara	A text of Engineering Chemistry	-
9.	R.Gopalan, D.Venkappa	Engineering Chemistry	Vikas Publishing House.

**M) Learning Website & Software**

- a. [www.substech.com](http://www.substech.com)
- b. [www.kentchemistry.com](http://www.kentchemistry.com)
- c. [www.chemcollective.org](http://www.chemcollective.org)
- d. [www.wqa.org](http://www.wqa.org)
- e. [www.chemistryteaching.com](http://www.chemistryteaching.com)
- f. [www.ancient-origins.net/hisotry-famous-people/indian-sage-acharya-kanad-001399](http://www.ancient-origins.net/hisotry-famous-people/indian-sage-acharya-kanad-001399)

**COURSE ID :**  
**COURSE NAME** :BASIC MATHEMATICS(CE/ME/ET/IT/EE/MT)  
**COURSE CODE** : CCH105  
**COURSE ABBREVIATION** : HBMT

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	04	4
	Tutorial Learning	02	
	Laboratory Learning	-	
	SLH-Self Learning	02	
	NLH-Notional Learning	08	

**B: ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Tutorial						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
03	30	70	100	40	--	--	--	--	25	10	125

**(Total IKS Hrs for Sem.: 06 Hrs)**

**C: ABBREVIATIONS:-**CL-ClassRoom Learning, TL-Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA -Self Learning Assessment

**Legends:**@Internal Assessment, #External Assessment, \*#OnLine Examination, @\$Internal Online Examination( TNR 12 font)

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL) hrs.\*15Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \*Self learning hours shall not be reflected in the Time Table.  
 \*Self learning includes micro project /assignment/other activities. (The list of all assignments are given in tabular format. At least 6 to 8 assignments to be given)

**D. i)RATIONALE:-**

Mathematics is an important prerequisite for the development and understanding of engineering and technological concepts. For an engineer and technologist, knowledge of mathematics is an effective tool to pursue and master the applications in the engineering and technological fields. Algebra provides the language and abstract symbols of mathematics. The topic Matrices is helpful for finding optimum solution of system of simultaneous equations which are formed in the various branches of engineering using different parameters. Trigonometry is the study of triangles and angles. Contents of this subject will form foundation for further study in mathematics. Statistics can be defined as a type of mathematical analysis which involves the method of collection and analyzing the data and summing of the data in numerical form for a given set of real world observations. Calculus is a branch of mathematics that calculates how matter, particles and heavenly bodies actually move. Derivatives are useful to find maxima & minima of a function, velocity & acceleration are also useful for many engineering problems. Hence the course provides the insight to analyze engineering problems scientifically using logarithms, matrices, trigonometry, straight line, differential calculus and statistics.

**ii) Competency:**

Apply principles of Basic Mathematics to solve industry based technology problems.

- 1. Cognitive** : To understand the mathematical concepts
- 2. Psychomotor:** Proper handling of scientific calculator
- 3. Affective** : Attitude of accuracy, punctuality, proper reasoning and presentation

**E. COURSE LEVEL LEARNING OUTCOMES (COS):**

CCH105-1 : To Apply concepts of algebra to solve engineering related problems

CCH105-2 : To Use techniques and methods of statistics to compare multiple sets of data

CCH105-3 : Solve area specific engineering problems under given conditions of straight lines

CCH105-4:- To memorize trigonometric formulae and solve problems based on them.

CCH105-5:- To solve the problems of maxima, minima, radius of curvature and geometrical applications.

**Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/ps) matrix**

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “0”

Competency and Cos	Programme Outcomes POs and PSOs								
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analyses	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 Maintain various types of electrical equipments	PSO2 Maintain various sections of electrical power systems
Competency: Use DC machines and transformers.	3	2	1	-	1	-	2		
CCH105-1-CO-1 : To Apply concepts of algebra to solve engineering related problems	3	1	-	-	-	-	1		
CCH105-2-CO-2 : To Use techniques and methods of statistics to compare multiple sets of data	3	1	-	-	1	-	1		
CCH105-3-CO-3 : Solve area specific engineering problems under given conditions of straight lines	3	-	-	-	-	-	1		
CCH105-4-CO-4:- To memorize trigonometric formulae and solve problems based on them.	3	1	1	-	-	-	1		
CCH105-5-CO-5:- To solve the problems of maxima, minima, radius of curvature and geometrical applications.	3	2	1	-	1	-	1		

## F. CONTENT:

### I) Tutorial exercises

Solve any **TEN** the following Tutorial exercises shall be conducted in the Tutorial room in tutorial sessions of batches of about 20- 22 students:

Sr. no	Tutorial experiences	CO
1	Solve Simple problems of Logarithms based on given application	CCH105-1
2	Solve elementary problems on Algebra of Matrices	CCH105-1
3	Solve simultaneous equations using Matrix inversion method	CCH105-1
4	Resolve into Partial Fractions using linear non repeated, repeated and irreducible quadratic factors	CCH105-1
5	Practice problems on equation of straight lines using different forms, Solve problems on perpendicular distance, distance between two parallel lines and angle between two lines	CCH105-3
6	Solve problems on finding range, coefficient of range and mean deviation	CCH105-2
7	Solve problems on Standard deviation, coefficient of variation and comparison of two sets	CCH105-2
8	Solve problems on Allied & Compound angles	CCH105-4
9	Solve problems on Multiple & sub multiple angles	CCH105-4
10	Solve problems on factorization & De- factorization formulae	CCH105-4
11	Solve problems on Inverse Trigonometric Functions	CCH105-4
12	Solve examples on functions & rules of derivatives	CCH105-5
13	Solve examples on Derivative of composite function ,inverse & parametric functions,	CCH105-5
14	Solve examples on Derivative of exponential, implicit and logarithmic functions	CCH105-5
15	Solve examples on Application of Derivatives	CCH105-5

## II)Theory

### Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO: CCH105-1 : To Apply concepts of algebra to solve engineering related problems			
Unit 1 Algebra	<p><b>1.1 LOGARITHMS</b>            1.1.1 Concept and laws of logarithm            1.1.2 Simple examples based on laws of Logarithms</p> <p><b>1.2 MATRICES</b>            1.2.1 Definition of a matrix, Types of matrices, Algebra of matrices, Equality of two matrices, Transpose of a matrix,            1.2.3 Adjoint and Inverse of a matrix            1.2.4 Solution of simultaneous equations having 3 unknowns using Matrix inversion method</p> <p><b>1.3 PARTIAL FRACTIONS</b>            1.3.1 Definition of rational, proper and improper fractions            1.3.2 Various cases of Partial fractions and Examples</p> <p>1.4 Algebra of Indian Knowledge System: Solution of simultaneous equations using Vedic Mathematics</p>	12	16
CO: CCH105-2 : To Use techniques and methods of statistics to compare multiple sets of data			
Unit 2 Statistics	<p><b>MEASURES OF DISPERSION</b>            2.1 Range, Coefficient of Range of Discrete and grouped data            2.2 Mean deviation and Standard Deviation about mean for Discrete &amp; Grouped Data (except Assumed mean method and Step deviation method)            2.3 Variance and coefficient of Variance            2.4 Comparison of 2 sets of observations</p>	6	10
CO: CCH105-3 : Solve area specific engineering problems under given conditions of straight lines			
Unit 3 Coordinate Geometry	<p><b>THE STRAIGHT LINE</b>            3.1 Slope, intercepts &amp; various methods of finding slope            3.2 Conditions for two straight lines to be parallel and Perpendicular to each others            3.3 Various forms of straight line            3.4 Perpendicular distance of a point from a line            3.5 Distance between two parallel lines            3.6 Angle between two straight lines            3.7 Geometry in Sulabh sutras in Indian Knowledge System</p>	6	8

**Section –II**

Sr. no.	Topics/Subtopics	Learning Hours	Classroom learning evaluation Marks
CO: CCH105-4:- To memorize trigonometric formulae and solve problems based on them.			
Unit 4 Trigonometry	<p style="text-align: center;"><b><i>TRIGONOMETRY</i></b></p> <p>4.1 Fundamental Identities(Only state,No examples)</p> <p>4.2 Conversion of degree into radian and vice versa of standard angles</p> <p>4.3 Trigonometric ratios of Compound Angles(Without Proof) , Examples</p> <p>4.4 Trigonometric ratios of Allied Angles (Without Proof) , Examples</p> <p>4.5 Trigonometric ratios of Multiple and Submultiple Angles (Without Proof) , Examples</p> <p>4.6 Factorization and De-Factorization Formulae (Without Proof) , Examples</p> <p>4.7 Inverse Trigonometric ratios , Principle values and simple problems</p> <p>4.8 Trigonometry in Indian Knowledge System : The evolution of sine function in India</p> <p>4.9 Trigonometry in Indian Knowledge System : Indian Trigonometry-From ancient beginning to Nilakantha</p> <p>4.10 Trigonometry in Indian Knowledge System : Ancient Indian Astronomy</p> <p>4.11 Trigonometry in Indian Knowledge System: Pythagorean to triples in Sulabhsutras</p>	14	14
CO: CCH105-5:- To solve the problems of maxima, minima, radius of curvature and geometrical applications.			
Unit 5 Differential Calculus	<p>5.1 <b>Functions:</b>Concept of Functions and simple examples</p> <p>5.2 <b>Limits:</b> Concept of Limits without examples</p> <p>5.3 <b>Derivatives:</b></p> <p>5.3.1 Derivative of sum, difference, product and quotient of two or more functions</p> <p>5.3.2 Derivative of composite functions</p> <p>5.3.3 Derivative of Inverse functions</p> <p>5.3.4 Derivative of Implicit functions</p> <p>5.3.5 Derivative of Parametric functions</p> <p>5.3.6 Derivative of exponential and logarithmic functions</p> <p>5.3.7 Calculus in Indian Knowledge system “ Discovery of Calculus by Indian Astronomers ( Indian Mathematics)</p>	16	16

CO: CCH105-5:- To solve the problems of maxima, minima, radius of curvature and geometrical applications.			
Unit 6 Application of Derivatives	<b><i>APPLICATIONS OF DERIVATIVES</i></b> 6.1 Second Order Derivatives(without examples) 6.2 Equation of Tangent & Normal 6.3 Maxima & Minima(only for algebraic functions) 6.4 Radius of curvature	06	06

\*\* No questions will be asked on IKS related subtopics in any question paper

### **G : List of Microproject /Assignments under SLA**

Sr.No	List of Assignment (under SLA)	Hrs Allotted
1	Collect the Data of Marks obtained by your class in mid semester test. Compute the variance and coefficient of variance of the data	02
2	Prepare a model using the concept of tangent and normal, bending of curves in case of sliding of a vehicle.	02
3	Prepare charts of grouped and ungrouped data.	02
4	Collect statistical data on real world problems and find Mean Deviation & S.D.	02
5	Collect at least 10 examples based on real world applications which will be used to find S.D. /Variance.	02
6	Prepare models to explain different concepts.	02
7	Prepare a model using concept of radius of curvature of bending of railway tracks.	02
8	A window in the form of rectangle surmounted by a semicircular opening . The total perimeter the window to admit maximum light through the whole opening ,prepare a model using concept of Maxima & Minima for the above problem and verify the result.	02
9	Collect applications of radius of curvature on lens design and optics, mirror and reflective surface properties , road and highway design , structural behavior, roller coaster track design & make a video of 5- minutes duration.	02
10	Design a puzzle based on matrices . Create a grid of numbers and operations.	02
11	Develop a math game based on operations of matrices.	02

12	Collect examples based on real world applications of logarithm and prepare a pdf file.	02
13	Measure height of trees/buildings in surrounding locations using trigonometry and prepare presentation.	02
14	Apply trigonometric principles to calculate angles ,distances, dimensions relevant to the chosen area and make a poster presentation.	02
15	Find height of room or distance between two pillars by using concept of straight line.	02

**\*\*Attempt any 10-12 Micro Projects, out of the given list.**

### **H : Specification table for setting question paper for semester end theory examination**

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	Algebra	4	6	6	16	CCH105-1
I / 2	Statistics	2	4	4	10	CCH105-2
I / 3	Coordinate Geometry	2	2	4	8	CCH105-3
II / 4	Trigonometry	2	6	6	14	CCH105-4
II / 5	Differential Calculus	2	6	8	16	CCH105-5
II/6	Application of Derivatives	2	2	2	6	CCH105-5
Total Marks					70	

### **I) :-Assessment Criteria**

#### **Formative Assessment of Tutorial:-**

Every Tutorial shall be assessed for 25 marks as per following criteria:

<b>Domain</b>	<b>Particulars</b>	<b>Marks out of 25</b>
Cognitive	Understanding	05
	Application	05
Psychomotor	Solving skill	05
	Remembering formulae & Accuracy	05
Affective	Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

**J) Instructional Methods:**

1. Lectures cum Demonstrations,
2. Classroom practices.
3. Use of projector and soft material for demonstration
4. Use of internate.
5. Whatsapp groups.
6. Use of books

**K) Teaching and Learning resources:**

Chalk board, Books,LCD presentations, Demonstrative kits, Demonstrative charts.

**L) Reference Books:**

S. N.	Name of Book	Author	Publication
1	A Text Book on Engineering Mathematics (First Year Diploma)	G.V.Kumbhojkar	Phadake Prakashan, Kolhapur
2	Basic Mathematics	Patel, Rawal and others	Nirali Prakashan,Pune
3	Basic Mathematics	Sachin S. Shah & Santosh R. Mitkari	Tech-Neo Publications
4	Basic Mathematics	Vitthal B.Shinde & others	Technical Publications
5	Higher Engineering Mathematics	Grewal B.S.	Khanna publication New Delhi,2013 ISBN:8174091955
6	A text book of Engineering Mathematics	Dutta D.	New age publication New Delhi,2006 ISBN:978-81-224-1689-3
7	Studies in the History of Indian Mathematics	C.S.Seshadri	Hindustan Book Agency,New Delhi 110016.ISBN 978-93-80250-06-9
8	Indian Mathematics Engaging with the World from Ancient to Modern Times	George Gheverghese Joseph	World Scientific Publishing Europe Ltd.57 ASBN 978-17-86340-61-0
9	Calculus and Its Applications	Marvin L.Bittinger David J.Ellenbogen Scott A.Surgent	Addison-Wealey 10 <sup>th</sup> Edition ISBN-13:978-0-321-69433-1
10	Mathematics- I	Deepak Singh	Khanna Book Publishing Co. (P) Ltd. ISBN:978-93-91505-42-4
11	Mathematics -II	Garima Singh	Khanna Book Publishing Co. (P) Ltd. ISBN:978-93-91505-52-3
12	Advance Engineering Mathematics	Das H.K.	S Chand publication New Delhi 2008 ISBN:9788121903455
	Sansar ke Mahan	Gunakar Muley	Raj kamal Prakashan ISBN-13.

13	Ganitagya		978-8126703579
14	An Introduction to Statistical learning with applications in R	Gareth James & others	Springer New York Heidelberg Dordrecht London ISBN:978-1-4614-7137-0

### **M) Learning Website & Software**

- a. [www.nptel.ac.in/courses/106102064/1](http://www.nptel.ac.in/courses/106102064/1)
- b. [www.scilab.org/-SCI Lab](http://www.scilab.org/-SCI%20Lab)
- c. [www.mathworks.com/product/matlab/-MATLAB](http://www.mathworks.com/product/matlab/-MATLAB)
- d. Spreadsheet Applications
- e. <http://ocw.abu.edu.ng/courses/mathematics/>
- f. <https://ocw.mit.edu/>
- g. <https://libguides.cmich.edu/OER/mathematics>
- h. <https://libguides.furman.edu/oer/subject/mathematics>

**GOVERNMENT POLYTECHNIC KOLHAPUR  
CIVIL ENGINEERING DEPARTMENT  
SAMPLE PATH - H SCHEME -SECOND SEMESTER**

Sr.no	Course Title	Abbreviation	Course Type	Course Code	Level	Total IKS Hrs. for Sem	Learning Scheme					Assessment Scheme					Based on LL & TL				Based on Self Learning		Total Marks			
							Actual Contact					Theory					Practical									
							CL	TL	LL	Self Learning (Activity/Assignment/MicroProject)	Notional Learning Hrs/Week	Credits	Paper Duration(Hrs)	FA-TH	SA-TH	Total	FA-PR	SA-PR		SLA						
							Max	Max		Max	min	Max	min	Max	min	Max	min	Max	min							
1	ENGINEERING PHYSICS-B	HPHB	DSC	CCH102	1	4	4	0	2	2	8	4	1.5	30	70	*#	100	40	25	10	25	@	10	25	10	175
2	APPLIED MECHANICS	HAPM	DSC	CCH108	1	2	4	0	2	2	8	4	3	30	70		100	40	25	10	25	@	10	25	10	175
3	APPLIED MATHEMATICS	HAMT	AEC	CCH301	3	2	4	2	0	0	6	3	3	30	70		100	40	0	0	0		0	0	0	100
4	SOCIAL AND LIFE SKILLS	HSLS	VEC	CCH204	2	0	0	0	1	1	2	1	0	0	0		0	0	0	0	0		0	50	20	50
5	BUILDING MATERIAL AND CONSTRUCTION	HBMC	DSC	CEH301	3	1	3	0	2	3	8	4	3	30	70		100	40	25	10	0		0	25	10	150
6	SURVEYING	HSVY	SEC	CEH302	3	1	3	0	4	1	8	4	3	30	70		100	40	25	10	50	#	20	25	10	200
		<b>TOTAL</b>				10	18	2	11	9	40	20		150	350		500	200	100	40	100	0	40	150	60	850

@ INTERNAL ASSESMENT  
# EXTERNAL ASSESMENT

**COURSE ID : CCH102**  
**COURSE NAME : ENGINEERING PHYSICS (CE/ME/MT)**  
**COURSE CODE : CCH102**  
**COURSE ABBREVIATION : HPHB**

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	04	4
	Tutorial Learning	-	
	Laboratory Learning	02	
	SLH-Self Learning	02	
	NLH-Notional Learning	08	

**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL & TL				BASED ON SLA		TOTAL
					Practical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
1.5	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	175
	30*#	70*#	100	40	25	10	25@	10	25	10	

**(Total IKS Hrs for Sem.: 04 Hrs)**

**C: ABBREVIATIONS :-** CL-Classroom Learning, TL-Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA -Self Learning Assessment  
**Legends:**@Internal Assessment, #External Assessment,\*# Online Examination, @\$Internal Online Examination

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\*15Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \*Self learning hours shall not be reflected in the Time Table.

\*Self learning includes microproject / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

### **D. i) RATIONALE :-**

Physics is the foundation of engineering and technology. The development of all engineering areas requires good understanding of fundamental principles in physics. Studying physics develops scientific methodology and technical aptitude in the students. Applications of principles of physics in engineering fields create interest and motivate the students.

### **ii) INDUSTRY/ EMPLOYER EXPECTED OUTCOME**

Apply principles of Physics to solve engineering problems as follows:

**Cognitive** : i) Understanding and applying principles and laws of Physics to simple practical problems/ situations. ii) Observing iii) Classifying iv) Interpreting

**Psychomotor** : Handling of instruments, apparatus and tools

**Affective** : Skill of i) working in team ii) curiosity, interest and self-confidence

### **E. COURSE LEVEL LEARNING OUTCOMES (COS)**

**CCH102-1** Estimate errors in measurement of physical quantities.

**CCH102-2** Express importance of semiconductors and nanotechnology.

**CCH102-3** Select proper material in engineering industry by analysis of its physical properties.

**CCH102-4** Apply principles of electricity and magnetism to solve engineering problems.

**CCH102-5** Apply principles of optics to solve engineering problems.

**CCH102-6** Apply principles of acoustics and ultrasonics for related engineering applications.

**Course outcomes and programme outcomes/ programme specific outcomes (co-po/ps0) matrix**

[ Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “0”

Cos	Programme Outcomes POs and PSOs								
	PO 1 Basic and Discipli ne specific knowle dge	PO 2 Proble m Analysi s	PO 3 Design / Develo pment of solutio ns	PO 4 Enginee ring Tools, Experim entation and Testing	PO 5 Engineeri ng Practices for society, sustainab ility and Environ ment	PO 6 Project Manag ement	PO 7 Life- long Learni ng	PSO1	PSO2
CCH102-1 Estimate errors in measurement of physical quantities.	3	1	-	1	1	1	1		
CCH102-2 Express importance of semiconductors and nanotechnology	3	-	-	-	1	1	1		
CCH102-3 Select proper material in engineering industry by analysis of its physical properties	3	1	-	1	1	1	1		
CCH102-4 Apply principles of electricity and magnetism to solve engineering problems	3	1	-	1	1	1	1		
CCH102-5 Apply principles of optics to solve engineering problems.	3	1	-	-	1	1	1		
CCH102-6 Apply principles of acoustics and ultrasonics for related engineering applications.	3	-	-	-	1	1	1		

**F. CONTENT :**

**I) Practical exercises**

The following practical exercises shall be conducted in the *Laboratory for Physics developed* by the Institute in practical sessions of batches of about 20- 22 students:

Sr. no	Laboratory experiences	CO
1	To measure internal and external dimensions of hollow cylinder by using Vernier Caliper	CCH102-1
2	To measure the diameter of bob and thickness of plate by using Vernier Caliper	CCH102-1
3	To measure the diameter of bob and thickness of plate by using Micrometer screw gauge	CCH102-1
4	To determine forbidden energy band gap in semiconductors	CCH102-2
5	To determine the viscosity of liquid by Stokes method.	CCH102-3
6	To determine the buoyancy force on a solid immersed in a liquid	CCH102-3
7	To measure unknown resistance of wire by Ohm’s law	CCH102-4

Sr. no	Laboratory experiences	CO
8	To verify series law of resistances	CCH102-4
9	To verify parallel law of resistances	CCH102-4
10	To draw magnetic lines of force for given magnet by using magnetic compass	CCH102-4
11	To verify Snell's law using glass slab	CCH102-5
12	To study variation of $\delta$ with $i$ for a prism by pin method	CCH102-5
13	To determine velocity of sound by resonance tube	CCH102-6
14	To measure distance using ultrasonic meter	CCH102-6
15	To be added by the subject teacher as per requirement	

## II) Theory

### Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO: CCH102-1 Estimate errors in measurement in Physical quantities.			
1	<b>UNITS AND MEASUREMENT</b> 1.1 Unit, Physical Quantities : Fundamental and Derived Quantities and their units 1.2 Systems of units : CGS, MKS, FPS and SI 1.3 Errors , Types of errors : Instrumental, Systematic and Random error, Estimation of errors : Absolute, Relative and percentage errors 1.4 Significant figures 1.5 Ancient Astronomical Instruments : Chakra, Dhanuryantra, Yasti and Phalaka yantra (IKS learning) 1.6 <b>Simple Numerical problems</b>	<b>10</b>	<b>12</b>
CO: CCH102-2 Express the importance of Semiconductors and nanotechnology.			
2	<b>INTRODUCTION TO SEMICONDUCTORS AND NANOTECHNOLOGY</b> <b>2.1 SEMICONDUCTORS</b> 2.1.1 Conductors, insulators and semiconductors 2.1.2 Energy bands 2.1.3 Intrinsic and extrinsic semiconductors 2.1.4 Minority and majority charge carriers 2.1.5 P and N type semiconductors 2.1.6 Properties of semiconductors 2.1.7 Applications of semiconductors <b>No numericals on above topic</b>	<b>08</b>  (06)	<b>08</b>  (06)

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	<p><b>2.2 Nanotechnology</b>            2.2.1 Definition of nanoscale, nanometer, nanoparticle            2.2.2 Definition and examples of nanostructured materials            2.2.3 Applications of nanotechnology in electronics, automobile, textile, space, medicine, cosmetics and environment  <b>No numericals on above topic</b></p>	(02)	(02)
CO: CCH102-3 Select proper material in engineering industry by analysis of its physical properties.			
3	<p><b>PROPERTIES OF MATTER</b></p> <p><b>3.1 ELASTICITY</b>            3.1.1 Definitions of elasticity, plasticity, rigidity, deforming force, restoring force            3.1.2 Stress, Strain and their types            3.1.3 Elastic Limit, Statement of Hooke's law            3.1.4 Modulus of elasticity and its types, Relation between Y, K and <math>\eta</math> (No derivation)            3.1.5 Ultimate stress, breaking stress, Working stress, Factor of safety            3.1.6 Applications of elasticity            3.1.7 <b>Simple Numerical problems</b></p> <p><b>3.2 VISCOSITY</b>            3.2.1 Definition and meaning of viscosity, velocity gradient            3.2.2 Newton's law of viscosity, Coefficient of viscosity            3.2.3 Stokes law            3.2.4 Derivation of expression for coefficient of viscosity of liquid by Stokes method            3.2.5 Effect of temperature and adulteration on viscosity of liquids            3.2.6 Applications of viscosity  <b>No numericals on above topic</b></p>	<p><b>12</b></p> <p>(06)</p> <p>(06)</p>	<p><b>14</b></p> <p>(10)</p> <p>(04)</p>

## Section –II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO: CCH102-4 Apply principles of electricity and magnetism to solve engineering problems			
4	<p><b>ELECTRICITY AND MAGNETISM</b></p> <p><b>4.1 ELECTRICITY</b>            4.1.1 Concept of charge, Coulomb's inverse square law,            4.1.2 Electric field, Electric field intensity            4.1.3 Electric potential and potential difference            4.1.4 Electric current, Resistance, Ohm's law            4.1.5 Specific resistance            4.1.6 Resistances in series and parallel            4.1.7 <b>Simple Numerical problems</b></p> <p><b>4.2 MAGNETISM</b>            4.2.1 Magnetic field and magnetic field intensity and its units            4.2.2 Magnetic lines of force, magnetic flux  <b>No numericals on above topic</b></p>	<p><b>10</b></p> <p>(06)</p> <p>(04)</p>	<p><b>12</b></p> <p>(08)</p> <p>(04)</p>
CO: CCH102-5 Apply principles of optics to solve engineering problems			
5	<p><b>OPTICS</b></p> <p><b>5.1 PROPERTIES OF LIGHT</b>            5.1.1 Refraction of light            5.1.2 Laws of Refraction of Light, Snell's law            5.1.3 Refraction through glass prism            5.1.4 Dispersion &amp; Dispersive Power (in terms of angles of deviation only)            5.1.5 <b>Simple Numerical problems</b></p> <p><b>5.2 LASER</b>            5.2.1 Introduction of LASER            5.2.2 Properties of laser            5.2.3 Spontaneous and stimulated emission            5.2.4 Population inversion and optical pumping            5.2.5 Applications of LASER  <b>No numericals on above topic</b></p> <p><b>5.3 X-RAYS</b>            5.3.1 Nature and properties of x-rays.            5.3.2 Production of x-rays by Coolidge tube            5.3.3 Applications of x-rays  <b>No numericals on above topic</b></p>	<p><b>14</b></p> <p>(06)</p> <p>(04)</p> <p>(04)</p>	<p><b>18</b></p> <p>(08)</p> <p>(06)</p> <p>(04)</p>

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO: CCH102-6 Apply principles of acoustics and ultrasonics for related engineering applications.			
6	<p><b>ACOUSTICS AND ULTRASONICS</b></p> <p><b>6.1 ACOUSTICS</b>  6.1.1 Echo and reverberation of sound  6.1.2 Sabine's formula  6.1.3 Requirements of good acoustics  6.1.4 Acoustical planning of an auditorium  <b>No numericals on above topic</b></p> <p><b>6.2 ULTRASONICS</b>  6.2.1 Limits of audibility  6.2.2 Ultrasonic waves  6.2.3 Ultrasonic transducers : Piezoelectric and Magnetostriction  6.2.4 Applications of ultrasonic waves  <b>No numericals on above topic</b></p>	<b>06</b>	<b>06</b>

**\*\* No questions will be asked on IKS learning subtopics in any question papers.**

### **G : List of Microprojects/ Assignments/ Other Activities under SLA**

Sr. No.	List of Microprojects (any one of the following under SLA)	Hrs Allotted
1	Prepare chart showing multipliers required for converting units of physical quantities.	02
2	Prepare prototype vernier caliper of desired least count using card sheet.	02
3	Collect information about ancient astronomical instruments like Chakra, Dhanuryantra, Yasti and Phalaka yantra.	02
4	Collect different materials such as metal, plastic, glass etc and prepare models to show their electrical conductivity.	02
5	Collect different sizes of same material (eg. sugar, salt etc) and list the physical/elerical/optical/chemical/mechanical characteristics for each of them.	02
6	Prepare chart showing the three types of modulus of elasticity developed in a material.	02
7	Prepare working model to differentiate liquids on the basis of viscosity.	02
8	Prepare chart/models to demonstrate magnetic lines of force of different types of magnets.	02

9	Prepare chart/models for series and parallel combination of resistances of different values.	02
10	Prepare a model to demonstrate the variation of angle of refraction with respect to angle of incidence.	02
11	Use keychain laser to differentiate laser with ordinary light.	02
12	Prepare a presentation for application of x-rays in different fields.	02
13	Collect information using internet about ancient acoustic architecture. (For CE/ME/MT students)	02
<b>OR</b>		
Sr.No	List of Assignment (any one of the following under SLA)	Hrs Allotted
1	Write fundamental and derived Physical quantities with their SI units	02
2	Enlist the rules used to decide significant figures in measurements.	02
3	Write points to differentiate conductors, semiconductors and insulators on the basis of energy band diagram.	02
4	List applications of semiconductors in Civil, Mechanical, Electrical, Information Technology, Electronics and Telecommunication, Metallurgical Engineering etc.	02
5	Write down the applications of nanotechnology in the field of electronics, cosmetics, textile, environment, medical, space and defense, automobiles.	02
6	Write applications of elasticity.	02
7	Explain free fall of a sphere in a liquid column.	02
8	Write information of electric lines of force and magnetic lines of force.	02
9	Explain conversion of galvanometer into ammeter/voltmeter of desired range.	02
10	Draw ray diagrams showing different phenomena of light (reflection, refraction, dispersion etc).	02
11	Enlist the properties and applications of laser.	02
12	Explain production of X-rays using Coolidge tube.	02
13	Write the information of factors to be considered while planning of an auditorium. (For CE/ME/MT students).	02
<b>AND</b>		
Sr.No	List of Activity (Compulsory activity under SLA)	Hrs Allotted
	Write importance and significance of calibration of measuring instruments. Collect information of related industries in nearby industrial areas.	02

**\*\*One microproject/ assignment and given activity is to be completed during the semester.**

## H : Specification table for setting question paper for semester end theory examination

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	Units and measurements	2	4	6	12	CCH102-1
I / 2	Introduction to Semiconductors and Nanotechnology	2	2	4	08	CCH102-2
I / 3	Properties of matter (Elasticity and Viscosity)	4	2	8	14	CCH102-3
II / 4	Electricity and Magnetism	2	4	6	12	CCH102-4
II / 5	Optics (Properties of light, Laser & X-rays)	6	6	6	18	CCH102-5
II / 6	Acoustics and Ultrasonics	2	2	2	06	CCH102-6
<b>Total Marks</b>					<b>70</b>	

### I :-Assessment Criteria

#### i) Formative Assessment of Practical:-

Every practical assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Presentation ( Observations, calculations & Result table)	05
Psychomotor	Operating Skills	05
	Drawing skills (Neat & complete circuit Diagram / schematic Diagram)	05
Affective	Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

#### ii) Summative Assessment of Practical :

Every practical assignment shall be assessed for 25 marks as per following criteria:

Sr.no	Criteria	Marks allotted
1	Attendance at regular practical	05
2	Preparedness for practical	05
3	Neat & complete Diagram / observation table	05
4	Observations / Calculations / Result / Graph	05
5	Safety / use of proper tools	05
<b>TOTAL</b>		<b>25</b>

### iii) Assessment of SLA :-

Every Self-learning assignment shall be assessed for 25 marks as per following criteria:

Sr.no	Criteria	Marks allotted
1	Attendance	05
2	Preparedness and workmanship	05
3	Presentation (neat figures/ diagrams/ tables/ graphs etc.)	05
4	Conclusion / Inference	05
5	Oral Based on microproject/ assignment/ activity	05
<b>TOTAL</b>		<b>25</b>

### J) Instructional Methods:

1. Lectures cum Discussions
2. Regular Home Assignments
3. Laboratory work
4. Use of projector and soft material for demonstration

### K) Teaching and Learning resources:

1. Chalk board
2. Video clips
3. Slides
4. Item Bank
5. Charts

### L) Reference Books:

S.N.	Name of Book	Author	Publication
1	Text book of Physics for class XI & XII (Part-I, II)	Narlikar	N.C.E.R.T Delhi
2	Engineering Physics	P.V.Naik.	Pearson Edu. Pvt. Ltd, New Delhi.
3	Concepts in Physics, Vol. I & II.	Narkhede, Pawar, Sutar	Bharti Bhawan Ltd, New Delhi.
4	Principles of Physics.	Walker, Halliday, Resnik	Wiley Publication. , New Delhi.
5	Engineering Physics	B.L. Theraja	S. Chand Publishers – New Delhi
6	Concept of modern physics	Beiser	Tata Mc-Graw Hill
7	Physics for Technicians	E. Zebro Wski	Tata Mc-Graw Hill
8	Engineering Physics	V. Rajendran	Tata McGraw-Hill Publications
9	The Archaic and The Exotic : Studies in the history of Indian astronomical instruments	Steeramula Rajeswara Sarma	Manohar Book Services
10	The Surya Siddhanta	Aryabhatta	Baptist Mission Press, Calcutta

## **M) Learning Website & Software**

- 1) <http://www.physicsclassroom.com>
- 2) <http://scienceworld.wolfram.com/physics/>
- 3) <http://physics.about.com/>
- 4) <http://nptel.ac.in/course.php?disciplineId=115>
- 5) <http://nptel.ac.in/course.php?disciplineId=104>
- 6) [www.fearofphysics.com](http://www.fearofphysics.com)
- 7) [www.science.howstuffworks.com](http://www.science.howstuffworks.com)
- 8) [www.iksindia.org](http://www.iksindia.org)

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**COURSE ID :****COURSE NAME : APPLIED MECHANICS (CE/ME/MT)****COURSE CODE :CCH108****COURSE ABBREVIATION :HAPM****A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	04	4
	Tutorial Learning	-----	
	Laboratory Learning	02	
	SLH-Self Learning	02	
	NLH-Notional Learning	08	

**B. LEARNING SCHEME**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
	FA-TH	SA-TH	TOTAL		Practical				MAX	MIN	
03	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	25	10	175
	30	70	100	40	25	10	25@	10			

(Total IKS hours for sem: 02 hours)

**C: ABBREVIATIONS: -**

CL- Class Room Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA - Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

**Legends:** @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination.

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

#### **D.RATIONALE:**

The role of an engineer is to dream a mechanism for the present and the future generation. Understand the concept of existing mechanism thoroughly. An engineer in his initial stages of learning need to understand the basics of components of the machine, then forces in those components, interaction of these forces resulting in an engineering marvel or a mechanism. The contents of this most versatile basic course for engineering curriculum aims at providing fundamental meaning of various engineering principles and concept in engineering applications .The contents also forms basic or primary set for higher level of subject such as strength of material, analysis of structures and design of steel structures and RCC structures. The subject being first and foremost entry level curriculum for the various programs in engineering it acts as gateway for engineering career. With the learning outcomes of the subject, learner can get clues for various fields such as mechanical, civil, metallurgical and varied courses like aerodynamics, space mechanics, marine structures .The subject being interdisciplinary in nature it comes under allied department applied mechanics.

#### **Competency identified for the course:**

The MPEC 2020 curriculum design based on MSBTE K curriculum guideline and NEP2020 policy incorporates all salient features such as notional hours and non-national hours of learning. Indian knowledge system through 2 hours in a semester is aimed at exploring ancient traditional technical knowledge prevailing in the country. Subject is given 4 hrs. Of class room learning, 2hrs of practicals (lab learning) and 2 hrs. of self-learning. All these hrs. Of learnings including IKS learning are aimed at achieving following skills sets.

Cognitive	psychomotor	Affective domain
<p>Understanding force concepts in various mechanics through FBD for various physical situations</p> <p>Solving for equilibrium condition of various force system and appreciating the mechanism analytically.</p> <p>Understanding the kinematics geometry of motion in rectilinear and circular motion</p> <p>Solving static equilibrium and dynamic equilibrium condition( kinetics) and lifting machines.</p> <p>Formative assessment is employed through two unit test., end semester exam (specification table) (30 marks)and progressive assessment format for lab work is to be followed .(10 marks)</p>	<p>Practicals with hands on experience on force system to verify Lamis theorem ,law of polygon of forces ,parallelogram of forces ,beam reactions on force table or similar set up.</p> <p>Lifting machines are operated to establish law of machine and compute efficiency .</p> <p>By performing motion of bodies with different surfaces in contact , frictional resistance is evaluated .</p> <p>By simulating areas to forces centroid for different laminae is graphically found.</p> <p>progressive assessment format for lab work is to be followed(10marks) .</p>	<p>All practical systematically executed to understand the principles, appreciate the inferences with the set of observations conducting lab learning in a small group where every individual gets ample opportunity, essence of team work is developed, result oriented performance is appreciated and time bound activity is scheduled . the neatness and presentation skills are appreciated in formative progressive assessment format for lab work is to be followed (5marks).</p>

### E. COURSE LEVEL LEARNING OUTCOMES (COs):

**CCH108-1** Understanding mechanisms for the interaction of various forces in their components with types and corresponding effects. With due focus on rigid body concept, principle of superposition resolution and composition of forces.

**CCH108-2** Study of equilibrium for concurrent and non-concurrent force system and finding resultant and equilibrant graphically and analytically.

**CCH108-3** Problems on equilibrium condition involving friction and support reactions in beams graphically and analytically.

**CCH108-4** Knowing simple lifting mechanisms establishing law of machine, evaluating efficiency for set of loads.

**CCH108-5** Studying equations of motion for rectilinear and circular motion, establishing relation between linear and angular motion parameters.

**CCH108-6** Understanding effect of force for executing work, energy principles and conservation of energy concept.

**Competency, course outcomes and programme outcomes/programme specific outcomes  
(CO-PO/PSO matrix)**

[Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “0” ]

Competency and COs	Programme Outcomes POs and PSOs								
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 Civil /Mechanical/metallurgy mechanisms – understanding	PSO2 Civil /Mechanical/metallurgy mechanisms – understanding-innovation
Competency: Applied Mechanics	3	2	2	2	3	1	2	2	2
CCH108-1 Understanding mechanisms for the interaction of various forces in their components with types and corresponding effects. With due focus on rigid body concept, principle of superposition resolution and composition of forces.	3	2	1	2	-	1	2	2	1
CCH108-2 Study of equilibrium for concurrent and non-concurrent force system and finding resultant and equilibrant graphically and analytically.	3	2	1	2	-	1	2	3	1
CCH108-3 Problems on equilibrium condition involving	3	2	1	2	-	1	2	3	1

Competency and COs	Programme Outcomes POs and PSOs								
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 Civil /Mechanical/metallurgy mechanics – understanding	PSO2 Civil /Mechanical/metallurgy mechanics – understanding-innovation
friction and support reactions in beams graphically and analytically.									
CCH108-4 Knowing simple lifting mechanisms establishing law of machine, evaluating efficiency for set of loads.	3	2	1	3	2	1	2	2	2
CCH108-5 Studying equations of motion for rectilinear and circular motion, establishing relation between linear and angular motion parameters.	2	1	1	2	-	1	2	1	1
CCH108-6 Understanding effect of force for executing work, energy principles and conservation of energy concept.	2	2	1	2	-	1	2	2	2

**Note : typical matrix assessment based on previous records—for continuous analysis improvement .**

**F. CONTENT:****I) LABORATORY WORK**

Practical Exercise and related skills to be developed

The following exercises shall be conducted as practical work as detailed in laboratory manual for Applied Mechanics developed by the institute in practical sessions of batches of about 20-22 students.

In the list, Expt. No.1 to7 exercises are compulsory and from 8 to 12, any three exercises shall be conducted. in all 10 experiments are mandatory.

Sr no	Title of practical exercise	Course Outcome
1	Verification Law of parallelogram of forces	CCH108-1
2	Verification Law of polygon of forces	CCH108-1
3	Verification of Lamis theorem	CCH108-2
4	Determination of Beam reaction (Graphically and Analytically)	CCH108-2
5	Graphic statics (To find resultant of concurrent and non-concurrent force system)	CCH108-2
6	Determination of centroid (regular and irregular laminas)	CCH108-2
7	Determination of coefficient of friction between different surfaces	CCH108-3
8	Simple lifting machine introduction of basic terms Study of differential axle and wheel	CCH108-4
9	Screw jack Application and finding efficiency and its law	CCH108-4
10	Study of worm and worm wheel	CCH108-4
11	Gear mechanism (Either single or double)	CCH108-4
12	Experiment on simple pendulum to know dynamic characteristics	CCH108-5

**II) THEORY:****Section I**

Sr no	Course content	Lecture hours (class room learning)	Theory Assessment marks
<b>CO: CCH108-1</b> Understanding mechanisms for the interaction of various forces in their components with types and corresponding effects. With due focus on rigid body concept, principle of superposition resolution and composition of forces.			
1	<b>Force systems and principles</b> 1.1 Rigid body concepts, physical quantities and their units 1.2 Free body diagram for various mechanisms 1.3 Force characteristics, definition, force and force system-principles and laws 1.4 Different type of actions and their representation, with their effect (resultant moment, couple etc.) 1.5 Application on force system – numerical on law of parallelogram of forces, law of polygon of forces	8 hours	12 marks
<b>CO: CCH108-2</b> Study of equilibrium for concurrent and non-concurrent force system and finding resultant and equilibrant graphically and analytically.			
2	<b>Equilibrium of bodies</b> 2.1 Two force system resultant and equilibrium inference 2.2, Lami's theorem for three force system and its application 2.3 Varignon's principle and its application 2.4 Solving graphically and analytically beams with roller and hinge support 2.5 Definition of centroid and centroid for standard areas /sections. Its determination experimentally for irregular areas	12 hours	12 marks
<b>CO: CCH108-3</b> Problems on equilibrium condition involving friction and support reactions in beams graphically and analytically.			
3	<b>Friction on bodies and beam statics</b> 3.1 Laws of dry friction 3.2 Free body diagram to derive expression for $\mu_s$ & $\mu_k$ 3.3 Problems on block and ladder friction 3.4 Reaction in beams carrying point load and udl with hinge and roller support. 3.5 Beam carrying transverse loads and couple	10 hours	10 marks
<b>Total</b>		<b>30</b>	<b>34</b>

## Section II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
<b>CO: CCH108-4</b> Knowing simple lifting mechanisms establishing law of machine, evaluating efficiency for set of loads.			
4	<b>Simple Lifting machines</b> 4.1 Basic definition of terms involved in lifting mechanisms. 4.2 Different types of simple lifting machines such as simple gears differential axial and wheel, screw jack 4.3 Inclined plane and evaluating coefficient of static friction	12 hours	14 marks
<b>CO: CCH108-5</b> Studying equations of motion for rectilinear and circular motion, establishing relation between linear and angular motion parameters.			
5	<b>Kinematics and kinetics</b> 5.1 Kinematics and kinetic equations of motion 5.2 D'Alembert's principle for dynamic equilibrium 5.3 Kinetics for circular motion 5.4 Evaluating dynamic characteristics of simple pendulum	10 hours	12 marks
<b>CO: CCH108-6</b> Understanding effect of force for executing work, energy principles and conservation of energy concept			
6	<b>Work, power and energy</b> 6.1 Definition of work done and dot product of force and displacement vectors 6.2 Energy types and law of conservation of energy 6.3 Collision of bodies and problem solving 6.4 Power and its interpretation in different mechanism	8 hours	10 marks
	<b>Total</b>	<b>30</b>	<b>36</b>

**G. List of Assignments/Microprojects under SLA**

\*\*assignments/Microproject are to be completed during the semester.

Sr.No	List of Microproject objectives	Format	Assessment criteria
1	Mechanism –free body diagrams, force equations and efficiency	Title:	Objectives: 5 marks
2	Equilibrium of static force systems - Buildings, Dams, Engineering structures case studies	Objectives:	Methodology:10 marks
3	Gear systems –case studies	Study scheme: 2* 15 = 30 hours planning	Presentation /inferences:10 marks
4	Rope drives, weighing machines case studies	Procedure: theory/ modeling	
5	Rolling, sliding friction field applications.	Observations:	
6	Machine foundation aspects	Inference:	
7	Vibration analysis of simple motions	Conclusion	
8	Motion of bodies, projectile, space mechanics preliminary studies	Bibliography	
9	Energy principles, fly wheel machine concept and applications		

## H: Specification table for setting question paper for semester end theory examination

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	Force systems and principles	4	4	4	12	CCH108-1
I / 2	Equilibrium of bodies	4	4	4	12	CCH108-2
I / 3	Friction on bodies and beam statics	4	2	4	10	CCH108-3
II / 4	Simple Lifting machines	4	2	8	14	CCH108-4
II / 5	Kinematics and kinetics	4	4	4	12	CCH108-5
II / 6	Work,power and energy	4	2	4	10	CCH108-6
Total Marks					<b>70</b>	

### I:-Assessment Criteria

#### i) Formative Assessment of Practical: -

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

#### ii) Summative Assessment of Practical:

Every practical assignment shall be assessed for 25 marks as per following criteria:

Sr. no	Criteria	Marks allotted
1	Attendance at regular practical	05
2	Preparedness for practical	05
3	Neat & complete Diagram.	05
4	Observations & handling of instrument.	05
5	Oral Based on Lab work and completion of task	05
<b>TOTAL</b>		<b>25</b>

#### iii) Assessment of SLA: -

Every Self-learning assignment/microproject shall be assessed for 25 marks as per assessment shown in table of criteria G.

**J. Instructional Methods:**

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration

**K. Teaching and Learning resources:**

1. Chalk board
2. LCD presentations
3. Demonstrative kits
4. Demonstrative charts
5. Question Bank
6. Digital learning resources

**L. REFERENCE BOOKS**

a) Book / journals / IS code

Sr no	Name of Book	Author	Publication
1	Engineering Mechanics	S Timoshenko and young	McGraw- Hill,1995
2	Vector Mechanics for Engineer	Beer, Johnston	McGraw- Hill,1995
3	Engineering Mechanics	S S BHAVIKATTI S.S and Rajashekharappa K.G.	New age international publisher
5	Engineering Mechanics	K L KUMAR	Tata McGraw- Hill Publishing company Limited
6	Text book on engineering mechanics	Khurmi R .S.	S. Chand Publications, New Delhi
7	Engineering Mechanics	Singer F.L.	Harper and Row Pub. York.

**M. Learning Website & Software**

- a. [www.nptel.com/iitm/](http://www.nptel.com/iitm/)
- b. [www.howstuffworks.com/](http://www.howstuffworks.com/)
- c. [www.vlab.com](http://www.vlab.com)
- d. [https:// en.wikipedia.org/wiki/applied\\_mechanics](https://en.wikipedia.org/wiki/applied_mechanics)

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**COURSE ID :**  
**COURSE NAME** :APPLIED MATHEMATICS  
**COURSE CODE** : CCH301  
**COURSE ABBREVIATION** : HAMT

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	04	3
	Tutorial Learning	02	
	Laboratory Learning	-	
	SLH-Self Learning	00	
	NLH-Notional Learning	06	

**B: ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Tutorial						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	100
03	30	70	100	40	--	--	--	--	--	--	

**(Total IKS Hrs for Sem.: 02 Hrs)**

**C: ABBREVIATIONS:-**CL-ClassRoom Learning, TL-Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA -Self Learning Assessment

**Legends:**@Internal Assessment, #External Assessment, \*#OnLine Examination, @\$Internal Online Examination( TNR 12 font)

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL) hrs.\*15Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \*Self learning hours shall not be reflected in the Time Table.  
 \*Self learning includes micro project /assignment/other activities. (The list of all assignments are given in tabular format. At least 6 to 8 assignments to be given)

**D. i)RATIONALE:-**

Mathematics is an important pre-requisite for the development and understanding of engineering and technological concepts. For an engineer and technologist, knowledge of Mathematics is an effective tool to pursue and to master the applications in the engineering and technological fields. Applied mathematics is designed for its applications in engineering and technology. It includes integration, differential equation,. The connection between applied mathematics and its applications in real life can be understood and appreciated. Integral calculus helps in finding the area . Differential equation is used in finding curve, rectilinear motion. Statistics and probability will help a student to analyze data of large volume in their higher studies. The fundamentals of these topics are directly useful in understanding engineering applications in various fields.

**ii) Competency:**

The course should be taught and implemented with the aim to develop the course outcomes (CO's) for the student to acquire the competency needed to apply the mathematical techniques for engineering subjects.

- 1.Cognitive** : Understanding and applying principles of mathematics to engineering problems
- 2. Psychomotor:** To prepare charts displaying the area of irregular shapes using the concept of integration,prepare charts to displaying grouped and ungrouped data .
- 3. Affective** : discipline, consistency, hard work , to concentrate ,accuracy, punctuality, aesthetics

**E. COURSE LEVEL LEARNING OUTCOMES (COS)(TNR 14)**

CCH301-1 : To solve examples on integration using various techniques

CCH301-2 : To solve Differential equation of first order and first degree by various methods

CCH301-3 : To find approximate solution of algebraic equations and simultaneous equations by various methods.

CCH301-4:- To solve problems on Probability distributions

CCH301-5 :- Solve examples on Laplace Transform



## F. CONTENT:

### I) Tutorial exercises

Any **TEN** of the following Tutorial exercises shall be conducted in the Tutorial room in tutorial sessions of batches of about 20- 22 students:

Sr. no	Tutorial experiences	CO
1	Solve simple problems of Integration by substitution.	CCH301-1
2	Solve integration using by parts.	CCH301-1
3	Solve examples on Definite Integral based on given methods.	CCH301-1
4	Solve problems on properties of definite integral.	CCH301-1
5	Solve given problems for finding the area under the curve and area between two curves . (Only for civil and mechanical engg. group)	CCH301-1
6	Solve examples on mean value and root mean square value.(only for Computer, Electrical and Electronics engg. group)	CCH301-1
7	Solve first order first degree differential equation using variable separable method.	CCH301-2
8	Solve first order first degree differential equation using exact differential equation and linear differential equation.	CCH301-2
9	Solve engineering application problems using differential equation.	CCH301-2
10	Solve problems on Bisection method, Regula falsi and Newton-Raphson method.	CCH301-3
11	Solve problems on Jacobi's method and Gauss Seidel method.	CCH301-3
12	Use Bakshali iterative methods for finding approximate value of square root.(IKS)	CCH301-3
13	Solve engineering problems using Binomial Distribution, Poisson Distribution and Normal Distribution.	CCH301-4
14	Solve problems on Laplace transform and properties of Laplace transform.	CCH301-5
15	Solve problems on Inverse Laplace transform and properties of Inverse Laplace transform.	CCH301-5

## II)Theory

### Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO: CCH301-1 : To solve examples on integration using various techniques.			
<b>Unit 1 Indefinite Integration</b>	<b>Indefinite Integration</b> 1.1 Definition, Standard formulae 1.2 Rules of Integration (without proof), Examples 1.3 Integration by substitution 1.4 Integration by parts 1.5 Integration by partial fractions (only linear non repeated factors at denominator of proper fraction)	14	16
CO: CCH301-1 : To solve examples on integration using various techniques			
<b>Unit 2 Definite Integration</b>	<b>Definite Integration</b> 2.1 Definition, Examples 2.2 Properties of Definite Integration ( without proof), Examples based on properties	8	8
CO: CCH301-2 : To solve Differential equation of first order and first degree by various methods			
<b>Unit 3 Differential equation</b>	<b>Differential equation</b> 4.1 Definition of differential equation 4.2 Order & degree of Differential equations 4.3 Methods of solving Differential equations of first order & first degree of following types: 4.3.1 Variable separable form 4.3.2 Exact Differential equations 4.3.3 Linear Differential Equations	8	10

### Section –II

Sr. no.	Topics/Subtopics	Learning Hours	Classroom learning evaluation Marks
CO: CCH301-3 :- To find approximate solution of algebraic equations and simultaneous equations by various methods.			
<b>Unit 4 Numerica</b>	<b>Numerical Methods</b> 4.1 Numerical solution of Algebraic Equations 4.1.1 Bisection Method 4.1.2 Regula- Falsi Method	10	14

I Methods	4.1.3 Newton –Raphson method. 4.2 Numerical solution to simultaneous equations 4.2.1 Jacobi’s Method 4.2.2 Gauss-Seidel method <b>Bakhshali iterative method for finding approximate square root.(IKS)</b>		
CO: CCH301-4:- To solve problems on Probability distributions			
<b>Unit 5</b> Probability Distribution	<b>Probability Distribution</b> 5.1 Binomial distribution 5.2 Poisson’s distribution 5.3 Normal distribution	8	8
CO: CCH301-5:- Solve examples on Laplace Transform .			
Unit 6 <b>Laplace Transform</b>	<b>Laplace Transform</b> 6.1 Definition , Linearity property 6.2 Laplace Transforms of Standard functions (without proof) and examples 6.3 First shifting property and examples 6.4 Examples on Multiplication by $t^n$ 6.5 Inverse Laplace Transform, Definition 6.6 Standard formulae(without proof) and examples 6.7 Inverse L.T.by using First shifting property 6.8 Inverse L.T. by using Partial fraction method	12	14

**\*\* No questions will be asked on IKS related subtopics in any question paper**

### **G : Specification table for setting question paper for semester end theory examination**

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	Indefinite Integration	4	6	6	16	CCH301-1
I / 2	Definite Integration	-	4	4	8	CCH301-1
I / 3	Differential equation	2	4	4	10	CCH301-2
II /4	Numerical Methods	2	4	8	14	CCH301-3
II /5	Probability Distribution	-	4	4	8	CCH301-4
II/6	Laplace Transform	2	6	6	14	CCH301-5
<b>Total Marks</b>					<b>70</b>	

### **H :-Assessment Criteria**

- i) **Formative Assessment (Assessment for Learning)**
  - Tests
- ii) **Summative Assessment (Assessment of Learning)**

- End term exam

### I) Instructional Methods:

1. Lectures cum Demonstrations
2. Classroom practices
3. Use of projector and soft material for demonstration
4. Use of softwares such as Geogebra

### J) Teaching and Learning resources:

Chalk board, LCD presentations, Demonstrative kits, Demonstrative charts.

### K) Reference Books:

S.N.	Name of Book	Author	Publication
1	Higher Engineering Mathematics	Grewal B.S.	Khanna publication New Delhi,2013 ISBN:8174091955
2	A textbook of Engineering Mathematics	Dutta.D.	New age publication New Delhi,2006 ISBN:978-81-224-1689-3
3	Advance Engineering Mathematics	Kreysizg,Ervin	Wiley publication New Delhi,2016 ISBN:978-81-265-5423-2
4	Advance Engineering Mathematics	Das H.K.	S Chand publication New Delhi,2008 ISBN:978-81-219-0345-5
5	Introductory Methods of Numerical Analysis	S.S.Sastry	PHI Learning Private Limited,New Delhi.ISBN:978-81-203-4592-8
6	Studies in the History of Indian Mathematics	C.S.Seshadri	Hindustan Book Agency (India) P 19 Green Park Extension New Delhi.ISBN 978-93-80250-06-9
7	Calculus & Its Applications	Marvin L.Bittinger David J.Ellenbogen Scott A. Surgent	Addison-Wesley 10 <sup>th</sup> Edition ISBN-13:978-0-321-69433-1
8	An Introduction to Statistical Learning with Application in R	Gareth James,Hastie Robert & Tibshirani	Springer New York Heidelberg Dordrecht London ISBN:978-1-4614-7138-7(eBook)

### L) Learning Website & Software

- a) <http://nptel.ac.in/courses/106102064/1>
- b) <https://www.woframalpha.com/>
- c) <http://www.sosmath.com/>
- d) <http://mathworld.wolfram.com>
- e) <https://www.brilliant.org/>
- f) <https://ocw.mit.edu/index.htm>



**COURSE ID** : CCH204  
**COURSE NAME** : SOCIAL AND LIFE SKILLS  
**COURSE CODE** : CCH204  
**COURSE ABBREVIATION** : HSLS

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	00	1
	Tutorial Learning	00	
	Laboratory Learning	00	
	SLH-Self Learning	02	
	NLH-Notional Learning	02	

**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Practical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	50
00	00	00	00	00	00	00	-	-	50	20	

**(Total IKS Hrs for Sem. : 00 Hrs)**

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**Legends:** @ Internal Assessment, # External Assessment, \*# Online Examination, @\$ Internal Online Examination.

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4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

#### **D. i) RATIONALE:-**

Life skills can be defined as abilities that enable an individual to deal effectively with the demands and challenges of life. Social skills are a subset of life skills that are needed for successful, healthy relationships to easily adapt when moving from one social situation to the next. They help regulate our emotions effectively and develop enduring, supportive relationships, we're happier and healthier. This is why developing life skills and eventually social skills is key not only to being successful in life, it's key for our health and well-being. Thus, Teaching of Social and life skills provide students with essentials of knowing, understanding attitudes, values, morals, social skills and better equip them to handle stress and build their self-efficacy, self-esteem and self-confidence.

Note: The course offers four different alternatives (modules) for achieving above outcomes. Students must complete any one module from the following given options.

- A) MODULE-I : Unnat Maharashtra Abhiyan (UMA)
- B) MODULE-II : National Service Scheme (NSS)
- C) MODULE-III : Universal Human Values
- D) MODULE-IV: Value Education (Unati Foundation)
- E) MODULE-V : Financial Literacy (NABARD)

The institute can choose to offer any one MODULE to the groups of the students by taking into consideration the resources required and resources available in the institute. Different group of students may be offered different MODULE based on their choices.

#### **ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME**

Exhibit psychosocial competencies, workplace ethics, resilience, positive attitude, integrity and self-confidence

#### **E. COURSE LEVEL LEARNING OUTCOMES (COs)**

Students will be able to achieve & demonstrate the following COs on completion of course based learning

CCH204-1 - Develop ability to adapt to new challenges.

CCH204-2 - Manage emotions effectively.

CCH204-3 - Follow workplace ethics and practices

CCH204-4 - Manage time effectively.

CCH204-5 - Increased self-confidence to handle stress.

#### **COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX:**

[Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0"

	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineerin g Tools, Experiment ation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Manage ment	PO 7 Life- long Learnin g	PSO1	PSO2
<b>Competency:</b> Apply principles of communication to communicate in formal and informal scenario.									
CCH204-1 Develop self-confidence and positive attitude towards work.							2		
CCH204-2 Set personal and professional goals.							2		
CCH204-3 Develop ability to manage emotions and to handle stress.							2		
CCH204-4 Manage time effectively.						2	2		
CCH204-5 Demonstrate effective interpersonal and leadership skills.							2		
CCH204-6 Identify and handle different types of conflicts.						2	2		

## F. CONTENT:

I) **Practical Exercises:**  
Not Applicable

II) **Theory**

Sr. No.	Theory Learning Outcomes (TLOs) Aligned to COs.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
	TLO 1.1 Explain developmental needs and connection of various stakeholders TLO 1.2 Enlist the local problems	<b>Unit - I MODULE I : Activities Under Unnat Maharashtra Abhiyan (UMA)</b> 1.1 Introduction to Societal Needs and respective stakeholders : Regional societal issues that need engineering intervention 1.2 Multidisciplinary approach-linkages of	Implementation Methodology: Considering the nature of the course designed, following points shall be considered while implementing the course.

	<p>TLO 1.3 Design a methodology for fieldwork</p> <p>TLO 1.4 Select the attributes of engineering and social system for measurement, quantification, and documentation</p> <p>TLO 1.5 Measure &amp; quantify the quantities / systems parameters</p> <p>TLO 1.6 Write a report using information collected. Study the data collected from fieldwork and conclude the observations.</p>	<p>academia, society and technology</p> <p>1.3 Stakeholders' involvement</p> <p>1.4 Introduction to Important secondary data sets available such as census, district economic surveys, cropping pattern, rainfall data, road network data etc</p> <p>1.5 Problem Outline and stakeholders : Importance of activity and connection with Mapping of system components and stakeholders (engineering / societal)</p> <p>1.6 Key attributes of measurement</p> <p>1.7 Various instruments used for data collection - survey templates, simple measuring equipments</p> <p>1.8 Format for measurement of identified attributes/ survey form and piloting of the same</p> <p>1.9 Fieldwork : Measurement and quantifications of local systems such as agriculture produce, rainfall, Road network, production in local industries, Produce /service which moves from A to B</p> <p>1.10 Analysis and Report writing Report writing containing-</p> <ol style="list-style-type: none"> <li>1. Introduction of the topic</li> <li>2. Data collected in various formats such as table, pie chart, bar graph etc</li> </ol> <p>Observations of field visits and data collected.</p>	<p>i) Regroup in the batches of 5-6 students for conducting the fieldwork from the bigger group.</p> <p>ii) Assign a few batches of the students for this course to all the faculty members.</p> <p>iii) A group of course teachers will visit local governance bodies such as Municipal Corporations, Village Panchayats, Zilla Parishads, Panchayat Samitis to assess the small technological / engineering needs in their area of work.</p> <p>iv) The group of course teachers will carry out initial field visits to evaluate the various possibilities of field visits / various scenarios wherein students can conduct field work to measure / quantify the parameters / attributes.</p> <p>v) The course will be implemented in eight sessions and fieldwork.</p> <ol style="list-style-type: none"> <li>a) Session I - Introduction to development paradigm, fieldwork and case study as pedagogy</li> <li>b) Session II - VII - Society, stakeholders and value creation, measurements, rudimentary analysis and reporting</li> <li>c) Session VIII - Final closure session feedback and assessment</li> <li>d) Field work -       <ol style="list-style-type: none"> <li>1. Pilot Visit - Pilot of survey instrument</li> <li>Survey Visit 1 - Data gathering / Information Collection</li> <li>3. Survey Visit 2</li> </ol> </li> </ol>
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			- Datagathering Summary Visit - Closure afteranalysis
<b>2</b>	TLO 2.1 Adoption of Village or Slum TLO 2.2 Survey and Problem IdentificationTLO 2.3 Conduct Project / Programs in the selected village / slum TLO 2.4 Undertake Special Camping Programme	<b>Unit - II MODULE II : National Service Scheme (NSS)</b> 2.1 Contacting Village/Area Leaders 2.2 Primary socio economic survey of few villages in the vicinity of the institute. 2.3 Selection of the village for adoption - conduct of activities 2.4 Comprehensive Socio Economic Survey of the Village/Area 2.5 Identification of Problem(s) 2.6 Dissemination of information about the latest developments in agriculture, watershed management, wastelands development, non- conventional energy, low cost housing, sanitation, nutrition and personal hygiene, schemes for skill development, income generation, government schemes, legal aid, consumer protection and allied fields. A liaison between government and other development agencies for the implementation of various development schemes in the selected village / slum.	(i) The teachers should visit the village / slum before adopting it for NSS activities. (ii) The selected area should be compact. (iii) The community people should be receptive to the ideas of improving their living standard. They should also be ready to coordinate and involve in the projects undertaken by theNSS for their up- liftment (iv) The areas where political conflicts are likely to arise should be avoided by the NSS units. The area should be easily accessible to the NSS volunteers to undertake frequent visits to slums;
<b>3</b>	TLO 3.1 Love and Compassion (Prem andKaruna) TLO 3.2 Truth (Satya) TLO 3.3 Non-Violence (Ahimsa) TLO 3.4 Righteousness (Dharma) TLO 3.5 Peace (Shanti)TLO 3.6 Service (Seva)TLO 3.7 Renunciation (Sacrifice) Tyaga TLO 3.8 Gender Equality and Sensitivity	<b>Unit - III MODULE-III : Universal Human Values</b> 3.1 Love and Compassion (Prem and Karuna): Introduction, Practicing Love and Compassion (Prem and Karuna) 3.2 Truth (Satya) : Introduction, Practicing Truth (Satya) 3.3 Non-Violence (Ahimsa) : Introduction, Practicing Non-Violence (Ahimsa) 3.4 Righteousness (Dharma) : Introduction, Practicing Righteousness (Dharma) 3.5 Peace (Shanti) : Introduction, Practicing Peace (Shanti) 3.6 Service (Seva) : Introduction, Practicing Service (Seva) 3.7 Renunciation (Sacrifice) Tyaga : Introduction, Practicing Renunciation (Sacrifice) Tyaga Gender Equality and Sensitivity: Introduction, Practicing Gender Equality andSensitivity	i) Lectures ii) Demonstration iii) Case Study iv) Role Play v) Observations vi) Portfolio Writing vii) Simulation viii) Motivational talks byPractitioners Site/Industry Visit
<b>4</b>	TLO 4.1 Punctuality TLO 4.2 Cleanliness, Hygiene and Orderliness	<b>Unit - IV MODULE-IV: Value Education (Unnati Foundation)</b> 4.1 Punctuality, Icebreaker and Simple Greeting, Understanding & Managing Emotions, Introducing Self, The power of a Positive Attitude, Talking about one's Family, Talking	i) Video Demonstrations ii) Flipped Classroom iii) Case Study iv) Role Play v) Collaborative learning vi) Chalk-Board

	<p>TLO 4.3 Responsibility  TLO 4.4 Gratitude and Appreciations  TLO 4.5 Determination &amp; Persistence  TLO 4.6 Respect  TLO 4.7 Team Spirit  TLO 4.8 Caring &amp; Sharing  TLO 4.9 Honesty  TLO 4.10 Forgive and Forget</p>	<p>about one's Family, Making a Positive Impression, Give word list for a Word based  4.2 Cleanliness , Hygiene and Orderliness , Likes and Dislikes, Developing Confidence in Self and Others, Strengths and Weaknesses, Listening Skills , Greeting gestures, Gender Equality and Sensitivity  4.3 Responsibility, OCSEM- Visual Comprehension and Word Based Learning, Goal Setting – Make it happen, Follow, Like &amp; Share Unnati Social Media - Facebook / Instagram/ Twitter Introducing Others, Time Management, Talking about the daily routine, Money Management  4.4 Gratitude and Appreciation , Asking Simple Questions &amp; Asking for the price , Stress Management, Student Referral process , Comprehending &amp; Paraphrasing Information, A Plate of Rice and Dignity of Labour, Topics for Public Speaking, Placement Process , OCSEM-E-Newspaper, Critical Thinking to overcome challenges  4.5 Determination and Persistence, Guiding and Giving Directions, Language Etiquette &amp; Mannerism, . Unnati Philosophy , b. Unnati Branding - Follow, Like &amp; Share Unnati Social Media - Facebook / Instagram/ Twitter, Simple instructions to follow procedures, Assertiveness, Give topics for Debate, Describing a person/Objects, Refusal Skills, Word List for Word based Learning  4.6 Respect, Comparing , OCSEM - Public Speaking, Student referral process, Attending a phone call, Being a Good Team Player , Placement Process, At a Restaurant, Workplace ethics  4.7 Team Spirit, Inviting someone, OCSEM - Picture Reading &amp; Word, a. Unnati Philosophy &amp; b. Unnati Branding - Follow, Like &amp; Share Unnati Social Media - Facebook / Instagram/ Twitter, Apologizing, Apologizing, Dealing effectively with Criticism, Introduce Importance of Self Learning and up skilling  Caring and Sharing , Handling Customer queries, Flexibility &amp; Adaptability, Student referral process, Writing a Resume, OCSEM-Public Speaking, Placement Process, Meditation/ Affirmation &amp; OCSEM-Debate, Introduce Certif-ID, how to create Certif-ID Project ,  4.9 Honesty, Email etiquette &amp; Official Email communication, Alcohol &amp; Substance use &amp; abuse, Describing a known place , Leadership Skills, Describing an event, OSCEM-Picture Reading &amp; Visual Comprehension</p>	
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		Forgive and Forget, Facing and Interview, OSCEM-Public Speaking , Attending a telephonic/Video interview & Mock Interview , Affirmation , Pat-a-Back & Closure (Valediction , Unnati Branding, Student Testimonials), Meditation/ Affirmation & Sponsor connect (Speak to UNXT HO)	
<b>5</b>	TLO 5.1 Literacy About Savings and Investments TLO 5.2 Literacy About Financial Planning TLO 5.3 Literacy About Transactions TLO 5.4 Literacy About Income, expenditure and budgeting TLO 5.5 Literacy About Inflation TLO 5.6 Literacy About Loans TLO 5.7 Literacy About the Importance of Insurance TLO 5.8 Literacy About the Dos and Don'ts in finances	<b>Unit - V MODULE-V : Financial Literacy</b> 5.1 Introduction - Life Goals and financial goals 5.2 Savings and Investments - Three pillars of investments, Popular asset classes, Government schemes, Mutual Funds, Securities markets (Shares and bonds), Gold, Real Estate, Do's and Don'ts of investments 5.3 Retirement planning 5.4 Cashless transactions 5.5 Income, expenditure and budgeting – Concepts and Importance 5.6 Inflation- Concept, effect on financial planning of an individual 5.7 Loans – Types, Management of loans, Tax benefits 5.8 Insurance – Types, Advantages, selection Dos and Don'ts in Financial planning and Transactions	i) Online/Offline Mode of Instructions ii) Video Demonstrations iii) Presentations iv) Case Study v) Chalk-Board Collaborative learning

\*\* No questions will be asked on IKS learning subtopics in any question papers.

## **G : List of Assignments/Activities/Micro-project under SLA**

### **Suggestive list of activities during Regular as well as Special Camping (NSS Activities)**

Following list is only an illustrative list of the type of activities that can be undertaken. Under the programme it would be open to each NSS Unit to undertake one of these programmes or any other activity which may seem desirable to them according to local needs. The NSS Unit should aim at the integrated development of the area selected for its operation which could be a village or a slum. It has also to be ensured that at least a part of the programme does involve manual work.

(a) Environment Enrichment and Conservation:

The activities under this sub-theme would inter-alia, include:

- (i) plantation of trees, their preservation and upkeep
- (ii) Construction & maintenance of village streets, drains
- (iii) Cleaning of village ponds and wells;
- (iv) Popularization and construction of Gobar Gas Plants, use of non-conventional energy;
- (v) Disposal of garbage & composting;
- (vi) Prevention of soil erosion and work for soil conservation,
- (vii) Watershed management and wasteland development
- (viii) Preservation and upkeep of monuments, and creation of consciousness about the preservation of cultural heritage among the community.

(b) Health, Family Welfare and Nutrition Programme:

- (i) Programme of mass immunization;
  - (ii) Working with people in nutrition programmes with the help of Home Science and medical college students;
  - (iii) Provision of safe and clean drinking water;
  - (iv) Integrated child development programmes;
  - (v) Health education, AIDS Awareness and preliminary health care.
  - (vi) Population education and family welfare programme;
  - (vii) Lifestyle education centres and counselling centres.
- © Programmes aimed at creating an awareness for improvement of the status of women: (i) programmes of educating people and making them aware of women's rights both constitutional and legal;
- (ii) creating consciousness among women that they too contributed to economic and social well-being of the community;
  - (iii) creating awareness among women that there is no occupation or vocation which is not open to them provided they acquire the requisite skills; and
  - (iv) imparting training to women in sewing, embroidery, knitting and other skills wherever possible.

(d) Social Service Programmes:

- (i) work in hospitals, for example, serving as ward visitors to cheer the patients, help the patients, arranging occupational or hobby activities for long term patients; guidance service for out-door-patients including guiding visitors about hospital's procedures, letter writing and reading for the patients admitted in the hospital; follow up of patients discharged from the hospital by making home visits and places of work, assistance in running dispensaries etc.
- (ii) work with the organisations of child welfare;
- (iii) work in institutions meant for physically and mentally handicapped;
- (iv) organising blood donation, eye pledge programmes;
- (v) work in Cheshire homes, orphanages, homes for the aged etc.;
- (vi) work in welfare organisations of women;
- (vii) prevention of slums through social education and community action;

(e) Production Oriented Programmes:

- (i) working with people and explaining and teaching improved agricultural practices;
- (ii) rodent control land pest control practices;
- (iii) weed control;

- (iv) soil-testing, soil health care and soil conservation;
- (v) assistance in repair of agriculture machinery;
- (vi) work for the promotion and strengthening of cooperative societies in villages;
- (vii) assistance and guidance in poultry farming, animal husbandry, care of animal health etc.;
- (viii) popularisation of small savings and assistance in procuring bank loans

(f) Relief & Rehabilitation work during Natural Calamities:

- (i) assisting the authorities in distribution of rations, medicine, clothes etc.;
- (ii) assisting the health authorities in inoculation and immunisation, supply of medicine etc.;
- (iii) working with the local people in reconstruction of their huts, cleaning of wells, building roads etc.;
- (iv) assisting and working with local authorities in relief and rescue operation;
- (v) collection of clothes and other materials, and sending the same to the affected areas;

(g) Education and Recreations: Activities in this field could include:

- (i) adult education (short-duration programmes);
- (ii) pre-school education programmes;
- (iii) programmes of continuing education of school drop outs, remedial coaching of students from weaker sections;
- (iv) work in crèches;
- (v) participatory cultural and recreation programmes for the community including the use of mass media for instruction and recreation, programmes of community singing, dancing etc.;
- (vi) organisation of youth clubs, rural land indigenous sports in collaboration with Nehru Yuva Kendras;
- (vii) programmes including discussions on eradications of social evils like communalism, castism, regionalism, untouchability, drug abuse etc.;
- (viii) non- formal education for rural youth and
- (ix) Legal-literacy, consumer awareness.

## **H: Specification Table for Setting Question Paper for Semester End Theory Examination:** Not Applicable

### **I:-Assessment Criteria**

#### **i) Formative Assessment of Practical:-**

Formative assessment (Assessment for Learning) report and presentation of fieldwork activities, self-learning (Assignment)

#### **ii) Summative Assessment of Practical:**

(Assessment of Learning)

### J) Instructional Methods:

1. Group Discussion, Flipped Classroom
2. Demonstration, Case Study, Role Play, Collaborative Learning, Cooperative Learning
3. Field Visit, Survey
4. Use of projector and soft material for Demonstration (ppt, audio ,video etc)

### K) Teaching and Learning Resources:

Chalk board, LCD presentations, Demonstrative kits, Demonstrative charts.

### L) Reference Books:

S.N.	Name of Book	Author	Publication
1	Compendium of Training Materials for the Capacity Building of the Faculty and Students of Engineering Colleges on 'IMPROVING THE PERFORMANCE OF RURAL WATER SUPPLY AND SANITATION SECTOR IN MAHARASHTRA' Districts Economic survey reports	IRAP, Hyderabad, CTARA, IIT Bombay and UNICEF, Mumbai	UNICEF
2	Central Public Health and Environmental Engineering Organisation	Manual on Water Supply and Treatment	Ministry of Urban Development, New Delhi
3	Specifications And Standards Committee	Indian Standards (IS) Codes and Indian Roads Congress (IRC) Codes	Bureau of Indian Standards and The Indian Road Congress
4	Prepared by each district administration	Districts Economic survey reports	Govt. of Maharashtra
5	Local college students,UMA staffs	Sample Case Studies on UMA website	IITB-UMA team

### M) Learning Website & Software

- a. <https://gr.maharashtra.gov.in/Site/Upload/Government%20Resolutions/English/201601131501523808.pdf> (Government Resolution of Government of Maharashtra regarding Unnat Maharashtra Abhiyan)
- b. <https://gr.maharashtra.gov.in/Site/Upload/Government%20Resolutions/English/201606151454073708.pdf> (Government Resolution of Government of Maharashtra regarding Unnat Maharashtra Abhiyan Guidelines)
- c. <https://censusindia.gov.in/census.website/> (A Website of Census of India)
- d. <https://gsda.maharashtra.gov.in/english/> (A Website of Groundwater Survey and Development Agency, GoM)
- e. <https://mrsac.gov.in/MRSAC/map/map> (A Website where district-wise mapsshowcasing)

different attributes developed by Maharashtra Remote Sensing Applications Centre.)

- f. <https://ejalshakti.gov.in/jjmreport/JJMIndia.aspx> (A Website of Jal Jivan Mission, Government of India)
- g. <https://cpcb.nic.in/> (A Website of Central Pollution Control Board, Government of India)
- h. <http://www.mahapwd.com/#> (A Website of Public Works Department, GoM)
- i. <http://tutorial.communitygis.net/> (A Website for GIS data sets developed by Unnat Maharashtra Abhiyan)
- j. <https://youtu.be/G71maumVZ1A?si=TzDTxKUpLYaRos7U> (A video record of lecture by Prof. Milind Sohoni, IIT Bombay, on Engineering, Development and Society)
- k. <https://youtu.be/TUcPNwtdKyE?si=wnSWrhGc9dJTC-ac> (A keynote talk by Prof. Milind Sohoni, IIT Bombay, on Interdisciplinary Engineering: The Road Ahead)

**COURSE ID :**  
**COURSE NAME :** BUILDING MATERIAL & CONSTRUCTION  
**COURSE CODE :** CEH301  
**COURSE ABBREVIATION :** HBMC

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	03	4
	Tutorial Learning	00	
	Laboratory Learning	02	
	SLH-Self Learning	03	
	NLH-Notional Learning	08	

**B. ASSESSMENT SCHEME :-**

Paper Duration In Hrs	Theory				Based On LL & TL				Based On SLA		Total
					Practical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
03	30	70	100	40	25	10	-	-	25	10	150

(Total IKS Hrs for Sem. :01Hrs)

**C:** Abbreviations: CL-Class Room Learning, TL-Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA –Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, \*#On Line Examination, @\$ Internal Online Examination.

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
  2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
  3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
  4. Notional Learning hours for the semester are(CL+LL+TL+SL)hrs.\*15Weeks
  5. 1(one) credit is equivalent to 30 Notional hrs.
  6. \*Self-learning hours shall not be reflected in the Time Table.
- \*Self-learning includes micro-project/assignment/other activities.

## D. i) RATIONALE:-

Building Materials and Construction is the key element in the construction project. It is a challenging job for the civil engineer to select relevant material for construction which is durable, economical and eco-friendly along with the construction procedure. At diploma level, students are expected to develop their understanding, performance-oriented abilities in order to apply their knowledge in construction industry. This course essentially imparts the knowledge of construction technology along with the processes involved in it and various construction materials used for economic and effective execution of various construction activities. This knowledge shall be used for effective and efficient utilization of these materials during the building construction..

## ii) INDUSTRY/EMPLOYER EXPECTED OUT COME

Undertake safe building construction practices with relevant building materials.

## E. COURSE LEVEL LEARNING OUTCOMES (COS)

CO1-Identify relevant type of construction materials for the given type of building.

CO2-Use the relevant type of special purpose construction materials in the given situation.

CO3-Undertake the given type of building construction activity for the given component of Building structure.

CO4-Design the relevant means of communication for the given building structure.

CO5-Use the relevant type of material for finishing purpose in the given situation.

CO6-Use the relevant type of special construction techniques in the given situation.

## Competency, course outcomes and programme outcomes/programme specific outcomes (CP-CO-PO/PSO) matrix

[ Note: Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “0”

Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 Plan & Design	PSO2 Construction & Maintenance	PSO3 Problem Solving on field
CEH301-CO1 Identify relevant type of construction materials for the given type of building.	2	1	.	1	1	1	1			

Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 Plan & Design	PSO2 Construction & Maintenance	PSO3 Problem Solving on field
<b>CEH301-CO2</b> Use the relevant type of special purpose construction materials in the given situation.	2	1	.	1	2	1	1			
<b>CEH301-CO3</b> Undertake the given type of building construction activity for the given component of building structure.	3	2	1	2	2	1	2			
<b>CEH 301-CO4</b> Design the relevant means of communication for the given building structure.	3	2	1	2	2	1	2			
<b>CEH301- CO5</b> Use the relevant type of material for finishing purpose in the given situation.	3	2	1	2	1	1	2			
<b>CEH301-CO6</b> Use the relevant type of special construction techniques in the given situation.	3	2	1	2	1	1	2			

## F. CONTENT:-

### I) Practical exercises

#### Practical Exercises and related skills to be developed:

The following practical exercises shall be conducted as practical sessions of batches of about 20-22 students: Continuous assessment work is dividing three parts as below –

**I. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.**

Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
<b>Practical:-</b>			
1	Identify the different Construction materials used in building construction	2	CO1
2	Perform field test on given sample of brick.	2	CO2
3	Assemble one and half Brick thick wall in a English Bond and prepare a report on it.	2	CO3
4	Practice to hold plumb-bob, tube level and transferring the levels ex. Lintel level for doors and windows.	2	CO3
5	Setting out a simple residential building (Line out of a framed structure)	2	CO3
<b>Field Visits:-</b>			
1	Prepare a visit report with labeled sketches of inspected RCC footing, beam, column, slab, chajja etc construction during site visit.	2	CO3
2	Prepare a visit report with sketches/photos of construction site with respect scaffolding, formwork and centering work.	2	CO6
3	Prepare a visit report with labeled sketches of inspected building components like masonry work, staircase, doors, windows, and flooring and roofing materials during site visit.	2	CO3-CO5
4	Prepare a visit report with sketches/photos by observing the process of plastering; pointing and painting work at construction site.	2	CO5
5	Prepare a visit report with sketches/photos by observing brick kiln/ stone quarry/ stone crusher.	2	CO1
6	Prepare a visit report with sketches/photos by observing different types of woods & sawing of wood.	2	CO1
<b>Market Survey:-</b>			
Market survey for types, cost, sizes, specifications etc of following materials. (Each of five)			
1	Wall tiles, flooring tiles, natural stones like polished granite, marble, kadapa etc.	CO1,CO2,CO5	
2	Plumbing materials : GI,PVC, APVC, CPVC etc		
3	Aluminum / structural steel / gas lines etc		
4	Fixtures and fastening of doors and windows		
5	Plywood, sun mica, fore-mica etc.		

## II) Theory

<b>Section I</b>			
Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
<b>CEH301-CO1</b> Identify relevant type of construction materials for the given type of building.			
1	<p><b>Overview of construction Materials</b></p> <p><b>1.1</b> Introduction to National Building Code-Part III (2005) Group A to I.</p> <p><b>1.2 Types of Constructions-</b> Load Bearing Structures, Framed Structures, Composite Structures.</p> <p><b>1.3 Broad classification of materials</b>–Sources of materials, Natural, Artificial -special, finishing and recycled.</p> <p><b>1.4 Natural Building Construction Materials- Types, uses and applications of:</b> - Stone, Timber, Soil, Sand and Coarse Aggregates, Bitumen (IKS-Materials used in Ancient Buildings-Stone , Lime)</p> <p><b>1.5 Artificial Building Construction Materials– Types, uses and applications of :-</b> Cement, Clay Brick, Flooring Tiles, Concrete Blocks, Plywood, particle board, Veneers, laminated board and Glass:.</p>	8	10
<b>CEH301-CO2</b> Use the relevant type of special purpose construction materials in the given situation.			
2	<p><b>Special Building Construction Materials</b></p> <p><b>2.1</b> Water proofing methods- Introduction to Brick bat Coba, Acrylic Polymer modified water proofing,</p> <p><b>2.2</b> Termite proofing - Introduction and applications</p> <p><b>2.3</b> Acoustic materials- Introduction and applications</p> <p><b>2.4</b> Geo polymer cement- uses and applications.</p>	3	6
<b>CEH301-CO3</b> Undertake the given type of building construction activity for the given component of building structure.			

3	<p><b>Construction of substructure &amp; Superstructure</b></p> <p><b>3.1 Building Components:</b> Building Components &amp; their Function: Substructure, Superstructure</p> <p><b>3.2 Earthwork:</b> Excavation For Foundation, Timbering and Strutting Earthwork for Embankment Material for Plinth Filling</p> <p><b>3.3 Foundation:</b> Functions, Types: hallow Foundation-Stepped Footing, Wall footing, Column Footing, Isolated and Combined Column Footing, Raft Foundation. Deep Foundation-Pile Foundation, Well foundation and Caissons, Pumping Methods of Dewatering, Deep wells, Cofferdams.</p> <p><b>3.4 Stone Masonry:</b> Terms used in stone masonry- facing, backing, hearting, through stone, cornerstone, cornice. Type of stone masonry: Rubble masonry, Ashlar Masonry and their types .Selection of Stone Masonry .Precautions to be observed in Stone Masonry Construction.(IKS- Ancient heritage building-stone masonry work</p> <p><b>3.5 Brick masonry:</b> Terms used in brick masonry- header, stretcher, closer, quoins, course, face, back, hearting, bat bond, joints, lap, frog, line, level and plumb. Bonds in brick masonry, header bond, stretcher bond, English bond and Flemish bond, Requirements of good brick masonry. Precautions to be observed in Brick Masonry Construction.</p> <p><b>3.6 Comparison between stone masonry and Brick Masonry, Tools and plants required for construction of stone masonry and brick masonry.</b></p>	12	20
	<b>TOTAL</b>	<b>23</b>	<b>36</b>
<b>Section II</b>			
<b>CEH 301-CO4</b> Design the relevant means of communication for the given building structure.			
4	<p><b>Building Communication</b></p> <p><b>4.1 Horizontal Communication:</b> Doors–Components of Doors, Types of Doors: Fully Paneled Doors, Partly Paneled and Glazed Doors, Flush Doors, Collapsible Doors, Rolling Shutters, Revolving Doors, Glazed Doors. Sizes of Door recommended by BIS.</p> <p><b>4.2 Windows:</b> Component of windows, Types of Windows: Fully Paneled, Partly Paneled and Glazed, Wooden, Steel, Aluminum Windows, Sliding Windows. Sizes of Windows recommended by BIS and Ventilators</p> <p><b>4.3 Fixtures and fastenings</b> for doors and windows.</p>	8	12

	<p><b>4.4 Vertical Communication</b> - Staircase, Ramps, Elevator and types of Escalators (excluding mechanism). Terms used in staircase, <b>Types of staircases</b>- Straight, doglegged, open well, Circular, Quarter turn. Calculation of no of flight's, dimensions of rise and trade.</p>		
<p><b>CEH301- CO5</b> Use relevant type of material for finishing purpose in the given situation.</p>			
5	<p><b>Building Finishes</b></p> <p><b>5.1 Types of Floor Finishes, laying process and its suitability</b>- Shahabad, Kota, Marble, Granite, Kadapa, Ceramic Tiles, Vitrified, Pavement Blocks, Concrete Floors, Wooden Flooring (Introduction) ,Skirting and dado, Mezzanine floors- location and use.</p> <p><b>5.2 Roofs</b> - Necessity of Roofs, Types: Pitched &amp; flat, component parts of pitched roof, requirements of good roof.</p> <p><b>5.3 Plastering</b>–Necessity, Procedure, rough finish, Neeru finishing.</p> <p><b>5.4 Pointing</b> – Necessity, Procedure and types (Sketches).</p> <p><b>5.5 Special Plasters</b>- Stucco Plaster, sponge finish, rough cast finish, pebbles finish. Plaster Board and Wall claddings.</p> <p><b>5.6 Painting</b> –Necessity, types of External paint and Internal paint, Surface Preparation for painting, Methods of Application, Selecting suitable painting material,</p>	10	14
<p><b>CEH301-CO6</b> Use the relevant type of special construction techniques in the given situation.</p>			
6	<p><b>Formwork and Allied Techniques</b></p> <p><b>6.1 Formwork:</b> Definition, requirements, materials used types and removal of formwork.</p> <p><b>6.2 Scaffolding, Shoring and Underpinning:</b> Necessity, types, application. Process of Erection and Dismantling.</p> <p><b>6.3 Re-barring technique</b>- necessity.</p> <p><b>6.4 Causes of cracks</b> in building, repair of cracks,</p> <p><b>6.5 Guniting And Grouting</b> - Definition and application</p>	4	8
	<b>TOTAL</b>	<b>22</b>	<b>34</b>

**I. SUGGESTED MICROPROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF LEARNING)**

**Micro project**

- a. Collect the market rates for following construction materials from various dealers/suppliers of local market for different brands. i. Bricks. ii. Stone / aggregate (20 mm, 40 mm and 80 mm) iii. Teak wood. iv. Flooring tiles. v. Ordinary Portland Cement vi. Oil paint vii. Cement Paint viii. Plaster of Paris ix. Plastic paints x. Recent types of paint.
- b. Collect the technical brochures of following construction materials. i. Ordinary Portland cement ii. Vitrified flooring tiles. iii. Particle boards used for aluminum partitions. iv. Paints.
- c. Undertake a market survey for the cost and technical specification of different brands of following construction Materials and prepare comparison chart. i. Cement ii. Tiles iii. Glass iv. Paints.
- d. Collection of information related to recent technologies used in building construction.
- e. Identify the different types of cracks and remedial measures (Case Study).
- f. Collection of information related to different techniques of demolition of existing structure.
- g. Visit to the site to check different construction activities as per the checklist.

**Assignment**

Other than the classroom and laboratory learning, following are the suggested student-related co-curricular activities which should be undertaken to accelerate the attainment of the various outcomes in this course:

Students should prepare **ASSIGNMENT ON EACH UNIT**.

**SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)**

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Overview of construction Materials.	CO1	8	4	2	4	10
2	II	Special Building Construction Materials.	CO2	3	2	2	2	6
3	III	Construction of substructure & Superstructure.	CO3	12	4	6	10	20
4	IV	Building Communication.	CO4	8	2	4	6	12
5	V	Building Finishes.	CO5	10	4	4	6	14
6	VI	Formwork and Allied Techniques.	CO6	4	2	2	4	08
<b>Grand Total</b>				<b>45</b>	<b>18</b>	<b>20</b>	<b>32</b>	<b>70</b>

**I. ASSESSMENT METHODOLOGIES/TOOLS**

**Formative assessment (Assessment for Learning)** - Term work, Self-Learning (Assignment) , Question Answer in Classroom, Quiz and Group Discussion.

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Attendance/Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

**Summative Assessment (Assessment of Learning - Pen Paper test / Oral Exam/ Practical Exam**

**Instructional Methods:**

1. Lectures cum Demonstrations,
2. Classroom practices.
3. Use of projector and soft material for demonstration

**Teaching and Learning resources:**

Chalk board, LCD presentations, Demonstrative kits, Demonstrative charts.

**II. SUGGESTED LEARNING MATERIALS / BOOKS**

Sr.No	Author	Title	Publisher with ISBN Number
1	Ghose, D. N.	Construction Materials	Tata McGraw Hill, New Delhi, 2014 ISBN: 9780074516478
2	Rangwala, S.C.	Engineering Materials	Charotar publisher, Ahemdabad, 2015, ISBN: 9789385039171
3	S. P. Arora and Bindra	Building Construction	Dhanpat Rai Publication, Delhi Edition 2013, ISBN: 9788189928803
4	S. C. Rangawala	Building Construction	Charotar Publication, Dist-Anand ISBN-10: 8185594856 ISBN-13: 978-8185594859
5	Sushil Kumar	Building Construction	Standard Publication, Edition 2010, ISBN: 9788180141683, 8180141683
6	BIS	National Building Code	Bureau of Indian Standard, New Delhi
7	BIS	BIS 962-1989 Code of Architectural and Building Drawing	Bureau of Indian Standard, New Delhi
8	BIS	BIS 1038- 1983 Steel Doors, Windows and Ventilators	Bureau of Indian Standard, New Delhi

**LEARNING WEBSITES & PORTAL**

Sr.No	Link / Portal	Description
1	<a href="https://www.youtube.com/watch?v=XsFeVuVQE-E">https://www.youtube.com/watch?v=XsFeVuVQE-E</a>	Introduction to Building Materials
2	<a href="https://www.youtube.com/watch?v=C6x_ersOn_o">https://www.youtube.com/watch?v=C6x_ersOn_o</a>	Building Blocks of Bharat
3	<a href="https://www.youtube.com/watch?v=3XGt-p-hpdU">https://www.youtube.com/watch?v=3XGt-p-hpdU</a>	Brick Masonry Construction
4	<a href="https://www.youtube.com/watch?v=L-VGe2j53NU">https://www.youtube.com/watch?v=L-VGe2j53NU</a>	15 Essential Tips for Building a 4" Thick Brick Masonry Wall: Expert Construction Guide
5	<a href="https://www.youtube.com/watch?v=Yg4Bly7f-iI">https://www.youtube.com/watch?v=Yg4Bly7f-iI</a>	Introduction to fix formwork for column at site
6	<a href="https://www.youtube.com/watch?v=fDKRtQqKzJM">https://www.youtube.com/watch?v=fDKRtQqKzJM</a>	Steps of Plastering



**COURSE ID** : CEH 302  
**COURSE NAME** : SURVEYING  
**COURSE CODE** : CEH 302  
**COURSE ABBREVIATION** : HSVY

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	03	4
	Tutorial Learning	--	
	Laboratory Learning	04	
	SLH-Self Learning	01	
	NLH-Notional Learning	08	

**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					<i>Practical</i>						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	200
03	30	70	100	40	25	10	50#	20	25	10	

**(Total IKS Hrs for Sem. : 01 Hrs)**

**C:** Abbreviations: CL- Class Room Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination, @\$ Internal

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

## D. i) RATIONALE:-

Surveying is generally used to make land maps and boundaries. The development of engineering survey is the basic foundation to ensure the quality of the project, because it can provide accurate data for the subsequent construction. Surveying is involved in everything right from accurately drawing boundaries between private and public land, to inspecting bridges and other critical infrastructure. Without surveying, the placement security, and safety of projects cannot be assured. Therefore, the students are required to develop such competency to carry out the given type of survey using relevant equipment's so as to prepare the plan to interpret the information to take the appropriate decisions. This course will help the students in achieving in above mentioned goal.

## ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

Prepare plans and Contour maps using Surveying Equipment's and Techniques.

## E. COURSE LEVEL LEARNING OUTCOMES (COS)

CEH302-1 State the importance of survey

CEH302-2 Determine distances with various linear instruments & Calculation of area.

CEH302-3 Setting up plane table and finding out area and distance.

CEH302-4 Determine reduced levels by different methods & Draw contour by interpolation & other methods.

CEH302-5 Measurement of horizontal and vertical angles by theodolite.

### Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/ps) matrix

[ Note: Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0"

Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 Plan and Design	PSO2 Construction and Maintenance	P Problem Solving on fieldSO3
<b>Competency:</b> Apply principles of surveying-1 to solve engineering problems	3	3	2	2	1	1	1	1	1	1
CEH302 CO-1 State the importance of survey	3	3	2	3	2	1	2	1	2	2
CEH302 CO-2 Determine distances	3	3	2	2	1	1	1	1	1	3

Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 Plan and Design	PSO2 Construction and Maintenance	P Problem Solving on fieldSO3
with various linear instruments & Calculation of area.										
CEH302 CO-3 Setting up plane table and finding out area and distance.	3	3	2	2	1	2	1	1	2	1
CEH302 CO-4 Determine reduced levels by different methods & Draw contour by interpolation & other methods.	3	3	2	2	2	1	1	3	2	2
CEH302 CO-5 Measurement of horizontal and vertical angles by theodolite.	3	3	2	2	1	2	1	1	2	1

## F. CONTENT:-

### I) Practical exercises

The following practical exercises shall be conducted in practical sessions of batches of about 20- 22 students:

Sr. no	Laboratory experiences	CO
1	*Measure the distance between two intervisible survey stations using chain, tape and ranging rods.	CEH302-2
2	*Determine area of open field using chain and cross staff survey.	CEH302-2
3	Determine area of irregular field using Digital Planimeter	CEH302-2
4	*Measure Fore Bearing and Back Bearing of survey lines of open traverse using Prismatic Compass	CEH302-2
5	*Measure Fore Bearing and back bearing of a closed traverse of 5 to 6 sides and correct the bearings and included angles.	CEH302-2
6	*Prepare plans and locate details by using Radiation Method.	CEH302-3
7	*Prepare plans and locate details by Intersection Method	CEH302-3

Sr. no	Laboratory experiences	CO
8	*Prepare traverse using Plane table Surveying	CEH302-3
9	Prepare plan to establish plant nursery	CEH302-3
10	*Determine Reduced Level by Height of Instrument Method	CEH302-4
11	*Determine Reduced Level by Rise and Fall Method	CEH302-4
12	*Perform Fly Levelling to check levelling work	CEH302-4
13	Undertake differential leveling by using dumpy level/Auto Level and leveling staff for Installation of irrigation pipelines	CEH302-4
14	Prepare Contour Plan/map using Block Contouring for the area of 40m x 40m to draw its contour plan	CEH302-4
15	Prepare Contour plan for control farming using block contouring method	CEH302-4
16	Measure Horizontal angle by using Transit Theodolite by Direct Method	CEH302-5
17	*Measure Horizontal angle by using Transit Theodolite by method of Repetition	CEH302-5
18	*Measure vertical angle using Transit Theodolite	CEH302-5
<b>PROJECTS</b>		
1	*Profile leveling and cross-sectioning for a road length of 300 m with cross-section at 20 m interval. (Compulsory).	CEH302-4
2	*Plotting contour map using block contouring method for a block of 150m x 150m with grid of 10m x 10m for given land parcel. (Compulsory).	CEH302-4
3	*Use transit theodolite to carry out Survey Project for closed traverse for minimum 5 sides (Compulsory).	CEH302-5
<p><b>Note : Out of above suggestive LLOs -</b>            '*' Marked Practicals (LLOs) Are mandatory.            Minimum 80% of above list of lab experiment are to be performed. Judicial mix of LLOs are to be performed to achieve desired outcomes.</p>		

## II) Theory

### Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO CEH302: 1: State the importance of survey			
1	<p><b>Overview and Classification of Surveying</b></p> <p>1.1 Surveying: Introduction, Purpose, use and Principles.</p> <p>1.2 Types of surveying- Primary and Secondary classification, Plane, Geodetic, Cadastral, Hydrographic, Photogrammetry Aerial, Layout survey, Control survey, Topographical survey, Route survey, Reconnaissance survey.</p> <p>1.3 Conventional sign and symbols</p>	04	06
CO CEH302:2: Determine distances with various linear instruments & Calculation of area.			
2	<p><b>Cross Staff and Compass Surveying</b></p> <p>2.1 Linear Measurement Instruments: Metric Chain, Tapes, Arrow, Ranging rod, Open cross staff (IKS)</p> <p>2.2 Chain survey Station, Base line, Check line, Tie line, Offset, Tie station, Types of offsets: Perpendicular and Oblique</p> <p>2.3 Ranging: Direct and Indirect Ranging.</p> <p>2.4 Area Calculations of field by cross staff (Numerical problems)</p> <p>2.5 Compass Traversing: open, closed.</p> <p>2.6 Technical Terms: Geographic/True Magnetic and Arbitrary Meridians and Bearings, Meridian and Bearing,</p> <p>2.7 Whole Circle Bearing System and Reduced Bearing System . Numerical on conversion of given bearing to another bearing (from one form to another), Fore Bearing and Back Bearing,</p> <p>2.8 Calculation of internal and external angles from bearings at a station.</p> <p>2.9 Components of Prismatic Compass and their Functions (No sketch) Temporary adjustments and observing bearings</p> <p>2.10 Local attraction, Methods of correction of observed bearings- Correction at station and correction to included angles</p> <p>2.11 Methods of plotting a traverse and closing error, Graphical adjustment of closing error.</p>	14	20

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO CEH302: -3: Setting up plane table and finding out area and distance.			
3	<b>Plane Table Surveying</b> 3.1 Principle of plane table survey. 3.2 Accessories of plane table and their use, Telescopic alidade. 3.3 Setting of plane table; Orientation of plane table - Back sighting and Magnetic meridian method 3.4 Methods of plane table surveys- Radiation, Intersection and Traversing. 3.5 Merits and demerits of plane table survey.	06	08

### Section –II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO CEH302:-4: Determine reduced levels by different methods & Draw contour by interpolation & other methods.			
4	<b>Levelling and Contouring</b> 4.1 Terminologies: Level surfaces, level line, Horizontal and vertical surfaces, Datum, Bench Marks- GTS, Permanent, Arbitrary and Temporary, Reduced Level, Line of collimation, Back sight, Fore sight, intermediate sight, Change point, Height of instruments 4.2 Types of levels: Dumpy, Auto level, Digital level, Fundamental axis of Dumpy Level. Temporary adjustments of Level. 4.3 Types of Levelling Staffs: Self-reading staff and Target staff. 4.4 Reduced level by Plane of collimation method and Rise/ Fall Method 4.5 Find the R. L. by H.I. method with necessary checks (Numerical problems) 4.6 Find the R.L by Rise and Fall method with necessary checks. (Numerical problems) 4.7 Types of Leveling : Simple, Differential, Fly, Profile and Reciprocal Levelling 4.8 Contour, contour interval, horizontal equivalent.	12	20

	4.9 Contour maps: Characteristics and uses of Contour maps 4.10 Methods of Locating Contour: Direct and Indirect		
CO CEH302 -5: Measurement of horizontal and vertical angles by theodolite.			
5	<b>Theodolite Surveying</b> 5.1 Types and uses of Theodolite; Component parts of transit Theodolite and their functions, Reading the Vernier of transit Theodolite 5.2 Technical terms- Swinging, Transiting, Face left, Face right 5.3 Fundamental axes of transit Theodolite and their relationship 5.4 Temporary adjustment of transit Theodolite 5.5 Measurement of horizontal angle- Direct and Repetition method, Errors eliminated by method of repetition 5.6 Measurement of vertical Angle 5.7 Theodolite traversing by included angle method and deflection angle method 5.8 Checks for open and closed traverse, Calculations of bearing from angles 5.9 Traverse computation-Latitude, Departure, Consecutive coordinates, independent coordinates, Balancing the traverse by Bowditch's rule and Transit rule, Gale's Traverse table computation	12	16

**\*\* No questions will be asked on IKS learning subtopics in any question papers.**

### **G : List of Assignments under SLA**

Sr.No	List of Assignment (under SLA)	Hrs Allotted
1	Explain one method each to measure the distance between points on either side of obstacles in case of following: River, Lake, Building.	2
2	Set the alignment of proposed road using Theodolite	2
3	Interpret the given contour maps.	2
4	Draw the representative contour maps for the following: Ridge of a mountain, Hillock, Valley, Pond/lake, Gent slope, Very Steep Slope, Plain Surface	2
5	Determine the reservoir capacity from a give contour map of reservoir. Measure area of small open ground by plane tabling.	4
6	Measure the height of the flag post using Theodolite.	2
7	Determine the reservoir capacity from a give contour map of reservoir.	4

<b>List of Micro Projects (Under SLA)</b>		
1	Collect the contour maps of different terrains available with various authorities & prepare a report on its interpretation.	
2	Determine the RLs of the components of existing structures like Plinth, lintels, chajja, slab, and beam etc	
3	Prepare a flex chart to explain one method of plane tabling.	
4	Compare Traversing with plane table and compass method.	
5	Perform reconnaissance survey for plotting the alignment of road	
6	Observe Topographical maps and interpret the details	
7	Carry out comparative study of following survey instruments of different make and brands : Auto level and Dumpy Level	
8	Collect the map of city /town and calculate the ward wise and total area using digital planimeter.	
9	Collect the information of survey instruments available in the market with their specifications.	
Note : “These are the just suggestive topics. Faculty must design Microproject/Activities/ Assignments based on Course Outcome requirements”.		

## **H : Specification table for setting question paper for semester end theory examination**

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	Overview and Classification of Surveying	2	4	0	06	CEH302-1
I / 2	Cross Staff and Compass Surveying	4	4	12	20	CEH302-2
I / 3	Plane Table Surveying	4	4	0	08	CEH302-3
II / 4	Levelling and Contouring	2	6	12	20	CEH302-4
II / 5	Theodolite Surveying	2	2	12	16	CEH302-3
		14	20	30		
Total Marks					70	

## **I :-Assessment Criteria**

### **i) Formative Assessment of Practical :-**

Every assignment shall be assessed for 25 marks as per following criteria:

<b>Domain</b>	<b>Particulars</b>	<b>Marks out of 25</b>
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05

	Drawing / drafting skills	05
Affective	Attendance/Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

**ii) Summative Assessment of Practical :**

At the time of Practical Examination assessed for 25 marks as per following criteria:

<b>Sr. no</b>	<b>Criteria</b>	<b>Marks allotted</b>
1	Knowledge about the course	05
2	Preparedness for practical /Oral	05
3	Neat & complete Diagram/write up	05
4	Observations/Handling of instrument/ Communication/Presentation	05
5	Oral Based on Lab work and completion of task	05
<b>TOTAL</b>		<b>25</b>

**J) Instructional Methods:**

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration

**K) Teaching and Learning resources:**

Chalk board, LCD presentations, Demonstrative kits, Demonstrative charts.

**L) Reference Books:**

S.N.	Name of Book	Author	Publication
1	Surveying and Levelling volume I	Kanetkar T. P.; Kulkarni, S. V.	Pune Vidyarthi Gruh Prakashan, Pune; ISBN:978-81-858-2511-3
2	Surveying and Levelling	Basak, N. N.	McGraw Hill Education, New Delhi ISBN 93-3290-153-8
3	Survey I	S. K. Duggal	McGraw Hill Education, New Delhi, ISBN: 978-00-701-5137-6
4	Surveying I	Punmia, B.C, Jain, Ashok Kumar Jain, Arun Kumar	Laxmi Publications., New Delhi. ISBN: 8-17- 008853-4
5	Surveying and Levelling, Volume 1	Bhavikatti, S. S.	I. K. International, New Delhi ISBN: 978-81- 906-9420-9

## M) Learning Website & Software

Sr.No	Link / Portal	Description
1	<a href="https://archive.nptel.ac.in/courses/105/104/105104101/">https://archive.nptel.ac.in/courses/105/104/105104101/</a>	Introduction to Surveying, Principles of surveying, and Classification of Surveying
2	<a href="https://lnct.ac.in/wp-content/uploads/2020/03/UNIT-4B.pdf">https://lnct.ac.in/wp-content/uploads/2020/03/UNIT-4B.pdf</a>	Theodolite Surveying
3	<a href="https://www.slideshare.net/gauravhtandon1/plane-table-survey-27614680">https://www.slideshare.net/gauravhtandon1/plane-table-survey-27614680</a>	Plane Table Surveying-accessories and methods
4	<a href="http://www.pkace.org/Lecture_Notes/Survey-lecture-notes.pdf">http://www.pkace.org/Lecture_Notes/Survey-lecture-notes.pdf</a>	Levelling-methods of levelling and types of levels
5	<a href="https://dspmuranchi.ac.in/pdf/Blog/Survey.pdf">https://dspmuranchi.ac.in/pdf/Blog/Survey.pdf</a>	Surveying and Levelling
6	<a href="https://civilplanets.com/compass-surveying/">https://civilplanets.com/compass-surveying/</a>	Compass Surveying and its types, Temporary adjustments
7	<a href="http://ecoursesonline.iasri.res.in/mod/page/view.php?id=128285">http://ecoursesonline.iasri.res.in/mod/page/view.php?id=128285</a>	Traversing by Prismatic Compass, WCB and RB conversion and Terms in Compass Surveying
8	<a href="https://www.youtube.com/watch?v=x9ZPMxrlS3U">https://www.youtube.com/watch?v=x9ZPMxrlS3U</a>	Measurement of bearing by prismatic compass
9	<a href="https://youtu.be/j8poe2vvD2Q">https://youtu.be/j8poe2vvD2Q</a>	Temporary adjustment of auto level
10	<a href="https://www.youtube.com/watch?v=c9U0xlmCzGI">https://www.youtube.com/watch?v=c9U0xlmCzGI</a>	10
11	<a href="https://youtu.be/L54T4uvpMTg">https://youtu.be/L54T4uvpMTg</a>	Levelling operation by using Dumpy Level
12	<a href="https://www.youtube.com/watch?v=boPrQFZEn9A">https://www.youtube.com/watch?v=boPrQFZEn9A</a>	Radiation method by plane table surveying
13	<a href="https://www.youtube.com/watch?v=PQfr1LABZWg">https://www.youtube.com/watch?v=PQfr1LABZWg</a>	Contouring and its characteristics, Methods of Contouring
14	<a href="https://www.youtube.com/watch?v=-mkf7uJG8DI">https://www.youtube.com/watch?v=-mkf7uJG8DI</a>	Intersection method of Plane Table

**CIVIL ENGINEERING SAMPLE PATH - H SCHEME -THIRD SEMESTER**

Sr.no	Course Title	Abbreviation	Course Type	Course Code	Level	Total IKS Hrs. for Sem	Learning Scheme						Assessment Scheme						Based on LL &TL				Based on Self Learning		Total Marks
							Actual			Theory			Theory			Practical			SLA						
							CL	TL	LL	Self Learning (Activity/Assignment/Micro Projec	Notional Learning Hrs/Week	Credits	Paper Duration (Hrs)	FA-TH	SA-TH	Total	FA-PR	SA-PR	SLA	SLA					
Max	Max	Max	min	Max	min	Max	min	Max	min	Max	min	Max	min												
1	ADVANCED SURVEYING	HASU	SEC	CEH303	3	0	3	0	4	1	8	4	3	30	70	100	40	25	10	25	#	10	25	10	175
2	BUILDING PLANNING&DRAWING	HBPD	SEC	CEH304	3	1	2	0	4	2	8	4	4	30	70	100	0	25	10	25	#	10	25	10	175
3	TRANSPORTATION ENGINEERING	HTRE	DSC	CEH305	3	1	4	0	2	0	6	3	3	30	70	100	40	25	10	0		0	0	0	125
4	GEOTECHNICAL ENGINEERING	HGTE	DSC	CEH306	3	1	3	0	2	1	6	3	3	30	70	100	40	25	10	0		0	25	10	150
5	COMPUTER AIDED DRAWING	HCAD	DSC	CEH307	3	0	0	0	2	2	4	2	0	0	0	0	0	0	0	25	@	10	25	10	50
6	ESSENCE OF INDIAN CONSTITUTION	HEIC	VEC	CCH205	2	1	1	0	0	1	2	1	0	0	0	0	0	0	0	0		0	50	20	50
7	ELECTIVE-1			CEH310 TO CEH312																					
	Advanced Construction Techniques & Equipments	HACT	DSC	CEH310	3	1	3	0	2	1	6	3	0	30	70	100	40	25	10	0		0	25	10	150
	Advanced Construction Materials	HACM	DSC	CEH311	3	1	3	0	2	1	6	3	0	30	70	100	40	25	10	0		0	25	10	150
	Energy Conservation & Green Building	HECG	DSC	CEH312	3	1	3	0	2	1	6	3	0	30	70	100	40	25	10	0		0	25	10	150
	<b>TOTAL</b>				0	17	0	16	7	40	20	0	0	150	350	500	160	125	50	75	0	30	150	60	875

**Legends :** @ INTERNAL ASSESMENT # EXTERNAL ASSESMENT \*# ONLINE THEORY EXAMINATION

**Abbreviations:** @\$ Internal Online Examination

CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning

SLH-Self Learning Hours, NLH- Notional Learning Hours, IKS - Indian Knowledge System,

FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

**Programme** :- ALL  
**Semester** : THIRD  
**Course Title** : ESSENCE OF INDIAN CONSTITUTION  
**Course Code** :- CCH205

### I. RATIONALE

This course will focus on the basic structure and operative dimensions of Indian Constitution. It will explore various aspects of the Indian political and legal system from a historical perspective highlighting the various events that led to the making of the Indian Constitution. The Constitution of India is the supreme law of India. The document lays down the framework demarcating the fundamental political code, structure, procedures, powers, and sets out fundamental rights, directive principles, and the duties of citizens. The course on constitution of India highlights key features of Indian Constitution that makes the students a responsible citizen. In this online course, we shall make an effort to understand the history of our constitution, the Constituent Assembly, the drafting of the constitution, the preamble of the constitution that defines the destination that we want to reach through our constitution, the fundamental right constitution guarantees through the great rights revolution, the relationship between fundamental rights and fundamental duties, the futurist goals of the constitution as incorporated in directive principles and the relationship between fundamental rights and directive principles.

### II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the student to attain the following industry /employer expected outcome – Abide by the Constitution in their personal and professional life.

### III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

### IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme						Credits	Assessment Scheme									
				Actual Contact Hrs./Week			SLH	NLH	Paper Duration		Theory			Based on LL & TL				Based on SL		Total Marks
				CL	TL	LL					Total	Practical		SLA						
												FA-TH	SA-TH	Max	Min	Max	Min	Max	Min	
CCH205	ESSENCE OF INDIAN CONSTITUTION	EIC	VEC	1	-	-	1	2	1	-	-	-	-	-	-	-	-	50	20	50

#### Total IKS Hrs for Sem. : 4 Hrs

Abbreviations: CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination  
 Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.
7. \* Self learning includes micro project / assignment / other activities.

CO1 - List salient features and characteristics of the constitution of India.

- CO2 - Follow fundamental rights and duties as responsible citizen and engineer of the country.  
 CO3 - Analyze major constitutional amendments in the constitution.  
 CO4 - Follow procedure to cast vote using voter-id.  
 CO5-List the roles and responsibilities of State Election Commission towards peoples in the state.  
 CO-6 List Judiciary provisions for the peoples in general

## V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

<b>SECTION-I</b>		
<b>Sr. No.</b>	<b>Topics / Sub-topics</b>	<b>Lectures (Hours)</b>
<b>1</b>	<b>CCH 205. 1.</b> The Constitution:- 1.1 Introduction. 1.2 The History of making of the Indian Constitution. 1.3 Basic structure and its interpretation. 1.4 Fundamental Rights and Duties and their interpretation	<b>2</b>
<b>2</b>	<b>CCH 205. 2.</b> Union Government 2.1 Structure of the Indian Union. 2.2 President –Role and power. 2.3 Prime minister and council of ministers. 2.4 Lok Sabha and Rajya Sabha. 2.5 Union Territories and their limitations.	<b>3</b>
<b>3</b>	<b>CCH 205.3</b> State Government. 3.1 Governor –Role and power. 3.2 Chief Minister and council of ministers. 3.3 State secretariat. 3.4 Administrative Regions of Maharashtra.	<b>3</b>
<b>SECTION -II</b>		
<b>4</b>	<b>CCH 205.4</b> Local Administration:-Their roles and responsibilities 4.1 District Administration. 4.2 Municipal Corporation. 4.3 Zilla Panchayat 4.4 Taluka (Tahasil) Administration .	<b>2</b>
<b>5</b>	<b>CCH 205. 5.</b> Election Commission. 5.1 Role and functioning. 5.2 Chief Election Commissioner –Appointment. 5.3 State Election Commission. 5.4 Elections and duties of government /Non government servants – introduction	<b>2</b>
<b>6</b>	<b>CCH 205. 6.</b> Introduction to Judiciary Provisions :- 1.1 Introduction 1.2 Different courts. 1.3 Government legal advisor-provisions. <b>1.4</b> Limitations of courts and co-ordination with Home department.	<b>3</b>

## VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES : N.A.

## VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

- 1.Outline the procedure to submit application for Voter-id

2. Assignments are to be provided by the course teacher in line with the targeted COs.
3. Prepare an essay on Constitution of India .
4. Prepare a comparative chart of Unique features of Indian Constitution of India and Constitution of USA  
 [Assignments are to be provided by the course teacher in line with the targeted COs. A1. Prepare an essay on .Constitution of India . A2 Prepare a comparative chart of Unique features of Indian Constitution of India and Constitution of USA A3. Self-learning topics: Parts of the constitution and a brief discussion of each part Right to education and girl enrollment in schools. GER of Girls and Boys. Right to equality. Social Democracy. Women Representation in Parliament and State Assemblies.]

**Micro project :-** Organize a workshop-cum discussions for spreading awareness regarding Fundamental Rights of the citizen of the country

1. Prepare elaborations where directive principle of State policy has prevailed over Fundamental rights with relevant Supreme Court Judgements.
2. Organize a debate on 42nd, 97th and 103rd Constitutional Amendment Acts of Constitution of India.

### **Seminar**

- 1 Differences in the ideals of Social democracy and Political democracy.
- 2 Democracy and Women's Political Participation in India.
- 3 Khap Panchayat - an unconstitutional institution infringing upon Constitutional ethos.
- 4 Situations where directive principles prevail over fundamental rights.

### **Group discussions on current print articles.**

- Art 356 and its working in Post-Independent India.
- Women's Resrvation in Panchayat leading to Pati Panchayats - Problems and Solutions.
- Adoption of Article 365 in India.
- Need of Amendments in the constitution.
- Is India moving towards a Unitary State Model ?

### **Activity**

Arrange Mock Parliament debates.

Prepare collage/posters on current constitutional issues.

- i. National (Art 352) & State Emergencies (Art 356) declared in India.
- ii. Seven fundamental rights.
- iii. Land Reforms and its effectiveness - Case study of West-Bengal and Kerala.

**VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED : NOT APPLICABLE**

**IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)**

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Constitution and Preamble	CO1	4	-	-	-	-
2	II	Fundamental Rights and Directive Principles	CO2	4	-	-	-	-
3	III	Governance and Amendments	CO3	4	-	-	-	-
4	IV	Electoral Literacy and Voter's Education	CO4	3	-	-	-	-
<b>Grand Total</b>				<b>15</b>				

**X. ASSESSMENT METHODOLOGIES/TOOLS**

**Formative assessment (Assessment for Learning): Suggested Proformas are to be used for ASSESSMENT.**

Assignment, Self-learning and Terms work Seminar/Presentation

**Summative Assessment (Assessment of Learning):- Suggested Proformas are to be used for ASSESSMENT**

**XI. SUGGESTED COS - POS MATRIX FORM**

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	1	-	-	-	2	-	-			
CO2	1	-	-	-	2	-	-			
CO3	1	2	-	-	2	-	1			
CO4	-	-	-	1	-	-	-			

Legends :- High:03, Medium:02,Low:01, No Mapping: -  
 \*PSOs are to be formulated at institute level

## XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	P.M.Bakshi	The Constitution of India	Universal Law Publishing, New Delhi 15th edition, 2018, ISBN: 9386515105 (Check the new edition)
2	D.D.Basu	Introduction to Indian Constitution	Lexis Nexis Publisher, New Delhi, 2015, ISBN:935143446X
3	B. K. Sharma	Introduction to Constitution of India	PHI, New Delhi, 6th edition, 2011, ISBN:8120344197
4	MORE READS :	Oxford Short Introductions - The Indian Constitution by Madhav Khosla. The Indian Constitution: Cornerstone of a Nation by Granville Austin. Working a Democratic Constitution: A History by Garnville Austin Founding Mothers of the Indian Republic: Gender Politics of the Framing of the Constitution by Achyut Chetan. Our Parliament by Subhash C. Kashyap. Our Political System by Subhash C. Kashyap. Our Constitution by Subhash C. Kashyap. Indian Constitutional Law by Rumi Pal.	Extra Read
5	B.L. Fadia	The Constitution of India	Sahitya Bhawan, Agra, 2017, ISBN:8193413768

## XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	<a href="http://www.legislative.gov.in/constitution-of-india">http://www.legislative.gov.in/constitution-of-india</a>	Constitution overview
2	<a href="https://en.wikipedia.org/wiki/Constitution_of_India">https://en.wikipedia.org/wiki/Constitution_of_India</a>	Parts of constitution
3	<a href="https://www.india.gov.in/my-government/constitution-india">https://www.india.gov.in/my-government/constitution-india</a>	Constitution overview
4	<a href="https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/">https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/</a>	Fundamental rights and duties
5	<a href="https://main.sci.gov.in/constitution">https://main.sci.gov.in/constitution</a>	Directive principles
6	<a href="https://legallaffairs.gov.in/sites/default/files/chapter%203.pdf">https://legallaffairs.gov.in/sites/default/files/chapter%203.pdf</a>	Parts of constitution
7	<a href="https://www.concourt.am/armenian/legal_resources/world_constitutions/constit/india/india-e.htm">https://www.concourt.am/armenian/legal_resources/world_constitutions/constit/india/india-e.htm</a>	Parts of constitution
8	<a href="https://constitutionnet.org/vl/item/basic-structure-indian-constitution">https://constitutionnet.org/vl/item/basic-structure-indian-constitution</a>	Parts of constitution



**COURSE ID :**  
**COURSE NAME : ADVANCED SURVEYING**  
**COURSE CODE : CEH 303**  
**COURSE ABBREVIATION : HASU**

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	03	4
	Tutorial Learning	--	
	Laboratory Learning	04	
	SLH-Self Learning	01	
	NLH-Notional Learning	08	

**B. ASSESSMENT SCHEME: -**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					<i>Practical</i>						
03	<i>FA-TH</i>	<i>SA-TH</i>	<i>TOTAL</i>		<i>FA -PR</i>		<i>SA-PR</i>		<i>MAX</i>	<i>MIN</i>	175
	<b>MAX</b>	<b>MAX</b>	<b>MAX</b>	<b>MIN</b>	<b>MAX</b>	<b>MIN</b>	<b>MAX</b>	<b>MIN</b>			
	<b>30</b>	<b>70</b>	<b>100</b>	<b>40</b>	<b>25</b>	<b>10</b>	<b>25#</b>	<b>20</b>	<b>25</b>	<b>10</b>	

**(Total IKS Hrs. for Sem.: 00 Hrs.)**

**C:** Abbreviations: CL- Class Room Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH- Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment  
Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination, @\$ Internal

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.
7. \* Self learning includes micro project / assignment / other activities.

## D. i) RATIONALE:-

The technology has brought the significant advancements in field of surveying. This will help civil engineers for accurate measurements of physical features of various construction projects and land with utmost accuracy, speed and easy operation of these surveying equipment's. The data obtained by various advanced surveying equipment's includes information of topography, grading, elevation, distances etc. Such data obtained helps civil engineers for future project planning and effective execution. The advanced surveying also helps in identifying potential risks associated with construction projects. This course will help students to acquire skills associated with surveying of land and buildings.

## ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

Use the relevant instrument to undertake the survey of the given area.

## E. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

CEH 303 -1 - Use the Tacheometer to obtain relevant details of the terrain in given situation.

CEH 303 -2 - Set out a Simple Circular curve to finalize the alignment of the given element.

CEH 303 -3 – State the importance of Aerial Survey

CEH 303 -4 - Prepare layout plans using relevant surveying instruments.

CEH 303 -5 - Locate the co-ordinates of a given stations using the relevant technology.

CEH 303 -6 - Interpret the images of given terrain using Photogrammetry Techniques.

**Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/pso) matrix** [ Note: Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0"]

Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 Plan and Design	PSO2 Construction and Maintenance	P Problem Solving on fieldSO3
<b>Competency:</b> Apply principles of surveying-1 to solve engineering problems	3	3	2	2	1	1	1	1	1	1
CEH 303 -1 - Use the Tacheometer to obtain relevant	3	3	2	2	2	1	2	1	2	2

Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 Plan and Design	PSO2 Construction and Maintenance	P Problem Solving on fieldSO3
details of the terrain in given situation.										
CEH 303 -2 - Set out a Simple Circular curve to finalize the alignment of the given element.	3	3	2	2	1	1	1	1	1	3
CEH 303 -3 – State the importance of Aerial Survey	3	3	2	2	2	1	2	1	2	2
CEH 303 -4 - Prepare layout plans using relevant surveying instruments.	3	3	2	2	1	2	1	1	2	1
CEH 303 -5 - Locate the co-ordinates of a given stations using the relevant technology.	3	3	2	2	2	1	1	3	2	2
CEH 303 -6 - Interpret the images of given terrain using Photogrammetry Techniques.	3	3	2	2	1	2	1	1	2	1

## F. CONTENT:-

### I) Practical exercises

The following practical exercises shall be conducted in practical sessions of batches of about 20- 22 students:

Sr. no	Laboratory experiences	CO
1	*Determine the Tacheometric Constant	CEH 303 -1

Sr. no	Laboratory experiences	CO
2	*Determine reduced levels of given stations and horizontal distances by Tacheometric Method (Part I)	CEH 303 -1
3	*Determine reduced levels of given stations and horizontal distances by Tacheometric Method (Part II)	CEH 303 -1
4	*Setting out of a circular curve by offsets from Long Chord Method.	CEH 303 -2
5	*Determine horizontal and vertical distance by using EDM.	CEH 303 -4
6	*Determine Horizontal and vertical angles using Electronic Digital Theodolite	CEH 303 -4
7	Setting up the Total Station instrument on site for surveying.	CEH 303 -4
8	*Determine horizontal, vertical and slope distances using Total station equipment (Part I)	CEH 303 -4
9	*Determine horizontal, vertical and slope distances using Total station equipment. (Part II)	CEH 303 -4
10	*Determine horizontal angles using Total Station.	CEH 303 -4
11	*Determine vertical angles using Total Station.	CEH 303 -4
12	*Determine the Reduced Levels of given stations (Minimum 10 station)	CEH 303 -4
13	Stack out (transferring the data on ground) using Total Station.	CEH 303 -4
14	Road profile of 100m length using Total Station instrument.	CEH 303 -4
15	Contouring using Total Station instruments for the area of size 50 X 50 m	CEH 303 -4
16	*Locate the coordinates of a station with the help of GPS.	CEH 303 -5
17	Create the images of contouring map with given data (Photogrammetry images, etc) using the freeware/open source software.	CEH 303 -6
18	Create the images of Road Profile plan with given data (Photogrammetry images, etc) using the freeware/open source software.	CEH 303 -6
19	*Write a brief report on the visit to nearby surveying software laboratory for visualization of image creation of contouring map of given area using given data <b>OR</b> Arrange Expert Lecture <b>OR</b> Show study videos of Photogrammetry surveying.	CEH 303 -6
<b>PROJECTS</b>		
1	*Setting out a circular curve by Rankine's Method of Deflection Angles. <b>(Project)</b> . Plot the curve details on A1 size imperial drawing sheet.	CEH 303 -2
2	*Prepare Building site layout by using Total Station <b>(Project)</b> . Plot the project details on A1 size imperial drawing sheet.	CEH 303 -4
3	*Carry out 5-Sided closed traverse Surveying project by using Total Station. <b>(Project)</b> . Plot the traverse details on A1 size imperial drawing sheet.	CEH 303 -4
<p><b>Note: Out of above suggestive LLOs -</b>          '*' Marked Practical's (LLOs) Are mandatory.          Minimum 80% of above list of lab experiment are to be performed. Judicial mix of LLOs is to be performed to achieve desired outcomes.</p>		

## II) Theory

### Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CEH 303 -1 - Use the Tacheometer to obtain relevant details of the terrain in given situation.			
1	<b>Unit - I Tacheometric Surveying</b> 1.1 Principle of tacheometry, Use of Tacheometry 1.2 Tacheometer and its component parts, Analytic lens, Tacheometric formula for horizontal distance with telescope horizontal and staff vertical. 1.3 Methods of Tacheometry: Stadia and fixed hair method 1.4 Field method for determining constants of tacheometer, Limitations of tacheometry.	12	16
CEH 303 -2 - Set out a Simple Circular curve to finalize the alignment of the given element.			
2	<b>Unit - II Curves setting</b> 2.1 Curve: Definition, Necessity of Curves, Types of curves used in roads and railway alignments. 2.2 Elements of simple circular curve, Designation of the curve by Radius and Degree of curve. 2.3 Radius and Degree of curve. 2.4 Setting out a simple circular curve by offsets from long chord and Rankine's method of deflection angles.	08	12
CEH 303 -3 – State the importance of Aerial Survey			
3	<b>Unit - III Aerial Surveying</b> 3.1 Aerial surveying: Definition, principle, uses, methods 3.2 DGCA Classification of Drones 3.3 Silent features of Drone Rules, 2021 as per DGCA.	02	06

### Section –II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CEH 303 -4 - Prepare layout plans using relevant surveying instruments.			
4	<b>Unit - IV Advanced Surveying Equipment's</b> 4.1 Electronic Distance Meter (EDM): Principle of Electronic Distance Meter (EDM), component parts and their Functions, use of EDM. 4.2 Electronic Digital Theodolite: Construction and Features of Electronic Digital Theodolite, procedure of angle	12	16

	<p>measurement.</p> <p>4.3 Total Station: Introduction, component parts with their functions, and Applications of Total Station, Temporary adjustments, sources of errors in Total Station, Measurements of Horizontal angles, vertical angles, distances and coordinates using Total Station. Traversing, Profile Survey and Contouring with Total Station.</p> <p>4.4 Building Site layout using Total Station: Procedure</p>		
CEH 303 -5 - Locate the co-ordinates of a given stations using the relevant technology.			
5	<p><b>Unit - V Remote sensing, GPS and GIS</b></p> <p>5.1 Remote Sensing : Definition, Electro-Magnetic Energy, Active and Passive system, Applications of remote sensing in Mining, land use / Land cover, mapping, disaster management and Environment.</p> <p>5.2 Global Positioning System: Introduction, Construction and use of Global Positioning System (G.P.S.)</p> <p>5.3 Geographic Information System (GIS): Overview, Component, Sources of errors, applications, Software's in GIS.</p>	08	14
CEH 303 -6 - Interpret the images of given terrain using Photogrammetry Techniques			
6	<p><b>Unit – VI Photogrammetry</b></p> <p>6.1 Definition of photogrammetry Basic Principles of Photogrammetry. Types of Photogrammetry: Terrestrial and Aerial Photogrammetry</p> <p>6.2 Types of Photographs, Terminology in aerial surveying.</p> <p>6.3 Merits and Demerits of Photogrammetry surveying</p> <p>6.4 Applications of Photogrammetry in civil engineering.</p>	03	06

### **G : List of Assignments under SLA**

Sr.No	List of Assignment (under SLA)
1	Measure the height of the flag post in your institute using Theodolite as tacheometer.
2	Measure the height of the slab bottom of second floor of your institute building using Theodolite as tacheometer.
3	Set the alignment of proposed road using Theodolite as tacheometer.
4	Use freeware or open source software for image processing using photogrammetry principles
5	Plot the contours using Total station by direct method.
6	Mark building layout using Total station.
7	Measure distance between two distant(>500m) points using EDM
8	Locate the coordinates of the campus using GPS
9	Search and download the freeware/open source software and prepare a report stating the applications.

### **H : Specification table for setting question paper for semester end theory examination**

<b>List of Micro Projects (Under SLA)</b>		
1	Carry out comparative study of following survey instruments of different make and brands: Total station/ EDM/GPS/Digital theodolite.	
2	Collect the relevant technical and commercial information of minimum five advanced survey instruments available in the market with specifications.	
3	Determine the RLs of the existing structures like lintels, chajja, slab, and beam using Tacheometer and Total station in a multistoried building and compare the results.	
4	Download specifications for Total Station/ EDM/GPS and make a chart.	
5	Set the profiles of curves at the changes in alignment of road in the premises of the institute (minimum two).	
6	Study the specifications of Mobile devices used for distance measurement.	
7	Collect the information on 360-degree laser	
8	Collect information of software required for mapping of images for photogrammetry.	
9	Collect the Information about Drone survey.	
10	Collect the information on Rover survey for land measurement	
<p>Note :</p> <p>Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.</p> <p>The faculty must allocate judicious mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.</p> <p>If a microproject is assigned, it is expected to be completed as a group activity. SLA marks shall be awarded as per the continuous assessment record.</p> <p>If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.</p>		

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	Tacheometric Surveying	02	04	10	16	CEH 303 -1
I / 2	Curve Setting	02	04	06	12	CEH 303 -2
I / 3	Aerial Surveying	02	04	00	06	CEH 303 -3
II / 4	Advance Survey Equipment's	04	06	06	16	CEH 303 -4
II / 5	Remote sensing, GPS and GIS	02	06	06	14	CEH 303 -5
II / 6	Photogrammetry	02	04	00	06	CEH 303 -6
Total Marks					70	

## **I: - Assessment Criteria**

### **i) Formative Assessment of Practical: -**

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Attendance/Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

**ii) Summative Assessment of Practical:**

At the time of Practical Examination assessed for 25 marks as per following criteria:

Sr. no	Criteria	Marks allotted
1	Knowledge about the course	05
2	Preparedness for practical /Oral	05
3	Neat & complete Diagram/write up	05
4	Observations/Handling of instrument/ Communication/Presentation	05
5	Oral Based on Lab work and completion of task	05
<b>TOTAL</b>		<b>25</b>

**J) Instructional Methods:**

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration

**K) Teaching and Learning resources:**

Chalk board, LCD presentations, Demonstrative kits, Demonstrative charts.

**L) Reference Books:**

S.N.	Name of Book	Author	Publication
1	Kanetkar T. P.; Kulkarni S. V.	Surveying and Levelling volume I & II	Pune Vidyarthi Gruh Prakashan, Pune; ISBN:978- 81-858-2511-3
2	Basak N. N.	Surveying and Levelling	McGraw Hill Education, New Delhi ISBN 93- 3290-153-8
3	S. K. Duggal	Surveying I & II	McGraw Hill Education, New Delhi, ISBN: 978- 00-701-5137-6
4	Punmia B.C, Ashok Kumar Jain, Arun Kumar	Surveying I & II	Laxmi Publications., New Delhi. ISBN: 8- 17- 008853-4
5	Shivam Pandey	Basic Concept of Remote Sensing, GPS, and GIS	Sankalp Publication, Gaurav Path, Bilaspur Chhathisgarh-4955001 ISBN: 978-81-94-77801-1

## M) Learning Website & Software

Sr.No	Link / Portal	Description
1	<a href="https://archive.nptel.ac.in/content/storage2/courses/105107122/modules/module7/html/100.htm">https://archive.nptel.ac.in/content/storage2/courses/105107122/modules/module7/html/100.htm</a>	Tacheometry Surveying
2	<a href="https://www.youtube.com/watch?v=7UhaCqea7IY">https://www.youtube.com/watch?v=7UhaCqea7IY</a>	Curve Setting
3	<a href="https://archive.nptel.ac.in/content/storage2/courses/105107122/modules/module11/index.htm">https://archive.nptel.ac.in/content/storage2/courses/105107122/modules/module11/index.htm</a>	Curve Setting
4	<a href="https://nptel.ac.in/courses/105104100">https://nptel.ac.in/courses/105104100</a>	Lecture on Total Station
5	<a href="https://www.youtube.com/watch?v=bbs5AEPstl4">https://www.youtube.com/watch?v=bbs5AEPstl4</a>	Total Station
6	<a href="https://www.youtube.com/watch?v=1KCqxx8r5Y4">https://www.youtube.com/watch?v=1KCqxx8r5Y4</a>	Electronic Digital Theodolite
7	<a href="https://www.youtube.com/watch?v=QLgwwVdMaWU">https://www.youtube.com/watch?v=QLgwwVdMaWU</a>	Remote sensing GIS and GPS
8	<a href="https://archive.nptel.ac.in/courses/105/103/105103193/">https://archive.nptel.ac.in/courses/105/103/105103193/</a>	Remote Sensing and GIS
9	<a href="https://onlinecourses.nptel.ac.in/noc22_ce84/preview">https://onlinecourses.nptel.ac.in/noc22_ce84/preview</a>	Remote Sensing and GIS
10	<a href="https://archive.nptel.ac.in/courses/105/104/105104101/">https://archive.nptel.ac.in/courses/105/104/105104101/</a>	Aerial Surveying and Photogrammetry
11	<a href="https://nptel.ac.in/courses/105104100">https://nptel.ac.in/courses/105104100</a>	Aerial Surveying and Photogrammetry
<b>Note :</b> Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students		

**COURSE ID :**  
**COURSE NAME :** BUILDING PLANNING & DRAWING.  
**COURSE CODE :** CEH304  
**COURSE ABBREVIATION :** HBPD

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	02	4
	Tutorial Learning	00	
	Laboratory Learning	04	
SLH-Self Learning	02		
NLH-Notional Learning	08		

**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Practical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
04	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	175
	30	70	100	40	25	10	25	10	25	10	

**(Total IKS Hrs for Sem. : 01 Hrs)**

**C. Abbreviations:** CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

## D.i) RATIONALE:-

Building planning and drawing are critical components of the construction process, enabling stakeholders to visualize, communicate, problem-solve, comply with regulations, estimate costs, guide construction, and ensure quality throughout the project lifecycle. In today's era of globalization and technology revolutions, it is necessary to prepare the civil engineering drawings in such a way that it can be prepared with utmost precision and accuracy. This course is therefore planned with the goal of developing such competency among the learners.

## ii)INDUSTRY / EMPLOYER EXPECTED OUTCOME

Prepare Drawings of the given building structure with required specifications.

### E. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning.

CEH304-1 Draw different types of lines.

CEH304-2 Apply building byelaws for planning of building.

CEH304-3 Apply principles of planning for planning and design of building.

CEH304-4 Planning of public buildings.

CEH304-5 Prepare presentation drawings

CEH304-6 Development of residential buildings Plan.

### Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/pso) matrix

[ Note: Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0" No Correlation]

Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 Plan and design	PSO2 Construction and maintenance	PSO3 Problem solving on field
CEH304-1, CO1- Draw different types of lines.	3	3	3	-	1	1	1	3	3	0
CEH304-2, CO2- Apply building byelaws for planning of building.	3	3	3	-	1	1	3	3	3	0
CEH304-3, CO3- Apply principles of planning for planning and design of building.	3	3	3	-	1	1	3	3	3	0
CEH304-4, CO4- Planning of public buildings	3	1	1	-	1	1	3	1	1	0

Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design/ Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 Plan and design	PSO2 Construction and maintenance	PSO3 Problem solving on field
CEH304-5, CO5- Prepare presentation drawings	3	3	3	-	1	1	2	3	3	0
CEH304-6, CO6- Development of residential buildings Plan.	3	3	3	-	1	1	3	3	3	0

## F. CONTENT:-

### D) PRACTICALS/EXERCISES

#### Practical Exercises and related skills to be developed:

The following practical exercises shall be conducted as practical sessions of batches of about 20 students: Drawing on full imperial sheet ,size A1 paper.

Sr. No.	Title of Practical/Exercise	Skills/ Competencies to be developed	Course outcome
1	<b>Measured Drawing</b> – of small residential building (single storey) with minimum two rooms, kitchen, and sanitary block consisting of plan, Elevation, section, schedule of opening, site plan, and construction notes.	1. Measure the units of existing building (Load bearing/ Framed structure) 2. Drawing of submission drawing	CEH304-3  CEH 304-1, CEH304-2, CEH304-3
2	<b>Reading and interpreting readymade Architectural building drawing</b> – (Drawing to be procured by student from consulting Engineer/ Architect) students should read and interpreting the drawing and write a report.	1. Observation of Technical details	CEH 304-1, CEH304-2
3	<b>Submission drawing, to the scale 1:100, of single storied Load Bearing Residential Building (2BHKD) with Flat Roof and staircase</b> showing developed plan, Elevation, section passing through Stair or W.C. and Bath, site plan (1:200), area Statement, schedule of openings and	Drawing of submission drawing	CEH 304-1, CEH304-2, CEH304-3, CEH304-6

		construction notes.		
<b>4</b>	<b>Submission drawing, to the scale 1:100, of (G+1) Residential Building Framed Structure (2 BHKD) with attached toilet to 1 bedroom</b> showing developed plan, elevation, section passing through staircase, Site plan (1:200), area statement, schedule of openings and construction notes.	Drawing of submission drawing	CEH 304-1, CEH304-2, CEH304-3, CEH304-6	
<b>5</b>	<b>Working drawing of above G+ 1 building</b> showing foundation plan (1:50), RCC column and footing, RCC beam, RCC Chajja and RCC staircase.	Drawing of working drawing	CEH304-3	
<b>6</b>	<b>Two Point Perspective Drawing of small objects</b> - steps, monuments, pedestals (any two) scale 1:50	Drawing of presentation drawing	CEH304-5	
<b>7</b>	<b>Line Plan</b> – Of any two public building on full imperial graph sheet.	Drawing of public building	CEH304-4	

**CONTENT: THEORY**

**Section – I**

<b>Sr. No.</b>	<b>Topics / Sub-topics</b>	<b>Lectures (Hours)</b>	<b>Theory Evaluation (Marks)</b>
<i>Course Outcome-</i> <b>CEH304-1</b> Draw different types of lines.			
<b>1</b>	<p>Introduction</p> <p>1.1 Purpose of drawing, preliminary requirement of good drawing.</p> <p>1.2 Symbols &amp; notations as per IS 962:1989 in civil engineering drawing such as earth work, brick work, stone work, concrete, wood work and glass used in civil engineering. Symbols for door, window, sanitary, electrical installations.</p> <p>1.3 Types of lines-visible line, center line, hidden line, section line, dimension line, extension line, pointers, arrow heads or dots, north point. Scales for various types of drawings.</p> <p>1.4 Types of scales- Monumental, intimate, human and shock scale. Selection of scale for specific drawing.</p>	<b>05</b>	<b>04</b>
<i>Course Outcome-</i> <b>CEH304-2</b> Apply building bye-laws for planning of building.			

2	<p><b>Agencies in Building construction work.</b></p> <p>2.1 Role of different agencies in building construction work – such as Owner, architects, structural engineer, contractor, promoter, quantity surveyor and supervisor, specialist of air conditioning, acoustics, lifts, interior decoration etc.</p> <p>2.2 <b>Building bye laws</b> –Definition, objectives of bye laws, The Municipalities, Corporations published their rules &amp; bye laws regarding building activities. Student is expected to know the following terminology – plot area, Margins,built – up-area, carpet area, plinth area, floor area, FAR/FSI.</p> <p>2.3 <b>Plan sanctions authorities-</b> such as gram panchayat, Municipal Corporation, town planning etc.</p> <p>2.3.1 Procedure for submitting plan for sanctioning.</p> <p>2.3.2 List of documents required and number of copies.</p>	05	06
<b>Course Outcome-CEH304-3</b> apply principles of planning for planning and design of building.			
3	<p><b>Planning of Residential Building –</b></p> <p>3.1 Principles of planning of buildings –aspect, prospect, roominess, grouping, circulation, privacy, flexibility, furniture requirement, sanitation, elegance, economy, Orientation of Building (IKS-Orientation of Indian Heritage Structures such as Mahalaxmi Temple, Kolhapur, Concept of Vastushastra for building planning.)</p> <p>3.2 Space requirements and norms for various units of residential buildings.</p> <p>3.3 Minimum / standard dimensions of various units such as W.C., Bath, Otta height , Plinth height , Window sill height , Garage height etc.</p> <p>3.4 Drawing line plan for residential building.</p> <p>3.5 Planning of staircase in available space, Working drawing of RCC staircase, column, column footing, Beam, chajja etc.</p>	06	08
<b>Course Outcome -CEH304-4</b> Planning public buildings.			
4	<p><b>Planning of public buildings –</b></p> <p>4.1 Planning of public building such as school building, primary health centre or hospital building, post office, banks, hostels, restaurant etc. Units required for each type of building with their approximate sizes. Grouping of various units with their functional requirements. (In examination only line plans of the same should be asked)</p>	04	06
<b>Course Outcome -CEH304-5</b> Prepare presentation drawings			

<b>5</b>	<p>Perspective drawings –</p> <p>5.1 Definition, necessity and principles of perspective drawing.</p> <p>5.2 Terms used in perspective drawing such as picture plane, station point, vanishing point, angle of vision, center of vision etc.</p> <p>5.3 Types of perspective such as one point perspective, two point perspective</p> <p>5.4 Concept of one point and two point perspective and its application. (In examination small objects such as steps block, pedestal may be asked to draw one or two point perspective)</p>	<b>04</b>	<b>10</b>
	<i>Total</i>	<b>24</b>	<b>34</b>
(Semester end exam question paper should be such that total marks of questions on each topic are one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted.)			

## Section II

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
<i>Course Outcome - CEH304-6 Design of residential buildings.</i>			
<b>6</b>	<p><b>Drawing of residential Building</b></p> <p>6.1 Detail development of line plan with orientation.</p> <p>6.2 Elevation</p> <p>6.3 Section</p> <p>6.4 Site plan and North direction.</p> <p>6.5 Preparing schedules of doors / windows</p> <p>6.6 Calculation of areas such as plot area, built-up-area, carpet area, floor area, plinth area, F.S.I./F.A.R.</p> <p>6.7 General construction notes, general specifications etc.</p> <p>6.8 Foundation plan.</p> <p><b>Note</b> – In examination a small single storied residential building load bearing/ framed structure for development of line plan should be asked.</p>	<b>06</b>	<b>36</b>
	<b>Total</b>	<b>06</b>	<b>36</b>
Semester end exam question paper should be such that total marks of questions on the topic is 36 having no options and is compulsory.			

## G : List of Assignments under SLA

### SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR

## **SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)**

### **Micro project**

**Suggested Micro-projects: Any one project for group of three to five students.**

- 1) Prepare report on provisions given in National Building Code 2005.
- 2) Collect and study building Bye laws, rules and regulation for planning any two competent authority such as Gram- Panchayat/Municipal Corporation/Metro Cities/Town Planning Department.
- 3) Prepare list of the documents required for obtaining permission for construction of residential building/apartment from competent authority and write report.
- 4) Develop plan of any public building
- 5) Draw one / Two point perspective of small building
- 6) Prepare a model of small building with waste packaging materials and apply principles of planning.
- 7) Prepare a report on IS-962:1989 - Code of practice for architectural and building drawings

### **Self Learning**

1. List any five software's used for building planning and drawing.
2. Prepare a model of a simple building using cardboard showing different components with suitable color.
3. Prepare line plan as per given requirement. (Any THREE -- other than mentioned in curriculum)
4. Free Online Courses on Auto CAD by NPTEL /Coursera/IGNOU/SWAYAM

### **Assignment**

1. State and explain the classification of residential buildings with respect to Planning such as Row House/Apartments/detached /Semi-detached Buildings
  2. Explain the Role of Architect, Structural Engineer and Supervisor in Planning of Building.
  3. Prepare a report on BUILDING PLAN MANAGEMENT SYSTEM -By Urban Development Department Government of Maharashtra.
  4. Prepare a report on Building Plan Approval Process as per NBC -2005
- \*\* No questions will be asked on IKS learning subtopics in any question papers

### **Note :**

Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.

The faculty must allocate judicious mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.

If a microproject is assigned, it is expected to be completed as a group activity. SLA marks shall be awarded as per the continuous assessment record.

If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

**Note – In Section II, line plan of small residential building shall be given & students are asked to prepare the following**

- |   |              |
|---|--------------|
| 1. Detailed plan                                      | – 08 marks   |
| 2. Front Elevation                                    | -- 06 marks  |
| 3. Section (section line shall be given on line plan) | -- 10 marks. |
| 4. Schedule of doors & windows                        | -- 06 marks. |
| 5. Area statement                                     | -- 05 marks  |
| 6. North Line   | -- 01 marks. |

**H : Specification table for setting question paper for semester end theory examination**

Topic No.	Name of topic	Distribution of marks (Cognitive level-wise)			Course Outcome	Total Marks
		Remember	Understand	Application		
1	Introduction	02	02	--	CEH304-1	04
2	Agencies in Building construction work.	04	02	00	CEH304-2	06
3	Planning of Residential Building	02	04	02	CEH304-3	08
4	Planning of public buildings	02	--	04	CEH304-4	06
5	Perspective drawings	03	03	04	CEH304-5	10
6	Drawing of residential Building	08	08	20	CEH304-6	36
TOTAL		21	19	30		70

## INDUSTRIAL EXPOSURE:

SN	Mode of Exposure	Topic
1.	Field Visits 1.Existing construction sites	For related topic

### I :-Assessment Criteria

#### i)Formative Assessment of Practical

Every practical assignment shall be assessed for 25 marks as per following criteria

#### ii) Summative Assessment of Practical :

At the time of Practical Examination assessed for 25 marks as per following criteria:

Sr. no	Criteria	Marks allotted
1	Knowledge about the course	05
2	Preparedness for practical /Oral	05
3	Neat & complete Diagram/write up	05
4	Observations/Handling of instrument/ Communication/Presentation	05
5	Oral Based on Lab work and completion of task	05
<b>TOTAL</b>		<b>25</b>

Domain	Particulars	Marks out of 25
Cognitive	Understanding	02
	Application	03
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Discipline and punctuality	05
	Decency and presentation	05
<b>TOTAL</b>		<b>25</b>

## INSTRUCTIONAL STRATEGIES :

### J) Instructional Methods:

1. Lectures cum Demonstrations
2. Classroom practices
3. Massive open online courses (**MOOCS**) may be used to teach various topics/subtopics.
4. About **15-20% of the topics/subtopics** which relatively simpler or descriptive in nature is to be given to the students for **self directed learning** .

### Suggested Micro-projects:

**Only one micro-project** is planned to be undertaken by the student that needs to be assign him/her in the beginning of the semester. The groups of students is to be formed and the no.

of students in the group should not exceed five. A suggestive list of Micro-Projects is given in Practical's/Exercise table. Similar Micro-Projects could be added by Concerned faculty.

### **K) Teaching and Learning resources:**

#### **Teaching and Learning resources:**

1. Chalk board
2. LCD presentations
3. Audio/ video presentations Demonstrative kits, Demonstrative charts
4. Question Bank

### **L) Reference Books:**

<b>Sr. No</b>	<b>AUTHOR</b>	<b>TITLE</b>	<b>PUBLISHER</b>
1.	Building Drawing	Shah, Kale, Patki	Tata Mgraw Hill, New Delhi
2.	Building planning & drawing	N Kumar Swamy A KameswaraRao	Charotar Publishing House, Anand
3.	Building Drawing	M N Gangrade B S Deshmukh, A K Kanitkar	NiraliPrakashan, Pune
4.	Civil Engg. Drawing	Rangwala	Charotar Publishing House, Anand
5.	Civil Engg. Drawing	M. Chakraborti,	By author 21B,Bhabananda rd. Calcutta. 700026.
6.	Planning &Design of Building	Y.S. Sane	Allied book stall Poona-4 And Engg. Book Publisher Co. Pune-16
7.	The text book of building drawing	S.V. Deodhar	New vrinda publishing house , M.G. Rd. Jalgaon.
8.	Civil Engg. Drawing	R.S. Malik & G.S. Meo	New Asian publisher, NaiSadak New Delhi
9.	Building rules & Bye-laws	---	Municipal Corporation/ Town Planning /Municipal Council.
10.	IS code of practice for Architectural and building drawing	BIS, New Delhi.	Govt. Publication.
11.	Principles of perspective drawing	M. G. Shah, C. M. Kale	McGraw Hill

### **IS, BIS And International Codes:**

- SP-41 (S&T) (1987)ISI Hand book of functional requirements of building other than industrial building.
- SP-35(S&T)(1987) ISI Handbook water supply and drainage with special emphasis on plumbing.

- IS 962-1989 code of practice for architectural and building drawing.
- IS 1742-1972 code of practice for building drainage.
- SP-27 1987 (1987) Handbook of method of measurement of building works.
- Data book – National building code, CBRI

**M) Learning Websites:**

[http://www.greenhome.com/sustainable\\_architecture.htm](http://www.greenhome.com/sustainable_architecture.htm)

[http://www.egaarchitect.com/upclose/vi/week23/vi\\_week23.pdf](http://www.egaarchitect.com/upclose/vi/week23/vi_week23.pdf)

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**COURSE ID :**  
**COURSE NAME :** TRANSPORTATION ENGINEERING  
**COURSE CODE :** CEH305  
**COURSE ABBREVIATION :** HTRE

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	04	03
	Tutorial Learning	00	
	Laboratory Learning	02	
	SLH-Self Learning	00	
	NLH-Notional Learning	06	

**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Practical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	125
03	30	70	100	40	25	10	00	00	00	00	

**(Total IKS Hrs for Sem.: 01Hrs)**

**C:** Abbreviations: CL-Class Room Learning, TL-Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA -Self Learning Assessment

Legends: @Internal Assessment, #External Assessment, \*#OnLine Examination, @\$Internal Online Examination

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\*15Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \*Self learning hours shall not be reflected in the Time Table.

\*Self learning includes microproject /assignment/other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

### D. i) RATIONALE:-

The course caters to the need of technician engaged in the investigation, planning, construction and maintenance of road, bridge, railway and tunnels. In practical field such a component of transportation is a specialized branch of engineering. This subject aims to imparting basic knowledge about roads, railways, bridges and tunnels in respect of their various types, materials used functions of component parts, method of construction, planning, aspects of supervision and maintenance.

### ii) INDUSTRY/EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the student to attain the following industry identified outcome through various learning experiences.

1. Investigation, planning, construction and maintenance of road, bridge, railway and Tunnels.

### E. COURSE LEVEL LEARNING OUTCOMES (COS)

CEH305-1 Identify types of roads and implements the geometrical design features of Different types of roads.

CEH305-2 Construction methods of different types of roads.

CEH305-3 Choose the shape of tunnel & identify the methods of tunnel surveying and its Construction.

CEH305-4 Identify different component parts and functions of permanent way.

CEH305-5 Identify the terms related to permanent way & track maintenance.

CEH305-6 Illustrate site selection, component parts and maintenance of bridge.

### Competency, course outcomes and programme outcomes/programme specific outcomes

#### (CP-CO-PO/PSO) matrix

[ Note: Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0"

Programme Outcomes POs and PSOs										
Competency and COs	PO 1 Basic & Discipline specific knowledge	PO 2 Problem analysis	PO 3 Design/development of solutions	PO 4 Engineering Tools, Experimentation & Testing	PO 5 Engineering practice for society, sustainability & environment	PO 6 Project management	PO 7 Life-long learning	PSO1 Plan and Design	PSO2 Construction and Maintenance	PSO3 Problem Solving on field
<b>Competency:</b> Apply principles of environmental engineering (water supply and sanitary engineering) to solve engineering problems.	3	3	3	2	2	2	2	3	3	2
<b>CEH305-1</b> Identify types of roads and implements the geometrical design features of different types of roads.	3	3	3	2	1	2	2	3	1	2
<b>CEH305-2</b> Construction	3	3	2	2	2	2	2	3	3	

Programme Outcomes POs and PSOs										
Competency and COs	PO 1 Basic & Discipline specific knowledge	PO 2 Problem analysis	PO 3 Design/development of solutions	PO 4 Engineering Tools, Experimentation & Testing	PO 5 Engineering practice for society, sustainability & environment	PO 6 Project management	PO 7 Life-long learning	PSO1 Plan and Design	PSO2 Construction and Maintenance	PSO3 Problem Solving on field
methods of different types of roads.										2
<b>CEH305-3</b> Choose the shape of tunnel & Identify the methods of tunnel surveying and its construction.	3	3	3	2	2	2	2	3	3	2
<b>CEH305-4</b> Identify different component parts and functions of permanent way.	3	3	3	2	2	1	1	3	3	2
<b>CEH305-5</b> Identify the terms related to permanent way & track maintenance.	3	3	3	2	2	2	2	3	3	2
<b>CEH305-6</b> Illustrate site selection, component parts and maintenance of bridge.	3	3	3	2	2	2	2	3	3	1

## F. CONTENT:-

### I) Practical exercises

The following practical exercises shall be conducted in the *Laboratory for Transportation Engineering developed* by the Institute in practical sessions of batches of about 20- 22 students:

Sr No.	Title of Practical Exercise	Skills / Competencies to be developed	Course Outcome
1.	<b>A)List of Practicals :- (Any five)</b> 1. Penetration test on bitumen. 2. Softening point test on bitumen. 3. Ductility test on bitumen. 4. Flash and fire point test on bitumen. 5. Viscosity test on bitumen 6. Extraction of bitumen	1. Self learning ability using laboratory journal 2. Applying concepts stud 3. Drawing real view diagrams of equipment's. 4. Time management and team working skills. 5. Presentation skills 6. Information collection regarding grade of bitumen. 7. Understand different properties of bitumen.	CEH305-3

2.	<b>Visits Report with detailed Report (any four):-</b> <b>1)</b> Visit to WBM road under construction <b>2)</b> Visit to concrete road under construction <b>3)</b> Visit to Bituminous road under construction <b>4)</b> Visit to Bridge site to study component parts <b>5)</b> Visit to Railway station to study station details and track geometric.	1. Time management, team working. 2. Studying component parts of roads, railways, bridges. 3. Understand, prepare and interpret the drawings related to work. 4. Understand the procedure of construction of different types of road.	CEH305-3 CEH305-6 CEH305-10
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## II) Theory

### Section I

Sr. no.	Topics	Teaching (Hours)	Theory evaluation Marks
<b>A) Roads</b>			
<b>Course Outcome</b> CEH305-1 Identify types of roads and implements the geometrical design features of different types of roads.			
1	<b>Introduction with Geometric Design</b> 1.1 Importance of Transportation Engg. History of the Road development in India (*IKS- Ancient Roads) 1.2 Classification of Roads 1.3 Alignment- selection, requirement & factors affecting 1.4 Geometric elements/ Technical terms of road pavements - Cross section in embankment & in cutting, right of way, width of carriage way, shoulder, camber – definition and objects. With IRC values. Cross section in embankment & in cutting, right of way, width of carriage way, shoulder, camber – definition and objects. With IRC values, Design speed 1.5 Gradients – definition - types, IRC values, sight distance – types and various components. 1.6 Super elevation- Definition, minimum and maximum values and objects. 1.7 Brief introduction of traffic volume study.	<b>09</b>	<b>12</b>
<b>Course Outcome</b> CEH305-2 Construction methods of different types of roads.			
2	<b>Construction of road</b> 2.1 Introduction to Rigid & Flexible Pavements. 2.2 Concept of W.B.M Roads , Construction procedure 2.3 Technical terms - Bitumen, Asphalt, Cutback, Tar, Emulsion, Seal coat, Prime coat, Tack coat, surface dressing, grouted macadam, semi and full grout. 2.4 Construction procedure.-bituminous carpet, bituminous concrete, bituminous bound macadam 2.5 Concrete Roads - advantages and disadvantages, Construction procedure- Alternate and continuous bay method, Joints- necessity and types	<b>10</b>	<b>12</b>

Sr. no.	Topics	Teaching (Hours)	Theory evaluation Marks
<b>B) Tunnel</b>			
<i>Cour Outcome</i> CEH305-3 Choose the shape of tunnel & Identify the methods of tunnel surveying and its construction.			
<b>3</b>	<b>3A. Introduction of tunnels</b> 3A.1 History of development of tunnels in India (IKS). 3A.2 Necessity of tunnels. Advantages and disadvantages of tunnels. 3A.3 Shapes of tunnel & its suitability. 3A.4 <b>Tunnel surveying</b> - 3A.4.1 Initial surveys 3A.4.2 Setting out the alignment of tunnel on the ground 3A.4.3 Transferring the alignment through shafts 3A.4.4. Shaft – purpose and construction	<b>06</b>	<b>06</b>
	<b>3B Tunneling – Construction &amp; its maintenance</b> 3B.1 Tunneling in soft rock –Different methods (only names),Shield method (Explain in brief) 3B.2 Tunneling in hard rock - Different methods(only names), full face heading method(Explain in brief) 3B.4 Lining of tunnels – purpose and factors affecting 3B.5 Tunnel Maintenance- Purpose measure to be taken for proper maintenance	<b>05</b>	<b>04</b>
	<b>Total</b>	<b>30</b>	<b>34</b>

### Section –II

Sr. no.	Topics	Teaching (Hours)	Theory evaluation Marks
<b>C) Railways</b>			
<i>Course Outcome</i> CEH305-4 Identify different component parts and functions of permanent way.			
<b>4</b>	<b>Permanent Way</b> 4.1. History of development of railways, in India (IKS) Definition, requirements 4.2. coning of wheels. 4.3 Components of railway track: 4.3.1 Rails – Functions, types, dimensions of Flat Footed Rails, Creep of rails, Causes of creep. 4.3.2. Sleepers – Function of sleepers and their requirements, list of Sleepers, sleeper density. 4.3.3.Rail fixture and fastenings – Fish plate , spikes , their types , bolts , chairs , blocks , keys , bearing plates . 4.3.4. Ballast – Functions and requirements, different types, their merits and demerits 4.4 Gauges – Different types	<b>08</b>	<b>12</b>

Sr. no.	Topics	Teaching (Hours)	Theory evaluation Marks
<b>Course Outcome CEH305-5</b> Identify the terms related to permanent way & track maintenance.			
5	<b>5.1 Technical terms &amp; track maintenance</b> 5.1 Points and crossings- 5.1.1 Definition, necessity, important technical terms, 5.1.2 Left hand and Right hand turnouts <b>5.2 Stations and Yards –</b> 5.2.1 Stations - Definition, site selection, requirements, Classification 5.2.2 Yards – Definitions ,types <b>5..2.3 Track Maintenance-</b> Necessity, Classification, Tools required for track maintenance with their function, Organization of track maintenance, duties of permanent way Inspector, gang mate and key man.	11	11
<b>D) Bridges</b>			
<b>Course Outcome CEH305-6</b> Illustrate site selection, component parts and maintenance of bridge.			
6	Bridge Components & its maintenance 6.1 History of development of bridges in India (IKS) Factors affecting Site selection and Alignment of Bridges 6.2 Substructure – foundation, pier, abutment, wing walls – Functions and types. 6.3 Superstructure components - Slab, Girder, Box only 6.4 Types of Bearings for R C C Bridge 6.5 Approaches- types 6.6 Afflux, span, scour, waterway, free board, clearance, economic span 6.7 Types of Bridges 6.7.1 Definition and Classification of Bridges 6.7.2 Definition and types of causeway (No sketches ask in exam) & culvert 6.7.3 Sketches , merits & demerits of RCC girder bridge, Prestressed girder bridge, simple suspension bridge Inspection & maintenance 6.8.1 Inspection of bridges-General points to be observed, Pre and post monsoon inspection Maintenance of bridges – types—routine and special Maintenance.	11	13
<b>Total</b>		<b>30</b>	<b>36</b>
Ssemester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.			

**\*\* No questions will be asked on IKS learning subtopics in any question papers.**

## H: Specification table for setting question paper for semester end theory examination

Topic No.	Name of topic	Distribution of marks (Cognitive level-wise)			Course Outcome	Total Marks
		Remember	Understand	Application		
1	Introduction with Geometric Design	02	04	06	CEH305-1	12
2	Construction of road	02	04	06	CEH305-2	12
3	3A. Introduction of tunnels	02	04	-	CEH305-2	06
	3B. Tunneling – Construction & its maintenance	-	02	02	CEH305-3	04
4	Permanent Way	02	04	06	CEH305-4	12
5	Technical terms & track maintenance	02	04	05	CEG305-5	11
6	Bridge Components & its maintenance	03	04	06	CEH305-6	13
	<b>Total</b>	<b>13</b>	<b>26</b>	<b>31</b>		<b>70</b>

## I :-Assessment Criteria

### i) Formative Assessment of Practical:-

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Attendance/Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

## J) Instructional Methods:

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration

## K) Teaching and Learning resources:

Chalk board, LCD presentations, Demonstrative kits, Demonstrative charts.

## L) Reference Books:

Sr. No.	Author	Title	Publisher
1.	N.L.Arrora	Transportation Engg.	IPH New Delhi
2.	Khanna& Justo	Highway Engg.	Nemchand and brothers, Roorkee
3.	S. C. Saxena&SatyapalArora	Railway Engg.	DhanpatRai and Sons
4.	S. C. Saxena	Tunnel Engg.	DhanpatRai and Sons
5.	Birdi and Ahuja	Road, railway and bridges	Standard book house

## M) Learning Website & Software

Sr.No	Link/Portal	Description
1	<a href="https://iksindia.org/index.php">https://iksindia.org/index.php</a>	Indian Knowledge Systems(IKS)
2	<a href="https://www.youtube.com/watch?v=TE8zYxUJHt0">https://www.youtube.com/watch?v=TE8zYxUJHt0</a> <a href="https://ts-nitk.vlabs.ac.in/exp/ductility-test/">https://ts-nitk.vlabs.ac.in/exp/ductility-test/</a>	Ductility test on Bitumen.
3	<a href="https://www.youtube.com/watch?v=-yBXI4z70mI">https://www.youtube.com/watch?v=-yBXI4z70mI</a> <a href="https://ts-nitk.vlabs.ac.in/exp/softening-point-test/">https://ts-nitk.vlabs.ac.in/exp/softening-point-test/</a>	Softening point test on bitumen.
4	<a href="https://www.youtube.com/watch?v=9HZE6DNfF5U">https://www.youtube.com/watch?v=9HZE6DNfF5U</a> <a href="https://ts-nitk.vlabs.ac.in/exp/penetration-test/">https://ts-nitk.vlabs.ac.in/exp/penetration-test/</a>	Penetration test on bitumen.
5	<a href="https://www.youtube.com/watch?v=PR7q4-ilENA">https://www.youtube.com/watch?v=PR7q4-ilENA</a>	Flash and Fire Point test on bitumen.
6	<a href="https://www.youtube.com/watch?v=JEySduXuxCc&amp;t=563s">https://www.youtube.com/watch?v=JEySduXuxCc&amp;t=563s</a> <a href="https://www.youtube.com/watch?v=d48qDaiDyVI">https://www.youtube.com/watch?v=d48qDaiDyVI</a>	Bitumen Extraction Test
7	<a href="https://www.youtube.com/watch?v=2VehMMP70HE&amp;list=PLLy_2iUCG87C7nApYQjgkDA0p67fMaXnE">https://www.youtube.com/watch?v=2VehMMP70HE&amp;list=PLLy_2iUCG87C7nApYQjgkDA0p67fMaXnE</a>	Geometric Design of Highways By Prof. Rajat Rastogi IIT Roorkee
8	<a href="https://www.youtube.com/watch?v=5zKC_aq4ypM&amp;list=PLE88643285BC70E0F">https://www.youtube.com/watch?v=5zKC_aq4ypM&amp;list=PLE88643285BC70E0F</a>	Transportation Engineering and Road development Process by IIT Kharagpur
9	<a href="https://crridom.gov.in/">https://crridom.gov.in/</a>	CSIR-Central Road Research Institute
10	<a href="https://www.irc.nic.in/">https://www.irc.nic.in/</a>	Indian Roads Congress(IRC)
11	<a href="https://nhai.gov.in/#/">https://nhai.gov.in/#/</a>	National Highway Authority of India(NHAI)
12	<a href="https://msrdc.in/1307/Home">https://msrdc.in/1307/Home</a>	Maharashtra State Road Development Corporation Ltd.
13	<a href="https://indianrailways.gov.in/">https://indianrailways.gov.in/</a>	Indian Railway Zones(IKS)
14	<a href="https://iricen.gov.in/iricen/BooksList.jsp">https://iricen.gov.in/iricen/BooksList.jsp</a>	IRICEN Books on Railway and Bridge Engineering
15	<a href="https://nhsrcl.in/en/home">https://nhsrcl.in/en/home</a>	National High Speed Rail Corporation Limited ( Bullet Train)
16	<a href="https://msrdc.in/Site/Common/ProjectListDetails.aspx?ID=56&amp;MainId=18">https://msrdc.in/Site/Common/ProjectListDetails.aspx?ID=56&amp;MainId=18</a>	Versova-Bandra Sea Link Project by MSRDC
17	<a href="https://marvels.bro.gov.in/AtalTunnel">https://marvels.bro.gov.in/AtalTunnel</a>	Atal Tunnel ,Rohtang
18	<a href="https://archive.nptel.ac.in/courses/105/105/105105216/">https://archive.nptel.ac.in/courses/105/105/105105216/</a>	Bridge Engineering video lectures by NPTEL

19	<a href="https://nptel.ac.in/courses/105107123">https://nptel.ac.in/courses/105107123</a>	Railway Engineering video lectures by NPTEL
20	<a href="https://mmrda.maharashtra.gov.in/projects/transport/metro-line-1/overview">https://mmrda.maharashtra.gov.in/projects/transport/metro-line-1/overview</a>	Mumbai Metropolitan Region Development Authority

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**COURSE ID :**

**COURSE NAME : GEOTECHNICAL ENGINEERING**

**COURSE CODE :CEH306**

**COURSE ABBREVIATION :HGTE**

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	03	4
	Tutorial Learning	-----	
	Laboratory Learning	02	
	SLH-Self Learning	01	
	NLH-Notional Learning	06	

**B.ASSESSMENT SCHEME**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
	FA-TH	SA-TH	TOTAL		Practical		FA -PR	SA-PR	MAX	MIN	
03	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	25	10	150
	30	70	100	40	25	10	00	00			

(Total IKS hours for sem : 01 hour )

**C: ABBREVIATIONS: -**

CL- Class Room Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

**Legends:** @ Internal Assessment, # External Assessment, \*# On Line Examination, @\$ Internal Online Examination.

FA-TH represents average of two class tests of 30 marks each conducted during the semester.

1. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
2. If candidate is not securing minimum passing marks in SLA of any course then the

candidate shall be declared as fail and will have to repeat and resubmit SLA work.

3. Notional Learning hours for the semester are (CL+LL+TL+SL) hrs.\* 15 Weeks

4. 1(one) credit is equivalent to 30 Notional hrs.

5. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities.

### **D.RATIONALE:**

As all the structures rely on the bearing strength of earth's surface for support, it's imperative to comprehend how soils behave under various mechanical forces. The behaviour of soil under load directly affects the design and foundation techniques. Civil Engineering diploma technicians are required to supervise the construction of roads, pavements, dams, embankments and other Civil Engineering structures. As such the knowledge of basic soil engineering is the pre-requisite for effective dealing with their job profile and role. This makes it necessary to introduce Geotechnical Engineering course in the curriculum for Diploma Course in Civil Engineering as value addition. This course aims to identify and classify the different types of soils, its origin, its properties and to apply principles of mechanics including hydraulics to the engineering problems related to soil.

### **Competency identified for the course:**

The MPEC 2023 curriculum design based on MSBTE K curriculum guideline and NEP2020 policy incorporates all self and tutorial such as notional hours and non-national hours of learning. Indian knowledge system is also intended to explore through additional hours of learning during the semester. Subject is allotted 3 hrs. of class room learning and 2hrs of practical (lab) and 2 hrs. of self-learning. All these hrs. Of learnings including IKS learning are aimed at achieving following skills sets.

### **E. COURSE OUTCOMES (COs):**

CEH306-1:Geology and its significance in Civil Engineering

CEH306- 2:To determine coefficient of permeability and seepage parameters of soil

CEH306-3 :To Determination Shear strength and stability parameters of soil

CEH306-4:To understand behavior of soil under loading and ground improvement techniques

CEH306-5:To understand types of foundations and determine bearing capacity of soil in shallow foundation

CEH306-6:To understand methods of exploring the sub soil before design of structure and to provide safety measures in construction of foundation.

### **Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/pso) matrix**

[Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0" ]

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Competency and COs	Programme Outcomes POs and PSOs									
	PO 1 Basic and disciplined knowledge	PO 2 Problem analysis	PO 3 Design /development of solutions	PO 4 Engineering Tools/experimentation and testing	PO 5 The engineering practice for society, sustainability and environment	PO 6 Project management	PO 7 Life-long learning	PSO1 Plan and Design	PSO2 Construction and Maintenance	PSO3 Problem Solving on field
Competency: Apply principles of soil mechanics to solve engineering problems.	3	2	3	2	2	-	2	1	1	2
CEH306-1 Geology and its significance in Civil Engineering	2	2	2	3	1	-	1	1	-	1
CEH306-2 To determine coefficient of permeability and seepage parameters of soil	2	2	2	3	1	-	1	1	1	1
CEH306-3 To Determination Shear strength and stability parameters of soil	2	2	3	3	1	-	1	1	1	1
CEH306-4 To understand behavior of soil under loading and ground improvement techniques	2	2	3	3	1	1	1	2	1	1
CEH306-5 To understand types of foundations and determine bearing capacity of soil in shallow foundation	2	2	3	3	1	1	1	2	2	1
CEH306-6 To understand methods of exploring the sub soil before design of structure and to provide safety measures in construction of foundation.	2	2	3	3	1	1	1	2	2	2

## F. CONTENT:

### I) LABORATORY WORK

Practical Exercises and related skills to be developed

The following exercises shall be conducted as practical work as detailed in laboratory manual for Geotechnical engineering produced by the department as manual for batches of about 20- 22 students.

In A part any 10 practicals are to be performed along with Part B (mandatory)

Sr. No.	Laboratory Experience	Skills / Competencies to be developed	
<b>A</b>	<b>Any 10 Experiments</b>		
1	Determination of water content by oven drying method	<p>Follow IS code procedures for tests.</p> <p>Studying equipment.</p> <p>Understanding test procedure</p> <p>Accuracy in taking observation.</p> <p>Reinforcement of Concepts.</p> <p>Performing calculation and plotting graphs. from observation.</p> <p>Interpreting test results.</p> <p>Classifying materials as per IS standards.</p> <p>Finding quality of material.</p>	
2	Determination of specific gravity by pycnometer method.		
3	Mechanical analysis of soil		
4	Determination of liquid limit by Casagrande's apparatus		
5	Determination of plastic limit		
6	Determination of liquid limit by cone penetrometer		
7	Determination of Shrinkage limit		
8	Determination of field unit weight by core cutter method.		
9	Determination of field unit weight by sand replacement method.		
10	Determination of soil permeability by lab test either constant head or falling head method		
11	Determination of OMC and MDD by standard Proctor test		
12	Determination of shear strength by direct shear test		
13	Vane shear test		
14	Determination of CBR by laboratory/Field method		
15	Standard penetration test/plate load test demo /vedio		
16	Calculation of bearing capacity of soil using Liquid limit and plastic limit of soil		
17	Unconfined compression test		
<b>B</b>	Site visit report –foundation details/soil exploration /site investigation /pavement design /shear strength determination		

## II) THEORY:

### Section I

Sr no	Course content	Lecture hours (class room learning)	Theory Assessment marks
<b>CO: CEH-1 Determination of the elementary properties of soil and classification of soil</b>			
1	<p><b>Introduction to Geology and index properties of soil:</b></p> <p><b>1.1 Introduction to Geology –Definition , branches and importance of geology</b></p> <p><b>1.2 Earth and its composition</b></p> <p><b>1.3 Formation of rock –petrology, classification based on genesis</b></p> <p>1.4 Soil map of India, soil in India,Local soil found in Maharashtra. Geological origin of soils with special reference to soil profiles in India: residual and transported soil, alluvial deposits, lake deposits</p> <p><b>1.4 I.S. definition of Soil, Three phase system, weight and volume relationships, Void ratio, Porosity, relative density ,Inter-relationships between Water content, Degree of saturation, Specific gravity,</b></p> <p><b>1.5 Atterberg’s limits of consistency and their determination, plasticity index,</b></p>	06 hours	10 marks
<b>CO: CEH-2 Determination of coefficient of permeability and seepage parameters of soil</b>			
2	<p><b>Soil classification and properties</b></p> <p><b>2.1 Soil Classification ...(04marks)</b> Necessity of soil classification, IS classification, Grain size distribution, Mechanical analysis, Use of semi log paper to draw Particle size distribution curve, Effective diameter of soil, Uniformity coefficient, Coefficient of curvature. Numerical problem</p> <p><b>2.1Permeability: .....(04marks)</b> Adsorbed water, absorbed water, pore water, Capillarity water, shrinkage and swelling of soil, Permeability of soil and factors affecting , effective stress, Darcy’s law, Laboratory method to determine coefficient of permeability by constant head and falling head method as per IS - 2720, Numerical problem to determine coefficient of permeability</p> <p><b>2.2Seepage:..... (04 marks)</b> Seepage through soil mass; Flow net and its application. Quick sand condition, Numerical problem on seepage calculation through flow net, List of Methods to obtain flow net</p>	09hours	12marks

**CO: CEH-3 Determination of Shear strength and stability parameters**

3	<p><b>Shear strength and soil pressure</b></p> <p><b>3.1 Shear strength of soils ... (06 marks)</b> Coulomb's theory and failure envelop. Strength equation, Representation of stresses by Mohr's circle for Cohesive, non-cohesive, saturated, partly saturated soil. Factors affecting shear strength and various strength tests to determine shear strength and their suitability. Types pavement ; CBR test for flexible pavement design – interpretation of values.</p> <p><b>3.2 Earth Pressure ... (06 marks)</b> Lateral earth pressure, Rankine's theory, Concept of earth pressure. Active and passive earth pressure Types of earth retaining structures, Earthen embankments and their stability. Numericals to calculate coefficient of earth pressures.</p>	08 hours	12 marks
	<b>Total</b>	<b>23</b>	<b>34</b>

**Section II**

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
<b>CO: CEH-4 : To understand behavior of soil under loading and ground improvement techniques</b>			
4	<p><b>Soil stabilization techniques</b></p> <p><b>4.1 Soil Compaction (06marks)</b> Compaction phenomenon, Purpose, field application, standard Proctor test, modified proctor test, difference between standard and modified compaction test, Compaction curve, factors affecting compaction, Field methods of compaction. Numerical to calculate amount of compaction</p> <p><b>4.2 Soil consolidation: (04marks)</b> Meaning, conditions/situations of occurrence with emphasis on practical significance of Consolidation and settlement</p> <p><b>4.3 Ground Improvement techniques: ..... (02 marks)</b> Stabilization, Stabilization methods</p>	08 hours	12 marks
<b>CO: CEH-5 To understand types of foundations and determination of bearing capacity of soil in shallow foundation</b>			

5	<p><b>Foundation- purpose (civil engineering structure /machine) and types .</b></p> <p><b>5.1 Shallow Foundations</b> .....(02marks)          Shallow foundation meaning types – spread, strap, combined, raft.          Pressure distribution beneath rigid footing.          IS criteria for depth of foundation</p> <p><b>5.2 Deep Foundations</b> .....(02marks)          Meaning of deep foundation, Use and classification of piles, Under-reamed piles, Well foundation – type, Caissons, Pier foundations</p> <p><b>5.3 Bearing Capacity of soil in shallow foundation:</b> .....(12marks)          Concept of bearing capacity, Ultimate, Safe, Allowable bearing capacity          Bearing capacity concept &amp; equation (IS equation and meaning of each term involved), (No derivation and problems), effect of water table, Presumptive bearing capacity values of different types of soils.          Calculation of bearing capacity of soil using Liquid limit and Plastic limit, Numerical problem          Field test to determine bearing capacity of soil: Plate load test, Standard penetration test.          Foundation settlement, permissible settlement</p>	08 hours	16marks
<p><b>CO: CEH305-6 To determine soil properties at site by exploring the sub soil and to provide safety measures in construction of foundation</b></p>			
6	<p><b>Soil Investigation and soil exploration</b></p> <p><b>6.1 Soil Investigation:</b> ..... (04marks)          Necessity of site investigation, List of Methods with brief introduction and its application (open excavation, boring, geophysical method) Soil sampling, disturbed and undisturbed samples, Bore log</p> <p><b>6.2 Safety measures during construction of foundation</b> ... (02marks)          Soil support methods , shuttering while excavation with variety of pile- sheet piles, Rackers, Tiebacks, Diaphragm walls, Cofferdam types, Dewatering methods</p> <p><b>6.3 Safety aspects while providing foundation</b> ..... (02 marks)          Foundation treatments, Corrosion resistance, water proofing, epoxy coatings</p>	06hours	08 marks
<b>Total</b>		<b>22</b>	<b>36</b>

### G. SLA (Self Learning Assessment)

**It should be assessed by practical teacher.**

Number of assignments /Microproject / model making/any other activity like making of chart etc are to be completed during the semester. (but it's announced before starting of the practical and same policy to every student in a batch)

## H: Specification table for setting question paper for semester end theory examination

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	Introduction to Geology and index properties of soil	2	4	4	10	CEH306-1
I / 2	Soil classification and properties	2	2	4	08	CEH306-2
I / 3	Shear strength and soil pressure	4	4	8	16	CEH306-3
II / 4	Soil stabilization techniques	4	4	4	12	CEH306-4
II / 5	Foundation- purpose (civil engineering structure /machine) and types	4	4	8	16	CEH306-5
II / 6	Soil Investigation and soil exploration	2	2	4	08	CEH306-6
Total Marks					<b>70</b>	

## I:-Assessment Criteria

### i) Formative Assessment of Practical: -

Every practical shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

### ii) Summative Assessment of Practical:

End exam practical assignment shall be assessed for 25 marks as per following criteria:

Sr. no	Criteria	Marks allotted
1	Attendance at regular practical	05

2	Preparedness for practical	05
3	Neat & complete Diagram.	05
4	Observations & handling of instrument.	05
5	Oral Based on Lab work and completion of task	05
<b>TOTAL</b>		<b>25</b>

**iii) Assessment of SLA: -**

Every Self-learning assignment/microproject shall be assessed for 25 marks as per Following criteria

Sr.no	Criteria	Marks allotted
1	Attendance	05
2	Preparedness and workmanship	05
3	Presentation (neat figures/ diagrams/ tables/ graphs etc.)	05
4	Conclusion / Inference	05
5	Oral Based on microproject/ assignment/ activity	05
<b>TOTAL</b>		<b>25</b>

**J. Instructional Methods:**

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration

**K. Teaching and Learning resources:**

- |                       |  |
|-----------------------|--|
| 1. Chalk board        | 2. LCD presentations                         |
| 3. Demonstrative kits | 4. Demonstrative charts                      |
| 5. Question Bank      | 6. Digital learning resources -NPTEL, Swayam |

**L. REFERENCE BOOKS**

a) Book / journals / IS code

Sr no	Name of Book	Author	Publication
1	Soil Mechanics in Engineering Practice	Terzaghi and Pech,	John Wiley and Sons Inc New York.
2	Soil Mechanics	Lamb and Whitman,	Wiley Eastern Pvt. Ltd., New Delhi.
3	Fundamentals of Soil Mechanics	by Taylor	John Wiley and Sons Inc New Delhi

4	Basic and applied soil mechanics	by Gopal Ranjan, A S R Rao.	New Age International publishers
5	Physical and Geological properties of soils	J E Bowles	Mc Graw Hill Co. Ltd
6	Soil Testing for Engineers	W.Lambe,	John Wiley and Sons, Inc, New York.
7	Principles of Geotechnical Engineering” Fifth edition.	Braja M. Das	Thomson/Brookscole
8	Soil mechanics and foundation Engineering	K. R. Arora	Standard Publisher Distribution 1997
9	Design Aids in Soil Mechanics and Foundation Engineering	S.R. Kaniraj	Tata Mc Graw Hill Education Limited, 2010
10	A Text Book of Soil Mechanics and Foundation Engineering	V.N.S. Murthy	UBS Publishers Distributors Ltd.
11	Geotechnical Engineering	Purushottam Raj	
12	SP36 Part 1:1987& SP36 Part 2 :1988		
13			

### **M. Learning Website & Software**

SAFE, ANSYS

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**COURSE ID :**  
**COURSE NAME :** COMPUTER AIDED DRAWING  
**COURSE CODE :** CEH307  
**COURSE ABBREVIATION :** HCAD

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	00	<b>02</b>
	Tutorial Learning	00	
	Laboratory Learning	02	
	SLH-Self Learning	02	
	NLH-Notional Learning	04	

**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Pracctical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	<b>50</b>
-	-	-	-	-	-	-	25	10	25	10	

(Total IKS Hrs for Sem. : 01 Hrs)

**C:** Abbreviations: CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA - Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment  
Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination.

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

### D. i) RATIONALE:-

Computers are used in each and every sphere of life. Numbers of civil engineering software packages are available and are used in different organizations. In this, Computer aided drawing as drafting software to draw, read and interpret the civil engineering drawing is now very much essential. This will increase speed and accuracy of drawing as well as give facilities to repetitive use of drawing as and when needed.

### ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

Use CAD software for drafting and editing of the given type of drawing.

### E. COURSE LEVEL LEARNING OUTCOMES (COS)

**CEK306-1** Know different types of latest of software's.

**CEK306-3** Understand fundamentals and various commands

**CEK306-4** Generate submission drawing of residential building

**Competency, course outcomes and programme outcomes/programme specific outcomes**

**(cp-co-po/pso) matrix**

[ Note: Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0"

Competency and COs	Programme Outcomes POs and PSOs									
	PO 1 Basic knowledge and Discipline Knowledge	PO 2 Problem Analysis	PO 3 Design/Development of solutions	PO 4 Engineering Tools, Experimentation & Testing	PO 5 Engineering Practices for society, sustainability and environment	PO 6 Project Management	PO 7 Life-long learning	PSO1 Plan and Design	PSO2 Construction and Maintenance	PSO3 Problem Solving on field
<b>Competency:</b> Apply and use of various commands of Auto CAD to prepare various drawings.	3	3	3	2	2	-	-	3	3	---
<b>CEH307-1</b> Know different types of latest of software's.	3	2	2	-	2	-	-	2	2	---
<b>CEH307-2</b> Understand fundamentals and various commands	2	3	3	1	1	-	-	3	3	---
<b>CEH307-3</b>	3	3	2	2	3	-	-	2	3	---

Competency and COs	Programme Outcomes POs and PSOs									
	PO 1 Basic knowledge and Discipline Knowledge	PO 2 Problem Analyses	PO 3 Design /Development of solutions	PO 4 Engineering Tools, Experimentation & Testing	PO 5 Engineering Practices for society, sustainability and environment	PO 6 Project Management	PO 7 Life-long learning	PSO1 Plan and Design	PSO2 Construction and Maintenance	PSO3 Problem Solving on field
Generate submission drawing of residential building										

## F. CONTENT:-

### I) Practical exercises

The following practical exercises shall be conducted in the in practical sessions of batches of about 20- 22 students:

Sr. No.	Laboratory experiences	CO
1	Demonstration the components of CAD screen and apply the process of initial setting using format menu	CEH307-CO1
2	Starting Auto CAD and Demonstration of auto-CAD commands as mentioned in topic no. 2	CEH307CO1& CEH307-2
3	Writing the names of the all commands and Short Keys	CEH307-CO2
4	Exercise on establishing limits and units of the proposed drawing	CEH307-CO2
5	Exerciser on Use of ortho, grid, snap, Line weight, and osnap, Polar commands	CEH307-CO2
6	Drawing triangles, rectangles, pentagon, circle etc using various commands with dimensions	CEH307-CO2
7	Layers – Drawing line sketch of three rooms residential building on different layers	CEH307-CO2
8	Hatching an object say brick work, stone masonry, bed concrete, sand filling, grill work etc.	CEH307-CO2
9	Reducing and increasing the dimension of a rectangular object / room using ‘stretch’ command	CEH307-CO2
10	Increasing or decreasing the size of an object using ‘scale’ command	CEH307-CO2
11	Calculating the area of the given figure	CEH307-CO2

12	Drawing the plan of a building showing living room, bedroom, kitchen, WC and bath, staircase etc	CEH307-CO2 and CEH307-CO3
13	Drawing elevation and section for serial no. 12	CEH307-CO2 and CEH306-CO3
14	Preparing area statement, site plan, construction notes, schedule of doors and windows etc. for serial no. 12 & 13	CEH307-CO2 and CEH307-CO3
15	Demonstration and taking printout (preferably on plotter) of serial no. 12 to 14	CEH307-CO2 and CEH307-CO3
16	Writing short notes on topic no. 1 and 2	CEH307-CO1 to CEH-CO2

## II) Theory

Sr. no.	Topics/Subtopics
<b>Course Outcome- CEH307-1</b> Know different types of latest of software's	
<b>1</b>	<b>A brief study of latest software in Civil Engineering</b> Auto CAD, STADPRO, 3D MAX, 3D HOMEARCHITECT
<b>Course Outcome- CEH307-3</b> Understand fundamentals and various commands.	
<b>2</b>	<p><b>Auto-CAD package</b></p> <p>2.1 Fundamentals: System requirement for drawing software. Advantages of computer aided drawing over traditional method of drawing.</p> <p>2.2 Initial setting required to start new drawing.</p> <p>2.3 Draw commands: Line, poly line, construction line, rectangle, polygon, circle, ellipse, hatch, boundary, text, arc, point, make block, insert block etc.</p> <p>2.4 Modify commands: Erase, copy, mirror, offset, trim, move, extend, rotate, array, lengthen, scale, chamfer, fillet, explode, stretch. break, join, explode, divide, lengthen etc.</p> <p>2.5 Compute area of the given drawing</p> <p>2.6 Changing properties of entity: line type, color, scale, font- size, color, style.</p> <p>2.7 Layer command: Create layers for given components of given drawing, Layer on/off, Freeze/Thaw, Lock/Unlock etc.</p> <p>2.7 Dimension toolbar: Quick dimension, linear dimension, and continuous dimension; align dimension, angular dimensions, dimension style.</p>

	2.9 Use of plot/print command for the output of given drawing.
<b>Course Outcome- CEH307-4</b> Generate submission drawing of residential building	
<b>3</b>	<b>Submission drawings</b> 4.1 Generation of plan of a building (on layers) Generation of detailed plan, elevation, section, site plan, area statement, schedule of doors and windows of a residential building

**Note - Above theory content will be delivered in practical hours.**

**\*\* No questions will be asked on IKS learning subtopics in any question papers.**

### **G: List of Assignments under SLA**

- 1) Draw Plan, elevation and section of a collected framed structure drawing from builder/Architect/ civil engineer.
- 2) Prepare construction notes, site plan and schedule of openings from the framed structure collected from builder/Architect/ civil engineer.
- 3) Draw Plan, elevation and section of a collected load bearing structure drawing from builder/Architect/ civil engineer.
- 4) Prepare construction notes, site plan and schedule of openings from the load bearing structure collected from builder/Architect/ civil engineer.
- 5) Draw working drawing of available drawing from builder/Architect/ civil engineer.
- 6) Learn latest software's of Civil Engg. Drawing

#### **Note :**

Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.

The faculty must allocate judicious mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.

If a microproject is assigned, it is expected to be completed as a group activity. SLA marks shall be awarded as per the continuous assessment record.

If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

### **H : Specification table for setting question paper for semester end theory examination- Not Applicable for this Course**

## I :-Assessment Criteria

### i) Formative Assessment of Practical :-

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Attendance/Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

### ii) Summative Assessment of Practical :

At the time of Practical Examination assessed for 25 marks as per following criteria:

Sr. no	Criteria	Marks allotted
1	Knowledge about the course	05
2	Preparedness for practical /Oral	05
3	Neat & complete Diagram/write up	05
4	Observations/Handling of instrument/ Communication/Presentation	05
5	Oral Based on Lab work and completion of task	05
<b>TOTAL</b>		<b>25</b>

## J) Instructional Methods:

1. Lectures cum demonstrations
2. Laboratory practices
3. Massive open online courses (*MOOCS*) may be used to teach various topics/subtopics.
4. About *15-20 of the topics/subtopics* which relatively simpler or descriptive in nature is to be given to the students for *self directed learning*.

## K) Teaching and Learning resources:

1. Computer
2. Computer based training packages.
3. LCD Presentations

**L) Reference Books:**

<b>Sr.No</b>	<b>AUTHOR</b>	<b>TITLE</b>	<b>PUBLISHER</b>
1.	George Omura, Brian C. Benton	Mastering Auto CAD	SYBEX, U.S.A.
2.	Prof. Sham Tickoo	Auto CAD 2016 for Engineers and Designers	Dream tech, USA
3.	David Frey	AutoCAD	
4.	Rajendra Solkhe	AutoCAD	Aruta Publishers, Chiplun
5.	Tickor Maini	Understanding AutoCAD	

**LI) LEARNING WEBSITES & PORTALS**

**COURSE ID** :  
**COURSE NAME** : **ADVANCED CONSTRUCTION TECHNIQUES AND EQUIPMENTS.**  
**COURSE CODE** : **CEH310**  
**COURSE ABBREVIATION** : **HACT**

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	03	3
	Tutorial Learning	00	
	Laboratory Learning	02	
	SLH-Self Learning	01	
	NLH-Notional Learning	06	

**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Pracctical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
03	30	00	70	00	25	10	00	00	25	10	150

**(Total IKS Hrs for Sem : 01 Hrs)**

**C:** Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA - Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment  
Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination, @\$ Internal Online Examination

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

### **D. i) RATIONALE:-**

In the recent years large developments have taken place in the process of construction methods in the Civil Engineering Industry. Various new innovative techniques, variety of plants and equipment's are used on small scale to large scale civil engineering projects to obtain quality construction and productivity. These emerging trends in Civil Engineering help to complete the undertaken projects within prescribed schedule, saves the natural resources and to make the projects eco-friendly. This subject is framed to induce knowledge of advanced techniques and equipment's used on construction sites.

### **ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME**

The aim of this course is to help the student to attain the following industry identified outcome through various learning experiences:

1. Apply knowledge of advance concreting methods and construction equipment's to solve construction problems as follows.
2. Knowing operation of different equipment's.
3. Drawing different types of Equipment.

### **E. COURSE LEVEL LEARNING OUTCOMES (COS)**

CEH310- 1- Understand and decide appropriate advanced concreting method and grouting Technique

CEH310- 2- Explain Ground improvement techniques and Slope stabilization methods.

CEH310- 3- Decide advanced formwork system.

CEH310- 4 -Recommend the suitable Hoisting and conveying equipment, Earth work Equipment's for the given situation

CEH310- 5- Recommend the suitable tools and equipment's for Concreting, Aggregate Manufacturing and Road construction Equipment's as per the given situation.

CEH310- 6- Suggest the equipment management techniques for the given project.

**Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/ps) matrix**

[ Note: Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “0”

Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analyses	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 Plan and Design	PSO2 Construction and Maintenance	PSO3 Problem solving on field
CEH310-1CO-1 Understand and decide appropriate advanced concreting method and grouting Technique	2	2	2	2	3	1	2	2	2	3
CEH310-2 CO-2 Explain Ground improvement techniques and Slope stabilization methods	3	2	3	2	3	3	2	2	3	3
CEH310-3 CO-3 Decide advanced formwork system	3	3	3	3	2	1	2	2	3	3
CEH310-4 CO-4 Recommend the suitable Hoisting and conveying equipment, Earthwork Equipment's for the given situation	3	3	3	3	2	1	2	2	3	3
CEH310-5 CO-5 Recommend the suitable tools and equipment's for Concreting, Aggregate Manufacturing and Road construction Equipment's as per the given situation	3	3	3	3	2	1	2	2	3	3
CEH310-6 CO-6 Suggest the equipment management techniques for the given project	3	3	3	3	2	1	2	2	3	3

## F. CONTENT:-

### I) Practical exercises

The following practical exercises shall be conducted in classroom or Field visits in practical sessions of batches of about 20- 22 students:

Sr. no	Laboratory experiences	CO
	<b>Field visits and use of digital techniques to study ( Animation videos and case studies)</b>	
1	Advance concreting techniques	CEH310-CO1
2	Grouting methods	CEH310-CO1
3	Slope stabilization techniques	CEH310-CO2
4	Advanced formworks	CEH310-CO3
5	Working of various types of construction equipment's	CEH310-CO4,6
6	RMC plant	CEH310-CO1
7	Hot mix bituminous plant	CEH310-CO5
8	Stone crusher unit	CEH310-CO5

### II) Theory

#### Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO:CEH000-1: Understand and decide appropriate advanced concreting method and grouting Technique			
1	<b>A) Advanced Concreting methods and grouting</b> 1.1 Pumping concrete- two types of pumps and there working and application 1.2 Vaccum Processed concrete- Process and application 1.3 Shotcrete Concrete-Process and application 1.4 Repacked concrete -Process and application 1.5 Cold and hot weather - Process and application concreting 1.6 Mass concreting in dams- Process and application 1.7 Ready Mix concrete ( RMC) 1.8 Tremix Concreting <b>B) Grouting</b> 1.1 Necessity of grouting 1.2 Materials used for grouting, 1.3 Grouting pressure, drilling pattern, Equipment for Grouting 1.4 Types of grout- cement grouting, clay grouting,	8	10

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	chemical grouting 1.5 Asphalt grouting. Uses of grouts in buildings, dams & tunnels.		
<b>CO: CEH000-2: Explain Ground improvement techniques and Slope stabilization methods</b>			
2	2.1 Ground improvement techniques 2.2 Advanced piling techniques 2.3 Stone Column 2.4 Vibro Flootation 2.5 Micro piles 2.6 Soil Nailing 2.7 Vertical drains- Sand Drains 2.8 Pre-Fabricated Vertical Drains 2.9 Thermal Methods- soil heating and soil freezing. 2.10 Slope stabilization in cutting and embankment by soil reinforcing techniques	8	12
<b>CO: CEH000-3: Understand and Decide advanced formwork system</b>			
3	3.1 Slip formwork: Concreting with slip form 3.2 Maivan :Brief idea 3.3 Form work for Bridges 3.4 Form work Heavy Structures 3.5 Tunnel Formwork for buildings 3.6 Modular Formwork 3.7 Climbing System of Formwork	6	12

### Section –II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
<b>CO: CEH000 -4: Recommend the suitable.Hoisting and conveying equipments, Earth work equipments for the given situation</b>			
4	A) <b>Hoisting and conveying equipment's</b> 4.1 Hoisting equipment's Principles and working of Tower crane 4.2 Crawler cranes, Truck mounted cranes, Gantry cranes, Mast cranes and Derricks ,Mobile crane all terrain cranes 4.3 Conveying equipment's: Different types of trucks, dumpers, belt conveyors  B) <b>Earth work equipment's</b> 4.4 Excavating equipment's : Working and output of	11	14

	bulldozers, Scrapers, Graders, Power Shovels, Loader with Back Hoe, Draglines 4.6 Compacting equipment's: Uses of rollers, types of rollers : plain rollers, sheep footed rollers, pneumatic rollers, Rammers : use and working		
CO: EEG307-5: Recommend the suitable tools and equipment's for Concreting ,Aggregate Manufacturing and Road construction Equipment's as per the given situation			
5	<b>Concreting Aggregate manufacturing and Road construction Equipment's</b> A) <b>Concreting equipments:</b> 5.1 Types of concrete mixers, weigh batching equipments, Equipments for transportation of concrete: trolleys, lifts, Transit mixer. Concrete Vibrators: Needle vibrators and Screed vibrators. Automatic concrete plants. Concrete pumps B) <b>Aggregate manufacturing</b> 5.2. Stone Crushers: Types of stone crushers, working and capacities, equipment for the production of artificial sand C) <b>Road Construction Equipments-</b> 5.3 Compoments and Working of hot mix bitumen plant, Bitumen paver 5.4 Concrete road paver	8	14
CO: EEG307-6: Suggest the equipment management techniques for the given project			
6	<b>Equipment management</b> 6.1 Standard equipment 6.2 Special equipment 6.3 Selection of equipment 6.4 Owning and hiring an equipment 6.5 Economic life of an equipment 6.6 Maintenance of equipment	04	08

**\*\* No questions will be asked on IKS learning subtopics in any question papers.**

### **G : List of Assignments under SLA**

Sr.No	List of Assignment (under SLA)	Hrs Allotted
1	Advance concreting methods	01
2	Grouting	02
3	Soil reinforcing techniques.	01
4	Formwork	02
5	Hoisting and conveying equipment's.	01
6	Earth moving equipment's	02
7	Stone crushers and concreting equip	01
8	Industrial Visits to Hot mix plant and RMC plant.	02
9	Collect detailed information of Ready Mix concrete Plant	01
10	Collect detailed information of Hot Mix Plant	01
11	Miscellaneous equipment's and Management	02

## H : Specification table for setting question paper for semester end theory examination

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	Advance Concreting methods and Grouting	2	4	4	10	CEH310-CO1
I / 2	Ground improvement techniques	2	4	6	12	CEH310-CO2
I / 3	Advanced Formwork systems	2	4	6	12	CEH310-CO3
II / 4	Hoisting and conveying equipment's & Earth work equipment's	2	4	8	14	CEH310-CO4
II / 5	Concreting, Aggregate Manufacturing and Road construction Equipment's	2	4	8	14	CEH310-CO5
II / 6	Equipment management	2	4	02	08	CEH310-CO6
<b>Total Marks</b>					<b>70</b>	

### I :-Assessment Criteria

#### i) Formative Assessment of Practical:-

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Attendance/Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

#### ii) Summative Assessment of Practical : Not Applicable for this course

At the time of Practical Examination assessed for 25 marks as per following criteria:

Sr. no	Criteria	Marks allotted
1	Knowledge about the course	05
2	Preparedness for practical /Oral	05
3	Neat & complete Diagram/write up	05
4	Observations/Handling of instrument/ Communication/Presentation	05
5	Oral Based on Lab work and completion of task	05
<b>TOTAL</b>		<b>25</b>

### **J) Instructional Methods:**

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration
4. Animation Videos and construction case studies.

### **K) Teaching and Learning resources:**

Chalk board, LCD presentations, Demonstrative kits, Demonstrative charts.

### **L) Reference Books:**

S.N.	Name of Book	Author	Publication
1	R L Peurifoy	Construction Planning, Equipment, and Methods	McGowan-Hill Education
2	S.C.Sharma	Construction Equipment And Its Management	Khanna Publication
3	S. A. Rasal, M. N. Gangrade	Advanced Construction Techniques And Equipments	
4	Sushilkumar	Building construction	PhadkePrakashan.
5	S.C.Rangwala	Building construction	Khanna Publishers
6	B.C.Punmia	Building Construction	SatyaPrakashan
7	S.K.Sharma	Building Construction	S.Chand& co.

### **M) Learning Website & Software**

- a. [www.nptel.com/iitm/](http://www.nptel.com/iitm/)
- b. [www.howstuffworks.com/](http://www.howstuffworks.com/)
- c. [www.virtual lab.com](http://www.virtual lab.com)

**COURSE ID :**  
**COURSE NAME : ADVANCE CONSTRUCTION MATERIALS**  
**COURSE CODE : CEH 311**  
**COURSE ABBREVIATION : HACM**

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	03	03
	Tutorial Learning	--	
	Laboratory Learning	02	
	SLH-Self Learning	01	
	NLH-Notional Learning	06	

**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					<i>Practical</i>						
	<i>FA-TH</i>	<i>SA-TH</i>	<i>TOTAL</i>		<i>FA -PR</i>		<i>SA-PR</i>		<i>MAX</i>	<i>MIN</i>	
	<b>MAX</b>	<b>MAX</b>	<b>MAX</b>	<b>MIN</b>	<b>MAX</b>	<b>MIN</b>	<b>MAX</b>	<b>MIN</b>	<b>MAX</b>	<b>MIN</b>	<b>150</b>
<b>03</b>	<b>30</b>	<b>70</b>	<b>100</b>	<b>40</b>	<b>25</b>	<b>10</b>	<b>00</b>	<b>00</b>	<b>25</b>	<b>10</b>	

**(Total IKS Hrs for Sem. : 01 Hrs)**

**C:** Abbreviations: CL- Class Room Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination, @\$ Internal

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
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3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

## D. i) RATIONALE:-

A great awareness & huge concern towards environmental protection compelled us to discover, develop & make use of eco friendly construction materials. Also a trend of utilizing maximum natural resources like rain water, sunlight, wind etc change the planning & requirement of construction materials. In the recent past, Composite materials, Plastics, Aluminium and ceramics have been the dominant emerging materials. Students of civil engineering should be familiar with all new construction materials.

## ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

Students of civil engineering should be familiar with all new construction materials.

## E. COURSE LEVEL LEARNING OUTCOMES (COS)

CEH 311 -1 To know History and developments of building materials.

CEH 311 -2 Know different advanced materials for wall construction.

CEH 311 -3 Know different materials available for doors, windows and partition walls and Suitability of each.

CEH 311 -4 Know types of Flooring, cladding, ceiling panels and its suitability.

CEH 311 -5 Know various roofing materials and its applications.

CEH 311 -6 To know advanced types of pipes and fixtures in plumbing, to know Geo-synthetics, painting and water proofing.

### Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/ps) matrix

[ Note: Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0"

Competency and CO's	PO 1 Basic & Discipline specific knowledge	PO 2 Problem analysis	PO 3 Design/development of solutions	PO 4 Engineering Tools, Experimentation & Testing	PO 5 Engineering practice for society, sustainability & environment	PO 6 Project management	PO 7 Life-long learning	PSO1 Plan and Design	PSO2 Construction and Maintenance	PSO3 Problem Solving on field
<b>Competency:</b> Apply principles of maintenance and rehabilitation of structures	3	3	2	1	2	1	2	2	1	3
<b>CEH 311 -1</b> To know History and developments of building materials.	2	2	2	2	3	1	2	2	2	3

<b>CEH 311 -2</b> Know different advanced materials for wall construction	3	2	3	2	3	3	2	2	3	3
<b>CEH 311 -3</b> Know different materials available for doors, windows and partition walls and suitability of each.	3	3	3	3	2	1	2	2	3	3
<b>CEH 311 - 4</b> Know types of Flooring, cladding, ceiling panels and its suitability.	3	3	3	3	2	1	2	2	3	3
<b>CEH 311 -5</b> Explain repair work of concrete and masonry buildings	3	3	3	3	2	1	2	2	3	3
<b>CEH 311 -6</b> To know advanced types of pipes and fixtures in plumbing, to know Geo-synthetics, painting and water proofing.	3	3	3	3	2	1	2	2	3	3

## F. CONTENT:-

### I) Practical exercises

Continuous assessment work contains assignments, market survey reports, information brochure, leaf-lets and pamphlets on the following

Sr. no	Laboratory experiences	CO
1	*Fly Ash	CEH 311- 1
2	*Doors and windows made up of Advanced materials	CEH 311 – 2
3	*Partition panels	CEH 311– 2
4	*Structural Glazing	CEH 311– 3
5	*Flooring	CEH 311 – 4
6	*Cladding, ceiling panels	CEH 311 - 4
7	*Roofs and pre cast roofing elements	CEH 311- 5
8	*Plumbing	CEH 311 – 6
9	*Construction Chemicals	CEH 311– 6
10	*Geo-synthetics Heat and sound insulating materials Acoustic materials	CEH 311 6

**Note : Out of above suggestive LLOs -**

'\*' Marked Practicals (LLOs) Are mandatory.

Sr. no	<b>Laboratory experiences</b>	<b>CO</b>
Minimum 80% of above list of lab experiment are to be performed. Judicial mix of LLOs are to be performed to achieve desired outcomes.		

## II) Theory

### Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CEH 311 -1 To know History and developments of building materials.			
1	<p style="text-align: center;"><b>Unit No 1 Introduction to Building Materials</b></p> 1.1 Introduction to Innovative building Materials, 1.2 History & developments, 1.3 Future building materials Scop & Limitation.	04	06
CEH 311 -2 Know different advanced materials for wall construction.			
2	<p style="text-align: center;"><b>Unit No 2 Wall</b></p> 2.1 Stabilized, compressed Earth Blocks, Fal-G stabilized Mud Blocks, 2.2 Bricks-, Fly ash, Sand- Lime, Red Mud burnt 3D printed brick, Bricks made up of cigarette butts, SBA (Sugar Bagas Ash) 2.3 Fly ash – Lime- Gypsum (Fal-G ) products :- Lato/ Precast Stone – Concrete – Hollow Blocks, 2.4 Fly ash based light weight Aerated & cellular concrete walling, 2.5 Bonding System e.g. Rat-Trap Bond 2.6 Composite Ferro cement systems 2.7 Ready mix plastering material 2.8 Plaster of Paris, Gypsum wall Plasters, Gypsum Plaster Boards Adhesives, ( Only description advantages & application )	08	14
CEH 311 -3 Know different materials available for doors, windows and partition walls and Suitability of each.			
3	<p style="text-align: center;"><b>Unit No 3 Doors, windows and partition panels</b></p> 3.1 UPVC 3.2 Precast RCC 3.3 Resin or Oxi chloride Cement Bonded Saw dust based ,	10	14

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	3.4 Natural Fibre Reinforced Polymer Composite, Ferro cement Shutters, 3.5 FRP – Fibre reinforced plastic 3.6 Aluminium- plain, powder coated, Anodized Heat and sound insulating materials (Only description, advantages & application)		

### Section –II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CEH 311 -4 Know types of Flooring, cladding, ceiling panels and its suitability.			
4	<p><b>Unit No 4 Flooring, cladding, ceiling panels:</b></p> <p>4.1 Ceramic, Marbonite, Vitrified, Artificial Marble flooring, Pavements Blocks. Laminated timber 3D tiles</p> <p>4.2 Synthetic flooring: PVC, linoleum and rubber flooring, Industrial flooring: epoxy, tremix and glass flooring. Other flooring: cork- tile and asphalt flooring</p> <p>4.3 Ceramic, Cement based artificial cladding tiles, Ready to use Tiles- Porch, Riser, Tread etc.</p> <p>4.4 False Ceiling boards, Gypsum based paneling &amp; ceiling tiles</p> <p>4.5 Study of materials and constructional details of Expansion joints Curtain Walls and Structural Glazing stabilized mud blocks, micro concrete tiles, pre cast roofing elements. (Only description advantage &amp; application )</p>	06	10
CEH 311 -5 Know various roofing materials and its applications.			
5	<p><b>Unit No 5 Roofs:</b></p> <p>5.1 Life extended Thatch roofing,</p> <p>5.2 Pyramidal Brick roofing</p> <p>5.3 Cement bonded Fibre Roofing sheets,</p> <p>5.4 Micro concrete tile / stone Patti, Precast brick panels</p> <p>5.5 Ferro cement channel / shell units,</p> <p>5.6 Precast Waffle units/Channel units /cored units/ In-situ Thin Ribbed Slabs. (Only description advantage &amp; application )</p>	07	10

CEH 311 -6 To know advanced types of pipes and fixtures in plumbing, to know Geo-synthetics, painting and water proofing.			
6	<p><b>Unit No 6 Other Construction materials</b></p> <p>6.1 Plumbing Materials – Plumbing pipes &amp; fixtures, composite copper, PPR</p> <p>6.2 Thermo Mechanically Treated Steel sections (TMT)</p> <p>6.3 Construction Chemicals used in - Roof slab, plaster, flooring &amp; waterproofing.</p> <p>6.4 Types and properties of acoustic materials.</p> <p>6.5 Road Materials – Geo-synthesis, Noise Reducing Asphalt, porous pavement, plastic roads, <i>solar roads</i>, <i>Anti-Icing Roads</i>, <i>Use of SBA (Sugar Bagas Ash)</i> in concrete roads</p> <p>6.6 Sustainable Materials – Ground Granulated Glass Blast Furnace slag (GGBS) concrete, Agro-gel Insulation, Cooling Bricks, Green Concrete, Timbercrete, Ferrock</p> <p><i>(Only description, advantage &amp; application)</i></p>	10	16

<b>List of Micro Projects (Under SLA)</b>		
1	To prepare and present a case study of above assignments in a seminar type situation	
2	Collect data of pre-stressed components manufactured in your vicinity.	
3	Write a detailed report of visit to anyone prefabricated unit.	
4	Collect data for materials required for precast elements, with their suppliers, sale price etc.	
5	Carry out market survey for identifying various advanced construction materials and prepare a report.	
<p>Note :</p> <p>“These are the just suggestive topics. Faculty must design Microproject/Activities/ Assignments based on Course Outcome requirements”.</p>		

**G : Specification table for setting question paper for semester end theory examination**

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	Introduction to Building Materials	02	04	00	06	CEH 3111
I / 2	Wall	04	04	06	14	CEH 311 2
I/3	Doors, windows and partition panels	04	04	06	14	CEH 311 3
II /4	Flooring, cladding, ceiling panels:	02	02	06	10	CEH 311 4
II / 5	Roofs	02	02	06	10	CEH 311 5
II/6	Other Construction materials	04	06	06	16	C0 - 6
Total Marks					70	

**H :-Assessment Criteria**

**i) Formative Assessment of Practical :-**

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	02
	Application	03
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Attendance/Discipline and punctuality	05
	Decency and presentation	05
<b>TOTAL</b>		<b>25</b>

**I) Instructional Methods:**

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration

**J) Teaching and Learning resources:**

Chalk board, LCD presentations, Demonstrative kits, Demonstrative charts.

**K) Reference Books:**

S.N.	Name of Book	Author	Publication
1	Sushilkuma	Building onstructio	Standard book hous
2	B.C Punmi	Building	Standard book hous

		onstructio	
3	W.B.Meckay	Building construction	Pearson India
4	F. Mitchell	Building onstructio	Batsford Ltd
5	-	National Building Code	Bearau of IndianStandards

**COURSE ID :**  
**COURSE NAME :** Energy Conservation & Green Building  
**COURSE CODE :** CEH312  
**COURSE ABBREVIATION :** HECG

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	03	3
	Tutorial Learning	00	
	Laboratory Learning	02	
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**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Practical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	150
03	30	70	100	40	25	10	00	00	25	10	

**(Total IKS Hrs for Sem.:01 Hrs)**

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1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\*15Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \*Self learning hours shall not be reflected in the Time Table.

\*Self learning includes micro project/assignment/other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

## **D. i) RATIONALE:-**

Technological development in all sectors has caused imbalance in energy generation and its consumption. Building heating and cooling are the most energy-intensive activities, followed by electricity use for lighting and appliances. Rising standards of living result in more energy services required for heating, cooling, lighting and communicating. Energy being in limited quantum as on date is a very scarce resource now days and need to be used optimally. Higher levels of energy efficiency reduce carbon emissions from the home's own energy systems. Therefore, it becomes necessary to be energy conscious and make every effort for the conservation of energy. Energy conservation is a scientific tool provided to minimize the energy imbalance. Green building use the resources optimally, reduce waste and reduce the cost of lifecycle and provide healthy indoor environment for its occupants through restoring/improving the natural environment. Therefore today's home buyers are interested in green building as it improve the way homes use energy, water, and materials, to reduce negative impacts on human health and the overall environment-both during construction and over its lifetime. This course will enable the student's to face these challenges of today's era in most effective way to build the structures as green one to improve the quality of environment significantly. This is one of the rapid emerging fields in the area of engineering hence this has been included as core technology subject.

### **ii) INDUSTRY/EMPLOYER EXPECTED OUTCOME**

The aim of this course is to help the student to attain the following industry identified outcome through various learning experiences:

1. To be energy conscious and make every effort for the conservation of energy

## **COURSE LEVEL LEARNING OUTCOMES (COs)**

**CEH312-1** .Identify the need of Energy Conservation and understand renewable, non renewable energy sources

**CEH312-2** Justify the need of EIA and Implement the different steps in environmental impact Assessment

**CEH312-3** Identify Energy efficiency opportunities and suggest measures for energy efficiency in Building

**CEH312-4** Explain the principles of. Green building and suggest the strategies for design of the green buildings.

**CEH312-5** Identify the relevant Materials required for the given building to have Green building construction.

**CEH312-6** Select the relevant rating system for assessment of given Green building.

## Competency, course outcomes and programme outcomes/programme specific outcomes (CP-CO-PO/PSO) matrix

[Note: Correlation levels: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “0”

Competency and COs	PO 1 Basic & Discipline specific knowledge	PO 2 Problem analysis	PO 3 Design/development of solutions	PO 4 Engineering Tools, Experimentation & Testing	PO5 Engineering practice for society, sustainability & environment	PO 6 Project management	PO 7 Life-long learning	PSO1 Plan and Design	PSO2 Construction and Maintenance	PSO3 Problem Solving on field
<b>Competency:</b> Implement concept of energy conservation in construction practices and Improve the quality of environment by adopting green building construction techniques.	3	3	2	1	2	3	2	2	3	3
<b>CEH312 -1.</b> Identify the need of Energy Conservation and understand renewable ,non renewable energy sources	2	2	2	2	3	1	2	2	2	3
<b>CEH312--2</b> Justify the need of EIA and Implement the different steps in environmental Impact assessment	3	2	3	2	3	3	2	2	3	3
<b>CEH312-3</b> Identify Energy efficiency opportunities and suggest measures for energy efficiency in building	3	3	3	3	2	1	2	2	3	3
<b>CEH312--4</b> Explain the principles of. green building and Suggest the strategies fo design of the green buildings	3	3	3	3	2	1	2	2	3	3
<b>CEH312-5</b> Identify the relevant Materials required for the given building to have green building construction	3	3	3	3	2	1	2	2	3	3
<b>CEH312 -6</b> Select the relevant rating system for assessment of given Green building	3	3	3	3	2	1	2	2	3	3

## E. CONTENT:-

### I) Practical exercises

The following practical exercises shall be conducted in the *class room for Energy Conservation & Green Building* developed by the Institute in practical sessions of batches of about 20- 22 students:

Sr No.	Title of Practical Exercise	Skills / Competencies to be developed	Course Outcome
	<ol style="list-style-type: none"> <li>1. Visit any building in your locality to identify there Levant legal provisions followed for control of pollution and submit your Observations -cum-findings in the form of a report.</li> <li>2. Inspect your institute building and submit an action plan for improving indoor and outdoor environmental quality</li> <li>3. Estimate the capacity of the solar plant required for your institute building on the basis of the total electricity consumption data</li> <li>4. Visit to any organization Where Energy Conservation program is Implemented. (e.g. Hospitals, Workshops, Commercial Buildings, Residential buildings and submit your observations-cum-findings in the form of a report.</li> <li>5. Study of different Electrical fixtures in the building to reduce energy consumption</li> <li>6. Identify the impact of number of trees, green belt on the energy level of the building. (By physical verification)</li> <li>7. Prepare an action plan for energy conservation by inspecting an existing structure to explore its potential in it.</li> <li>8. Conduct the energy audit of your institute building using any rating system</li> <li>9. Visit to the nearby wind mill and prepare a report on your observations w.r.t. generation of energy with relevant sketches</li> <li>10. Visit to the nearby Hydroelectric power plant and prepare are portony our observations w.r.t. generation of energy with relevant sketches wherever required.</li> <li>11.Visit to the nearby solar energy plant and prepare are portony our observations w.r.t. generation of energy with relevant sketches.</li> <li>12.Inspect any conventional building in your area to suggest the action plan for converting it into green building with necessary legal provisions to be followed</li> <li>13.Visit the site for assessment of green building with relevant rating system and submit your findings in the form of a report.</li> <li>14.Visit a building in your locality for suggesting necessary modifications required for energy conservation and improving green rating .</li> </ol>	<ol style="list-style-type: none"> <li>1. Information collection and presentation in form of report</li> <li>2. Motivation through field exposure</li> <li>3. Presentation skills</li> </ol>	<p>CEH312-1 to CEH312-6</p>

## II) Theory

### Section I

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
CEH312-1. Identify the need of Energy Conservation and understand renewable, non renewable energy sources.			
1	<p><b>Energy sources and energy conservation</b></p> <p>1.1 <b>Renewable Energy Resources:</b> Solar Energy, wind Energy, Ocean Energy, Hydro Energy, Biomass Energy</p> <p>Non-renewable Energy Resources: Coal, Petroleum, Natural Gas, Nuclear Energy, Chemical Sources of Energy, Fuel Cells, Hydrogen, Bio fuels</p> <p>1.2 <b>Energy conservation:</b> Introduction, Specific objectives, present scenario, Need of energy conservation, LEED India Rating System and Energy Efficiency.</p> <p>Functions of Government organization working for Energy conservation and Audit(ECA)-</p> <ul style="list-style-type: none"> <li>National productivity council –NPC</li> <li>Ministry of New and Renewable energy-MNRE</li> <li>Bureau of energy efficiency BEE</li> <li>Maharashtra energy development agency MEDA</li> </ul>	10	14
CEH312-2 Justify the need of EIA and Implement the different steps in environmental impact assessment			
2.	<p><b>2.1 Environmental Audit:</b> Meaning, Necessity, Norms</p> <p><b>2.2 Types:</b> Objective based types: Liabilities audit, Management audit, Activities audit</p> <p><b>2.3 Client-driven types:</b> Regulatory external audit, Independent external audit, Internal environmental audit, Third party audit</p> <p>Environmental</p> <p><b>2.4. Impact Assessment (EIA):</b> Introduction, EIA regulations, Steps in environmental impact assessment process, Benefits of EIA, Limitations of EIA,</p> <p>2.5. Environmental clearance for the civil engineering projects</p>	06	10
CEH312-3 Identify Energy efficiency opportunities and suggest measures for energy efficiency in building			
3	<p><b>3.1 Energy Efficiency in building construction</b></p> <p>Environmental impact of building constructions, Concepts of embodied energy, operational energy and life cycle energy. Methods to reduce operational energy: Energy efficient building envelopes, efficient lighting technologies, energy efficient appliances for heating and air conditioning systems in buildings, zero ozone depleting potential (ODP) materials, wind and solar energy harvesting, energy metering and monitoring, concept of net zero buildings.</p>	06	10
<b>TOTAL</b>		<b>22</b>	<b>34</b>

## Section –II

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
CEH312-4 Explain the principles of Green building and Suggest the strategies for design of the green buildings			
<b>4</b>	<b>Green Buildings</b> 4.1 Introduction to Green Buildings: Definition of green buildings and sustainable development, typical features of green buildings, benefits of green buildings towards sustainable development <b>4.2 Principles:</b> Principles of Green Building planning <b>4.3. Features:</b> Salient features of Green Building, Environmental design (ED) strategies for building construction <b>4.4. Process:</b> Improvement in environmental quality in civil structure	<b>14</b>	<b>22</b>
CEH312-5 Identify the relevant Materials required for the given building to have green building construction			
<b>5</b>	<b>Building materials:</b> 5.1. Methods to reduce embodied energy in building materials: (a) Use of local building materials (b) Use of natural and renewable materials like bamboo, timber, rammed earth, stabilized mud blocks, (c) use of materials with recycled content such as blended cements, pozzolana cements, fly ash bricks, vitrified tiles, materials from agro and industrial	<b>04</b>	<b>07</b>
CEH312-6 Select the relevant rating system for assessment of given Green building			
<b>6</b>	<b>Green building Rating system</b> 6.1 Indian Green Building Council (IGBC) IGBC Green new buildings rating systems Scope and benefits of IGBC Levels of certification 6.2 Green Rating for Integrated Habitat Assessment. (GRIHA) criteria	<b>05</b>	<b>07</b>
<b>TOTAL</b>		<b>23</b>	<b>36</b>

**\*\* No questions will be asked on IKS learning subtopics in any question papers**

### **G: List of Assignments under SLA**

<b>Sr No.</b>	<b>Title of Practical Exercise</b>	<b>Skills / Competencies to be developed</b>	<b>Course Outcome</b>
<b>1.</b>	<p><b>Micro-project</b>            Only one <b>micro-project</b> is planned to be undertaken by a student that needs to be assigned to him/her in the beginning. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission.            A. suggestive list of micro-projects is given here. Similar micro-projects could be added by the concerned faculty:</p> <ol style="list-style-type: none"> <li>a. Prepare a report by taking case study to classify the terms and the construction methodologies between Traditional building and Green building.</li> <li>b. Collect the relevant information of recent technologies in green building construction and prepare a report on it.</li> <li>c. Make a model of hydroelectric power plant and prepare a report.</li> <li>d. Prepare questionnaires for environmental audit.</li> </ol> <p>Prepare questionnaires for assessment of environmental impact.</p>	<ol style="list-style-type: none"> <li>1. Information collection and presentation in form of report</li> <li>2. Motivation through field exposure</li> </ol> <p>Presentation skills</p>	
<b>2.</b>	<ol style="list-style-type: none"> <li>a. Other than the classroom and laboratory learning, following are the suggested student-related co-curricular activities which should be undertaken to accelerate the attainment of the various outcomes in this course:              Students should prepare ASSIGNMENT ON EACH UNIT.</li> </ol>		

## H : Specification table for setting question paper for semester end theory examination

Topic No.	Name of topic	Distribution of marks (Cognitive level-wise)			Course Outcome	Total Marks
		Remember	Understand	Application		
1	Energy sources and energy conservation	06	06	02	CEH312-1	14
2	Environmental Audit	02	04	04	CEH312-2	10
3	Energy Efficiency in building construction	02	04	04	CEH312-3	10
4	Green Buildings	06	08	08	CEH312-4	22
5	Building materials	03	04	--	CEH312-5	07
6	Green building Rating system	02	02	03	CEH312-6	07
	<b>TOTAL</b>	<b>21</b>	<b>28</b>	<b>21</b>		<b>70</b>

### I:-Assessment Criteria

#### i) Formative Assessment of Practical:-

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Attendance/Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

#### ii) Summative Assessment of Practical:

At the time of Practical Examination assessed for 25 marks as per following criteria:

Sr.no	Criteria	Marks allotted
1	Knowledge about the course	05
2	Preparedness for practical /Oral	05
3	Neat & complete Diagram/write up	05
4	Observations/Handling of instrument/ Communication/Presentation	05
5	Oral Based on Lab work and completion of task	05
<b>TOTAL</b>		<b>25</b>

## J) Instructional Methods:

1. Lectures cum Demonstrations,
2. Classroom practices.
3. Use of projector and soft material for demonstration

## K) Teaching and Learning resources:

Chalk board, LCD presentations, Demonstrative kits, Demonstrative charts.

## L) Reference Books:

Sr. No.	Author	Title	Publisher
1.	Kibert, C.J.	Sustainable construction: Green Building design and Delivery	John Wiley Hoboken, New Jersey,
2.	-----	IGBC Green Homes Rating System, Version 2.0., Abridged reference guide, 2013,	Indian Green Building Council Publishers.
3.	K.S. Jagadish, B.V. Venkatarama Reddy and K.S. Nanjunda Rao.	Alternative Building Materials and Technology	Wiley Press
4	G. D. Rai	Non conventional Energy Resources	Khanna Publishers.
5	Sam Kubba	Handbook of Green Building Design and Construction	Butterworth hinemann

## M) Learning Website & Software

1. Website of bureau of energy and efficiency : [WWW.bee-india.nic.in](http://WWW.bee-india.nic.in)
2. Website of Akshay Urja News Bulletin : [WWW.mnes.nic.in](http://WWW.mnes.nic.in)
3. Notes on energy management on : [WWW.energymanagertraing.com](http://WWW.energymanagertraing.com)
4. WWW. Greenbusiness.com
5. WWW. Worldenergy.org
6. WWW. Mahaurga.com (For Case Studies)
7. ECBE. User Guide 2010

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**SAMPLE PATH - H SCHEME - 4th SEMESTER**

Sr.no	Course Title	Abbreviation	Course Type	Course Code	Level	Total IKS Hrs. for Sem	Learning Scheme					Assessment Scheme					Based on LL & TL				Based on Self Learning		Total Marks			
							Actual Contact					Theory					Practical									
							CL	TL	LL	Self Learning (Activity/Assignment/Micro Project)	Notional Learning Hrs/Week	Credits	Paper Duration (Hrs)	FA-TH	SA-TH					FA-PR	SA-PR			SLA		
							Max	Max		Max	min	Max	min	Max	min	Max	min	Max	min							
1	CONCRETE TECHNOLOGY	HCTE	DSC	CEH401	4	1	4	0	2	2	8	4	3	30	70		100	40	25	10			25	10	150	
2	HYDRAULICS	HHYD	DSC	CEH308	3	1	6	0	2	0	8	4	3	30	70		100	40	25	10	25	@	10	0	0	150
3	EMERGING TRENDS IN CIVIL ENGINEERING	HETC	DSC	CEH402	4		4	0	0	2	6	3	3	30	70		100	40	0	0	0		0	25	10	125
4	MECHANICS OF MATERIAL	HMOM	DSC	CEH309	3	1	4	0	2	0	6	3	3	30	70		100	40	25	10	25	#	10	0	0	150
5	ENVIRONMENTAL EDUCATION & SUSTAINABILITY	HEES	VEC	CCH206	2	2	2	0	0	2	4	2	1.5	30	70	*#	100	40	0	0	0		0	25	10	125
6	ESTIMATING AND COSTING	HEAC	DSC	CEH403	4		4	0	4	0	8	4	4	30	70		100	40	25	10	25	#	10	0	0	150
	<b>TOTAL</b>					5	24	0	10	6	40	20		180	420		600	240	100	40	75		30	75	30	850

**Legends :**

@ INTERNAL ASSESMENT      # EXTERNAL ASSESMENT      \*# ONLINE THEORY EXAMINATION

**Abbreviations:**

@\$ Internal Online Examination

CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning

SLH-Self Learning Hours, NLH- Notional Learning Hours, IKS - Indian Knowledge System,

FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

**Programme Name/s ALL**

**Programme :- CE/EE/ME/ET/MT/IF**

**Semester : Fourth**

**Course Title : ENVIRONMENTAL EDUCATION AND SUSTAINABILITY**

**Course Code CCH206**

**I. RATIONALE**

The survival of human beings is solely depending upon the nature. Thus, threats to the environment directly impact on existence and health of humans as well as other species. Depletion of natural resources and degradation of ecosystems is accelerated due to the growth in industrial development, population growth, and overall growth in production demand. To address these environmental issues, awareness and participation of individuals as well as society is necessary. Environmental education and sustainability provide an integrated, and interdisciplinary approach to study the environmental systems and sustainability approach to the diploma engineers.

**II. INDUSTRY / EMPLOYER EXPECTED OUTCOME**

Resolve the relevant environmental issue through sustainable solutions

**III. COURSE LEVEL LEARNING OUTCOMES (COS)**

Students will be able to achieve & demonstrate the following COs on completion of course based learning

CO1 - Identify the relevant Environmental issues in specified locality. CO2 - Provide the green solution to the relevant environmental problems. CO3 - Conduct SWOT analysis of biodiversity hotspot

CO4 - Apply the relevant measures to mitigate the environmental pollution.

CO5 - Implement the environmental policies under the relevant legal framework.

**IV. TEACHING-LEARNING & ASSESSMENT SCHEME**

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme											
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Min					Max	Min	Max	Min	Max	Min			
CCH206	ENVIRONMENTAL EDUCATION AND SUSTAINABILITY	EES	VEC	2	-	-	2	4	2	1.5	30	70*#	100	40	-	-	-	-	25	10	125

[Use Proforma 1 for Assessment of SLA]

## V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	<p><b>CCH206.1</b></p> <p>1.1 Explain the need of studying environment and its components.</p> <p>1.2 Investigate the impact of population growth and industrialization on the relevant environmental issues and suggest remedial solutions</p> <p>1.3 Explain the Concept of 5 R w.r.t. the given situation</p> <p>1.4 elaborate the relevance of Sustainable Development Goals in managing the climate change</p> <p>1.5 Explain the concept of zero carbon-footprint with carbon credit</p>	<p><b>Unit - I Environment and climate change</b></p> <p>1.1 Environment and its components, Types of Environments, Need of environmental studies</p> <p>1.2 Environmental Issues- Climate change, Global warming, Acid rain, Ozone layer depletion, nuclear accidents. Effect of population growth and industrialization</p> <p>1.3 Concept of 5R, Individuals' participation in i) 5R policy, ii) segregation of waste, and iii) creating manure from domestic waste</p> <p>1.4 Impact of Climate change, Factor contributing to climate change, Concept of Sustainable development, Sustainable development Goals (SDGs), Action Plan on Climate Change in Indian perspectives</p> <p>1.5 Zero Carbon footprint for sustainable development, (IKS-Environment conservation in vedic and pre-vedic India)</p>	<p>Lecture Using Chalk-Board Presentations</p>

2	<p><b>CCH206.2</b></p> <p>2.1 Justify the importance of natural resources in sustainable development</p> <p>2.2 Explain the need of optimum use of natural resources to maintain the sustainability</p> <p>2.3 Differentiate between renewable and non-renewable sources of energy</p> <p>2.4 Suggest the relevant type of energy source as a green solution to environmental issues</p>	<p><b>Unit - II Sustainability and Renewable Resources</b></p> <p>2.1 Natural Resources: Types, importance, Causes and effects of depletion. (Forest Resources, Water Resources, Energy Resources, Land resources, Mineral resources), (IKS- Concepts of Panchmahabhuta)</p> <p>2.2 Impact of overexploitation of natural resources on the environment, optimum use of natural resources</p> <p>2.3 Energy forms (Renewable and non-renewable) such as Thermal energy, nuclear energy, Solar energy, Wind energy, Geothermal energy, Biomass energy, Hydropower energy, biofuel</p> <p>2.4 Green Solutions in the form of New Energy Sources such as Hydrogen energy, Ocean energy &amp; Tidal energy</p>	Lecture Using Chalk-Board Presentations
3	<p><b>CCH206.3</b></p> <p>3.1 Explain the characteristics and functions of ecosystem</p> <p>3.2 Relate the importance of biodiversity and its loss in the environmental sustainability</p> <p>3.3 Describe biodiversity assessment initiatives in India</p> <p>3.4 Conduct the SWOT analysis of the biodiversity hot spot in India</p> <p>3.5 Explain the need of conservation of biodiversity in the given situation</p>	<p><b>Unit - III Ecosystem and Biodiversity</b></p> <p>3.1 Ecosystem - Definition, Aspects of ecosystem, Division of ecosystem, General characteristics of ecosystem, Functions of ecosystem</p> <p>3.2 Biodiversity - Definitions, Levels, Value, and loss of biodiversity</p> <p>3.3 Biodiversity Assessment Initiatives in India</p> <p>3.4 SWOT analysis of biodiversity hot spot in India</p> <p>3.5 Conservations of biodiversity - objects, and laws for conservation of biodiversity</p>	Lecture Using Chalk-Board Presentations Video Demonstration
4	<p><b>CCH206.4</b></p> <p>4.1 Classify the pollution based on the given criteria</p> <p>4.2 Justify the need of preserving soil as a resource along with the preservation techniques</p> <p>4.3 Maintain the quality of water in the given location using relevant preventive measures</p> <p>4.4 State the significance of controlling the air pollution to maintain its ambient quality norms</p> <p>4.5 Compare the noise level from different zones of city with justification</p> <p>4.6 Describe the roles and responsibilities of central and state pollution control board</p>	<p><b>Unit - IV Environmental Pollution</b></p> <p>4.1 Definition of pollution, types- Natural &amp; Artificial (Man- made)</p> <p>4.2 Soil / Land Pollution – Need of preservation of soil resource, Causes and effects on environment and lives, preventive measures, Soil conservation</p> <p>4.3 Water Pollution - sources of water pollution, effects on environment and lives, preventive measures, BIS water quality standards for domestic potable water, water conservation</p> <p>4.4 Air pollution - Causes, effects, prevention, CPCB norms of ambient air quality in residential area</p> <p>4.5 Noise pollution - Sources, effects, prevention, noise levels at various zones of the city</p> <p>4.6 Pollution Control Boards at Central and State Government level: Norms, Roles and Responsibilities</p>	Lecture Using Chalk-Board Presentations

5	<p>CCH206.5</p> <p>5.1 Explain Constitutional provisions related to environmental protection</p> <p>5.2 Explain importance of public participation (PPP) in enacting the relevant laws</p> <p>5.3 Use the relevant green technologies to provide sustainable solutions of an environmental problem</p> <p>5.4 Explain the role of information technology in environment protection</p>	<p>Unit – V- Environmental legislation and sustainable practices</p> <p>5.1 Article (48-A) and (51-A (g)) of Indian Constitution regarding environment, Environmental protection and prevention acts</p> <p>5.2 Public awareness about environment. Need of public awareness and individuals' participation. Role of NGOs</p> <p>5.3 Green technologies like solar desalination, green architecture, vertical farming and hydroponics, electric vehicles, plant-based packaging</p> <p>5.4 Role of information technology in environment protection and human health</p>	<p>Lecture Using Chalk-Board Presentations Video Demonstrations</p>
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**VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES:  
N.A.**

**VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)**

**Assignment**

Suggest the steps to implement (or improve the implementation) of the 5R policy in your home/institute stating your contribution

Draft an article on India's Strategies to progress across the Sustainable Development Goals

Make a chart of Renewable and non-renewable energy sources mentioning the advantages and disadvantages of each source

Conduct the SWOT analysis of biodiversity hotspot in India

Prepare a mind-mapping for the zero carbon footprint process of your field

Prepare a chart showing sources of pollution (air/water/ soil), its effect on human beings, and remedial actions

Any other assignment on relevant topic related to the course suggested by the facilitator

**UNICEF Certification(s)**

Students may complete the self-paced course launched by Youth Leadership for climate Exchange under UNICEF program on portal [www.mahayouthnet.in](http://www.mahayouthnet.in) . The course encompasses five Modules in the form of Units as given below:

-

Unit 1: Living with climate change

Unit 2 : Water Management and Climate Action

Unit 3: Energy Management and Climate Action

Unit 4 : Waste Management and Climate Action

Unit 5 : Bio-cultural Diversity and Climate Action

If students complete all the five Units they are not required to undertake any other assignment /Microproject/activities specified in the course. These units will suffice to their evaluations under SLA component

**Micro project**

Technical analysis of nearby commercial RO plant.

Comparative study of different filters used in Household water filtration unit

Evaluate any nearby biogas plant / vermicomposting plant or any such composting unit on the basis of sustainability and cost-benefit

IKS-Study and prepare a note on Vedic and Pre-Vedic techniques of environmental conversion

Visit a local polluted water source and make a report mentioning causes of pollution  
 Any other activity / relevant topic related to the course suggested by the facilitator

### Activities

Prepare a report on the working and functions of the PUC Center machines and its relevance in pollution control.  
 Prepare and analyse a case study on any polluted city of India  
 Prepare a note based on the field visit to the solid waste management department of the municipal corporation / local authority  
 Record the biodiversity of your institute/garden in your city mentioning types of vegetation and their numbers  
 Visit any functional hall/cultural hall /community hall to study the disposal techniques of kitchen waste and prepare a report suggesting sustainable waste management tool  
 Watch a video related to air pollution in India and present the summary  
 Any other assignment on relevant topic related to the course suggested by the facilitator

### Note :

Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.  
 The faculty must allocate judicious mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.  
 If a microproject is assigned, it is expected to be completed as a group activity.  
 SLA marks shall be awarded as per the continuous assessment record.  
 If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and may be considered for FA-PR evaluations.

## VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Nil	All

## IX . SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Environment and climate change	CO1	6	4	4	4	12
2	II	Sustainability and Renewable Resources	CO2	08	4	4	8	16
3	III	Ecosystem and Biodiversity	CO3	6	4	4	4	12
4	IV	Environmental Pollution	CO4	10	4	8	6	20
5	V	Environmental legislation and sustainable practices	CO5	5	4	4	4	10
<b>Grand Total</b>				<b>30</b>	<b>20</b>	<b>24</b>	<b>26</b>	<b>70</b>

## X . ASSESSMENT METHODOLOGIES/TOOLS

### Formative assessment (Assessment for Learning)

Two-unit tests (MCQs) of 30 marks will be conducted and average of two-unit tests considered. Formative assessment of self learning of 25 marks should be assessed based on self learning activity such as UNICEF Certification(s)/Microproject/assignment/activities. (60 % weightage to process and 40 % to product)

Two-unit tests (MCQs) of 30 marks will be conducted and average of two-unit tests considered.

Formative assessment of self learning of 25 marks should be assessed based on self learning activity such as UNICEF Certification(s)/Microproject/assignment/activities. (60 % weightage to process and 40 % to product)

**Assessment of Self Learning** :- Based on work done by students as a self learning Activities such as microprojects ,assignments and similar activities using proforma 1 marks of SLA can be calculated.

#### XI. SUGGESTED COS-POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	-	1	-	-	3	2	3			
CO2	-	2	2	-	3	2	3			
CO3	-	-	-	-	3	1	2			
CO4	1	-	-	-	3	2	2			
CO5	1	-	2	-	3	2	3			

Legends :- High:03, Medium:02,Low:01, No Mapping: -  
\*PSOs are to be formulated at institute level

#### XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	Y. K. Singh	Environmental Science	New Age International Publishers, 2006, ISBN: 81-224-2330-2
2	Erach Bharucha	Environmental Studies	University Grants Commission, New Delhi
3	Rajagopalan R.	Environmental Studies: From Crisis to Cure.	Oxford University Press, USA, ISBN: 9780199459759, 0199459754
4	Shashi Chawla	A text book of Environmental Science	Tata Mc Graw-Hill New Delhi
5	Arvind Kumar	A Text Book of Environmental science	APH Publishing New Delhi (ISBN 978-8176485906)

#### XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	<a href="https://sdgs.un.org/goals">https://sdgs.un.org/goals</a>	United Nation's website mentioning Sustainability goals
2	<a href="http://www.greenbeltmovement.org/news-and-events/blog">http://www.greenbeltmovement.org/news-and-events/blog</a>	Green Belt Movement Blogs on various climatic changes and other issues
3	<a href="http://www.greenbeltmovement.org/what-we-do/tree-planting-for-r-watersheds">http://www.greenbeltmovement.org/what-we-do/tree-planting-for-r-watersheds</a>	Green Belt Movement's work on tree plantation, soil conservation and watershed management techniques

4	<a href="https://www.youtube.com/@ierekcompany/videos">https://www.youtube.com/@ierekcompany/videos</a>	International Experts For Research Enrichment and Knowledge Exchange – IEREK's platform to exchange the knowledge in fields such as architecture, urban planning, sustainability
5	<a href="http://www.mahayouthnet.in">www.mahayouthnet.in</a>	UNICEF Initiative for youth leadership for climate action
6	<a href="https://eepmoefcc.nic.in/index1.aspx?Isid=297&amp;lev=2&amp;lid=1180&amp;langid=1">https://eepmoefcc.nic.in/index1.aspx?Isid=297&amp;lev=2&amp;lid=1180&amp;langid=1</a>	GOI Website for public awareness on environmental issues
7	<a href="https://egyankosh.ac.in/handle/123456789/61136">https://egyankosh.ac.in/handle/123456789/61136</a>	IGNOU's Initiative for online study material on Environmental studies
8	<a href="https://egyankosh.ac.in/handle/123456789/50898">https://egyankosh.ac.in/handle/123456789/50898</a>	IGNOU's Initiative for online study material on sustainability
9	<a href="https://sustainabledevelopment.un.org/content/documents/11803Official-List-of-Proposed-SDG-Indicators.pdf">https://sustainabledevelopment.un.org/content/documents/11803Official-List-of-Proposed-SDG-Indicators.pdf</a>	Final list of proposed Sustainable Development Goal indicators
10	<a href="https://sustainabledevelopment.un.org/memberstates/india">https://sustainabledevelopment.un.org/memberstates/india</a>	India's Strategies to progress across the SDGs.
11	<a href="https://www.un.org/en/development/desa/financial-crisis/sustainable-development.html">https://www.un.org/en/development/desa/financial-crisis/sustainable-development.html</a>	Challenges to Sustainable Development
12	<a href="https://nptel.ac.in/courses/109105190">https://nptel.ac.in/courses/109105190</a>	NPTEL course on sustainable development
13	<a href="https://onlinecourses.swyam2.ac.in/cec19_bt03/preview">https://onlinecourses.swyam2.ac.in/cec19_bt03/preview</a>	Swayam Course on Environmental studies (Natural Resources, Biodiversity and other topics)
14	<a href="https://onlinecourses.nptel.ac.in/noc23_hs155/preview">https://onlinecourses.nptel.ac.in/noc23_hs155/preview</a>	NPTEL course on environmental studies which encompasses SDGs, Pollution, Climate issues, Energy, Policies and legal framework
15	<a href="https://www.cbd.int/development/meetings/egmbped/SWOT-analysis-en.pdf">https://www.cbd.int/development/meetings/egmbped/SWOT-analysis-en.pdf</a>	SWOT analysis of Biodiversity
16	<a href="https://www.sanskrit.nic.in/SVimarsha/V2/c17.pdf">https://www.sanskrit.nic.in/SVimarsha/V2/c17.pdf</a>	Central Sanskrit University publication on Vedic and pre Vedic environmental conservation
<p><b>Note :</b> Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students</p>		





**COURSE ID** :  
**COURSE NAME** : **HYDRAULICS**  
**COURSE CODE** : **CEH308**  
**COURSE ABBREVIATION** : **HHYD**

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	04	4
	Tutorial Learning	00	
	Laboratory Learning	02	
	SLH-Self Learning	02	
	NLH-Notional Learning	08	

**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Practical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
03	30	00	70	00	25	10	25	10	25	10	175

**(Total IKS Hrs for Sem : 01 Hrs)**

**C:** Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA - Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment  
Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination  
Note : ( TNR 11 font)

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

### **D. i) RATIONALE:-**

Hydraulics is a course of civil engineering which consists of study of fluid behavior and design of hydraulic structures. The study of hydraulics plays an important role in various civil engineering applications such as water supply, wastewater management, drainage systems and hydraulic structures. Understanding hydraulics for civil engineers will help them to make decisions during design of hydraulic structures and ensuring the efficient management of water supply and wastewater sources. In this course, student will learn behavior of fluid at rest, fluid in motion, flow through open channel and flow through pipe.

### **ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME**

The aim of this course is to help the student to attain the following industry identified outcome through various learning experiences:

1. Apply the principles of hydraulics in given situation to solve the civil engineering problem.
2. Designing the distribution system
3. Fixing the capacity of pumps
4. Designing most economical section of open channels.

### **E. COURSE LEVEL LEARNING OUTCOMES (COS)**

CEH308- 1- Interrelate physical properties of fluid & Interpret the pressure parameters from Pressure Measuring devices in flowing liquids.

CEH308 -2- Determine total hydrostatic pressure and center of pressure for different Conditions.

CEH308- 3- Apply continuity equation & Bernoulli's theorem for calculations.

CEH 308-4- Determine loss of head & flow through pipes.

CEH 308-5- Calculate discharge through open channels.

CEH 308-6- Select relevant hydraulic pumps for different applications.

**Competency, course outcomes and programme outcomes/programme specific outcomes**

**(cp-co-po/ps) matrix**

[ Note: Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “0”

Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 Plan and Design	PSO2 Construction and Maintenance	PSO3 Problem Solving on field
CEH300-1 CO-1 Interrelate physical properties of fluid & Interpret the pressure parameters from Pressure Measuring devices in flowing liquids.	3	3	3	2	1	2	2	3	1	2
CEH300-2 CO-2 Determine total hydrostatic pressure and center of pressure for different Conditions.	3	3	2	2	2	2	2	3	3	2
CEH300-3 CO-3 Apply continuity equation & Bernoulli's theorem for calculations	3	3	3	2	2	2	2	3	3	2
CEH300-4 CO-4 Determine loss of head & flow through pipes.	3	3	3	2	2	1	1	3	3	2
CEH300-5 CO-5 Calculate discharge through open channels	3	3	3	2	2	2	2	3	3	2
CEH300-6 CO-6 Select relevant hydraulic pumps for different applications.	3	3	3	2	2	2	2	3	3	1

## F. CONTENT:-

### I) Practical exercises

The following practical exercises shall be conducted in the Hydraulics Laboratory in the Institute in practical sessions of batches of about 20- 22 students:

Sr. no	Name of the Practical	CO
1	Computation of physical properties of given fluid (tap water and muddy water)	CO1
2	Computation of physical properties of given liquid (oil and Mercury)	CO1
3	Use of Bourdon Gauge to measure the pressure at a given point.	CO1
4	Use of U tube differential manometer to measure the pressure difference between two given points.	CO1
5	Use of Bernoulli's apparatus to obtain Total Energy Line for flow in closed conduit of varying cross sections.	CO1
6	Use of Friction factor Apparatus to determine the friction factor for the given pipe	CO1
7	Determination of minor losses in pipe for sudden contraction and sudden enlargement.	CO1
8	Use of 'V' notch to measure the discharge through open channel	CO1
9	Find the resultant pressure and its position for given situation of liquid in a tank.	CO1
10	Determination of efficiency of given Centrifugal Pump.	CO1

### II) Theory

#### Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
<b>CO:CEH000-1: Interrelate physical properties of fluid &amp; Interpret the pressure parameters from Pressure Measuring devices in flowing liquids</b>			
1	<b>Properties of fluid &amp; pressure measurement</b> 1.1 Definition of fluid, Hydraulics. Branches of hydraulics. Importance of Hydraulics with respect to Irrigation and Environmental engineering. 1.2 Physical properties of fluid Mass density, Weight density, Specific volume, Specific gravity, Surface tension capillarity, Compressibility, Viscosity, Dynamic and kinematic viscosity. Ideal and Real fluids.  1.3 Various types of pressure: Fluid Pressure, Pressure head, Pascal's Law and its applications, Absolute Pressure, Gauge Pressure, Atmospheric Pressure, Vacuum Pressure. 1.4 Pressure Measuring Devices: Piezometer, Simple U tube Manometer, U Tube Differential Manometer and	08	10

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	Inverted U Tube Differential Manometer, Bourdon Tube Pressure Gauge		
<b>CO: CEH000-2: Determine total hydrostatic pressure and center of pressure for different Conditions.</b>			
2	<b>Hydrostatic pressure&amp; its Measurement</b> 2.1 Definition of Hydrostatics, Total Pressure and Centre of Pressure: Concept and Applications. 2.2 Total Hydrostatic Pressure and Center of Pressure on: Horizontally, Vertically Immersed Surfaces: for rectangular, Triangular and Circular lamina. 2.3 Total Pressure and Center of Pressure using Pressure diagram on sides , bottom and partition wall of a tank .	11	12
<b>CO: CEH000-3: Apply continuity equation &amp; Bernoulli's theorem for calculations.</b>			
3	<b>Hydro kinematics and Hydro dynamics</b> 3.1 Types of Fluid Flow: Steady, unsteady, uniform, non uniform, laminar, turbulent, compressible and Incompressible flow, Reynolds's number. 3.2 Discharge: Definition, Unit, Continuity Equation. 3.3 Energies associated with fluid flow: Potential, Kinetic, Pressure Energy and total energy. 3.4 Bernoulli's Equation: Statement, Assumptions, Equation, Practical applications, Modified Bernoulli's Theorem.	11	12

### Section –II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
<b>CO: CEH000 -4: Determine loss of head &amp; flow through pipes.</b>			
4	<b>Flow through Pipes</b> 4.1 Major head loss in pipe: Frictional loss and its Computation by Darcy Weisbach equation. (Simple Numericals on Darcy Weisbach equation) 4.2 Minor Energy (Head) losses in pipe: Sudden Enlargement, Sudden Contraction, loss of head at entrance of pipe, loss of head at exit of pipe, loss of head due to bend in pipes and fittings. 4.3 Flow through pipes in series, pipes in parallel and Dupit's equation for equivalent pipe. 4.4 Hydraulic Gradient Line and Total Energy Line(No Numerical, only representative Diagram). Siphon pipe, Water hammer in pipes, causes and its effects and remedial Measures. Moody's Chart, Use of Nomograms for design of Water distribution system. 4.5 Discharge measuring device for pipe flow:	12	16

	Venturimeter, Construction and working. 4.6 Discharge measuring for a tank: using Orifice, Hydraulic Coefficients of Orifice.		
<b>CO: EEG307-5: Calculate discharge through open channels.</b>			
5	<b>Flow through Open Channel</b> 5.1 Types of channels - artificial & natural, purposes of artificial channel Geometrical properties of Channel section: Wetted area, Wetted perimeter, Hydraulic Radius for Rectangular and Trapezoidal Channel section. 5.2 Chezy's and Manning's equation of velocity for calculation of discharge through an open channel. Most economical channel section, conditions for most economical channel Velocity measuring devices for open channels sections. 5.3 Hydraulic Jump – Study & Uses 5.4 Velocity measuring devices for open channels. Floats, Pitot tube, current meter and its types. 5.5 Weir & Notches, expression for discharge for rectangular and triangular notches, Francis formula, end contraction and velocity of approach, Broad crested weir, cippolletti weir and expression for discharge through it.	12	12
<b>CO: EEG307-6: Select relevant hydraulic pumps for different applications</b>			
6	<b>Hydraulic pumps</b> 6.1 Pump: Types of pump :Centrifugal, Reciprocating pumps and Submersible pumps. 6.2 Centrifugal pump & Reciprocating pump Component parts and working. 6.3 Types of heads :Suction head, delivery head, static head and Manometric head. 6.4 Compute power requirement of Centrifugal Pump.	06	08

**\*\* No questions will be asked on IKS learning subtopics in any question papers.**

### **G : List of Micro project/Assignments under SLA**

#### **Micro project-**

1. Collect the technical brochure of available brands of pump in the market and prepare report with your comments.
2. Determination of type and capacity of pump for residential bungalow (06 Occupants) of G+1 Storey having 200 Sqm built up area.
3. Prepare a model of rectangular and trapezoidal channel.

\*Similar topics related to concepts used in the hydraulics.

Sr.No	List of Assignment (under SLA)	Hrs Allotted
1	Explain the concept and use of pressure diagram with neat sketches	02
2	Explain with a neat sketch the working of Bourdon's pressure gauge	02
3	State Bernoulli's theorem. State any two applications of it.	02
4	Explain the reasons of using mercury in the manometers.	04
5	Describe the principle on which Venturimeter works.	02
6	Explain Moody's diagram and Nomograms with its use	02
7	State and explain causes and remedial measures of water hammer	04
8	Explain the necessity of hydraulic jump	02
9	Explain with neat sketch working of single acting and double acting reciprocating pump	02
10	Explain critical, sub critical and supercritical flow with reference to Froude's number	02

## H : Specification table for setting question paper for semester end theory examination

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	Properties of fluid & pressure measurement	2	6	4	10	CEH308-CO1
I / 2	Hydrostatic pressure & its Measurement	2	6	4	12	CEH308-CO2
I / 3	Hydro kinematics and Hydro dynamics	2	4	6	12	CEH308-CO3
II / 4	Flow through Pipes	2	4	10	16	CEH308-CO4
II / 5	Flow through Open Channel	4	2	6	12	CEH308-CO5
II / 6	Hydraulic pumps	2	4	2	8	CEH308-CO6
Total Marks					70	

### I :-Assessment Criteria

#### i) Formative Assessment of Practical :-

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Attendance/Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

#### ii) Summative Assessment of Practical :

At the time of Practical Examination assessed for 25 marks as per following criteria:

Sr. no	Criteria	Marks allotted
1	Knowledge about the course	05
2	Preparedness for practical /Oral	05
3	Neat & complete Diagram/write up	05
4	Observations/Handling of instrument/ Communication/Presentation	05
5	Oral Based on Lab work and completion of task	05
<b>TOTAL</b>		<b>25</b>

### J) Instructional Methods:

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration

**K) Teaching and Learning resources:**

Chalk board, LCD presentations, Demonstrative kits, Demonstrative charts.

**L) Reference Books:**

S. N.	Name of Book	Author	Publication
1	Modi, P. N. and Seth, S.M.	Hydraulics and Fluid Mechanics	Standard book house, Delhi ISBN:13: 978- 8189401269;
2	Ramamrutham S, and Narayan, R.	Hydraulics, Fluid Mechanics and Fluid Machines	Dhanpat Rai Publishing Company, New Delhi, ISBN:8187433841
3	Khurmi, R S	Hydraulics, Fluid Mechanics, Hydraulic machines	S Chand Publishers, New Delhi ISBN: 9788121901628
4	Rajput, R K	Fluid Mechanics	S Chand, New Delhi ISBN: 9788121916677
5	Dr. R.K. Bansal	Fluid mechanics and hydraulic machines	Laxmi Publication; New Delhi, ISBN: 978- 8131808153

**M) Learning Website & Software**

Sr.No	Link / Portal	Description
1	<a href="https://eerc03-iiith.vlabs.ac.in/">https://eerc03-iiith.vlabs.ac.in/</a>	An MoE, Govt of India virtual laboratory of Hydraulics and Fluid Mechanics.
2	<a href="https://nptel.ac.in/courses/105105203">https://nptel.ac.in/courses/105105203</a>	Basics of Fluid Mechanics
3	<a href="https://archive.nptel.ac.in/courses/105/106/105106114/">https://archive.nptel.ac.in/courses/105/106/105106114/</a>	Classification of flow
4	<a href="https://nptel.ac.in/courses/105103021">https://nptel.ac.in/courses/105103021</a>	Open Channel flow
5	<a href="http://www.nitttrc.edu.in/nptel/courses/video/105101082/L01.html">http://www.nitttrc.edu.in/nptel/courses/video/105101082/L01.html</a>	Fluid Properties
6	<a href="https://onlinecourses.nptel.ac.in/noc24_ce20/preview">https://onlinecourses.nptel.ac.in/noc24_ce20/preview</a>	Hydraulic Jump
7	<a href="http://www.nitttrc.edu.in/nptel/courses/video/105103021/L01.html">http://www.nitttrc.edu.in/nptel/courses/video/105103021/L01.html</a>	Advanced Hydraulics
8	<a href="https://www.youtube.com/watch?v=mIF7nQBbaj0&amp;list=UU_JX7j7HYXROO6jCAUmHIw&amp;index=231">https://www.youtube.com/watch?v=mIF7nQBbaj0&amp;list=UU_JX7j7HYXROO6jCAUmHIw&amp;index=231</a>	Fluid Pressure
9	<a href="https://www.youtube.com/watch?v=-jb5A9GluNQ">https://www.youtube.com/watch?v=-jb5A9GluNQ</a>	Energy Gradient of pipe flow
10	<a href="https://www.youtube.com/watch?v=qie6UCJqM_Q">https://www.youtube.com/watch?v=qie6UCJqM_Q</a>	Bernoulli's Equation
11	<a href="https://www.youtube.com/watch?v=PH75Y1wIubQ">https://www.youtube.com/watch?v=PH75Y1wIubQ</a>	Hydraulic Pumps

**COURSE ID:**

Course Name : MECHANICS OF MATERIALS

Course Code : CEH309

Course Abbreviation: HMOM

**A. LEARNING SCHEME:**

Pre-requisite Course(s): Nil

Scheme component	Actual Contact Hours / week	Credits
Classroom Learning (CL)	04	3
Tutorial Learning (TL)	00	
Laboratory Learning (LL)	02	
Self-Learning Hours (SLH)	00	
Notional Learning (NLH)	06	

**B. ASSESSMENT SCHEME: CEH309**

PAPER DURATION IN HRS	Theory				Based on LL & TL				Based on Self Learning		Total Marks
					Practical				SLA		
03	FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		150
	Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
	30	70	100	40	25	10	25	10	-	-	

(Total IKS Hrs for Sem: 2 Hrs)

**C. ABBREVIATIONS:** CL- Classroom Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

**Legends:** @ Internal Assessment, # External Assessment, \*# On Line Examination, @\$ Internal Online Examination

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course, then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL) hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all 5 assignments here in tabular format)

## D. i) RATIONALE: -

With the preliminary understanding of forces and force systems acting on the engineering structures and their components. The focus now shifts on various actions and the corresponding strength evaluation of engineering materials under these specified actions to ascertain the suitability of materials, their size requirements. Simultaneously analytical approaches are dealt with behaviour of the materials in focus, understanding the engineering parameters of loading on these members namely shear force and bending moments for various configurations of members, support conditions and loading.

## ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

Analyse the stresses & strains in the given structural elements using relevant methods.

## E. COURSE LEVEL LEARNING OUTCOMES (CO'S)

**CEH309-1** Structural systems, actions and their types. Simple actions on a linear member causing deformations in the member.

**CEH309-2** Elastic constants and their relation, strain energy for various forms of load application.

**CEH309-3** Theorem of moments, M.I of single and built-up sections rectangular and circular used in Engineering applications.

**CEH309-4** Engineering analysis of beams carrying transverse loading, constructing SFD and BMD for s/s and cantilever beams.

**CEH309-5** Understanding pure and ordinary bending governing flexural behaviour.

**CEH309-6** Understanding polar moment of inertia, torque and design of circular shafts and corner columns.

### Competency, course outcomes and programme outcomes/programme specific outcomes (CP-CO-PO/PSO) matrix

[ Note: Correlation levels: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0"]

Competency and Cos	Programme outcome POs and PSO's								
	PO 1 Basic and discipline specific knowledge	PO 2 Problem analysis	PO 3 Design/ development of solutions	PO 4 Engineering tools, experimentation & testing	PO 5 Engineering practices for society, sustainability and environment	PO 6 project management	PO 7 Life-long learning	PSO 1 Work in Mfg & service sector	Ps 2 Start entrepreneurial activity
Competency	3	2	2	2	3	1	2	2	2
<b>CEH309-1</b>	3	2	-	2	-	1	2	2	1
<b>CEH309-2</b>	3	2	1	2	-	1	2	3	1
<b>CEH309-3</b>	3	2	1	2	-	1	2	3	1
<b>CEH309-4</b>	3	2	1	3	2	1	2	2	2
<b>CEH309-5</b>	2	1	1	2	-	1	2	1	1
<b>CEH309-6</b>	2	2	1	2	-	1	2	2	2

**Note : Typical matrix assessment based on previous records—for continuous analysis and improvement to identify gap areas and further improvement.**

## F. CONTENT:

### i) Practical exercises

The following exercises shall be conducted as practical work as detailed in laboratory manual for Mechanics of Materials developed by the institute in practical sessions of batches of about 20- 22 students.

Sr No	Title Of Practical Exercise	Course Outcome
1	Study of Universal Testing machine and Compression testing machine	CEH309-1
2	Tension test on mild steel rod (Fe250)	CEH309 -1
3	Tension test on TOR steel or HYSD bar	CEH309 -2
4	Compression test on metals –Mild steel, Aluminum and timber	CEH309-2
5	Flexure test on metal	CEH309 -2
6	Shear test on metal	CEH309- 2
7	Impact test on metal	CEH309 -3
8	Rockwell Hardness test on metal	CEH309 -4
9	Shear force and BM diagram –problems on standard cases and, cantilever and s/s beams.	CEH309 -4
10	Brinell's Hardness Test	CEH309 -4
11	Flexure test on timber specimen	CEH309 -4
12	Torsion test on circular shaft	CEH309 -5

In the list, Expt. No.1 to7 exercises are compulsory and from 8 to 12, any three exercises shall be conducted. in all 10 experiments are mandatory.

### ii) THEORY

#### SECTION – I

Sr. No	Topics/ Subtopics	Learning (Hours)	Classroom learning evaluation Marks
<i>Course Outcome CEH309/MEH305-1 Structural systems, actions and their types. Simple actions on a linear member causing deformations in the member.</i>			
1	<b>Engineering systems, actions and simple behaviour</b> 1.1 Engineering systems –buildings, machines, water tanks, chimney, bridges, retaining walls. 1.2 Various actions and their effect – axial tension, axial compression, flexure, torsion 1.3 Material behaviour –Elasticity, plasticity, ductility, malleability, toughness, hardness, brittleness-physical properties governing engineering design 1.3 Force characteristics, definition, force and force system-principles and laws 1.4 Simple stresses and strains- Hooke's law, linear stress, strain.	8	12

	1.5 Compound bar subjected to axial loading.		
<i>Course Outcome CEH309/MEH305-2 Elastic constants and their relation, strain energy for various forms of load application.</i>			
2	<b>Elastic Constants and strain energy</b> 2.1 Elastic constants E, G, $\mu$ and K definition, sketches and explanation. 2.2, Relation among elastic constants. 2.3 Forms of loading and instantaneous stress produced in each form of loading –gradual, sudden and impact. 2.4 Composite section carrying load and its analysis 2.5 Temperature stress and its computation in a rigid member having single material and made of two materials.	12	12
<i>Course Outcome MEH305-3 Theorem of moments, M.I of single and built-up sections rectangular and circular used in Engineering applications.</i>			
3	<b>M.I. and its Engineering applications</b> 3.1 M. I definition; Area and mass moment of inertia. 3.2 Theorem on Moments –parallel and perpendicular axes theorems. 3.3 M. I of standard sections-square, rectangular, triangular, circle and rhombus 3.4 M. I. of built up sections – I, T and L sections.	10	10

#### SECTION – II

Sr. No	Topics/ Subtopics	Learning (Hours)	Classroom learning evaluation Marks
<i>Course Outcome CEH309 -4 Engineering analysis of beams carrying transverse loading, constructing SFD and BMD for s/s and cantilever beams.</i>			
4	<b>Shear force and Bending Moment Diagrams</b> 4.1 Definition of shear force and BM at any section of a beam carrying transverse loading 4.2 Sign convention and construction of SFD and BMD for standard cases of loading on cantilevers and s/s beams (point load and UDL only). 4.3 Plotting SFD and BMD for s/s beams with overhangs carrying point load, UDL and couple.	12 hours	14 marks
<i>Course Outcome CEH309 -5 Understanding pure and ordinary bending governing flexural behaviour leading to design of beams.</i>			
5	<b>Bending theory of beams</b> 5.1 Theory of Pure bending 5.2 Theory of ordinary bending 5.3. Flexure formula and assumptions made in its derivation. 5.4 Bending stress, section modulus and design of rectangular beams. 5.5 Shearing stress across any section –shear stress distribution and meaning of each term involved.	10 hours	12 marks

	4.15.6. Shearing stress across a rectangular and a circular section.		
<i>Course Outcome CEH309-6 Understanding polar moment of inertia, torque and design of circular shafts and corner columns.</i>			
6	<b>Torsion on Circular shafts</b> 6.1 Polar MI for circular section 6.2 Torsion formula for twist in a circular shaft subjected to pure torque. 6.3 Torsional section modulus and design of circular shaft from strength criteria and twist criteria 6.4 Power transmitted by circular shaft.	8 hours	10 marks
<b>Total</b>		<b>30</b>	<b>70</b>
Summative assessment – Theory paper should be such that total marks of questions on each topic are one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.			

**\*\* No questions will be asked on IKS learning subtopics in any question papers.**

### **G. SUGGESTED MICRO PROJECTS / ASSIGNMENTS/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING) UNDER SLA**

- NA

### **H. SPECIFICATION TABLE FOR SETTING QUESTION PAPER FOR SEMESTER END THEORY EXAMINATION**

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	Engineering systems, actions and simple behaviour	4	4	4	12	CEH309-1
I / 2	Elastic Constants and strain energy	4	4	4	12	CEH309 -2
I / 3	M.I. and its Engineering applications	4	2	4	10	CEH309 -3
II / 4	Shear force and Bending Moment Diagrams	4	2	8	14	CEH309 -4
II / 5	Bending theory of beams	4	4	4	12	CEH309 -5
II / 6	Torsion on Circular shafts	4	2	4	10	CEH309 -6
<b>Total Marks</b>					<b>70</b>	

## I. ASSESSMENT CRITERIA

### i) Formative Assessment of Practical: -

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

### ii) Summative Assessment of Practical:

Every practical assignment shall be assessed for 25 marks as per following criteria

Sr.no	Criteria	Marks allotted
1	Understanding	05
2	Preparedness for practical	05
3	Neat & complete Drawing	05
4	Drawing / drafting skills	05
5	Drawing / drafting skills	05
<b>TOTAL</b>		<b>25</b>

## I. INSTRUCTIONAL METHODS:

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration

## K. TEACHING AND LEARNING RESOURCES:

1. Chalk board
2. LCD presentations
3. Simulation labs
4. Infographics charts/Virtual labs –NITK etc.

## L. REFERENCE BOOKS:

Sr. No.	Name of Book	Author	Publication
1	Elements of Strength of Materials	Timoshenko, S.P. and Young, D.H.	Affiliated East West Press Pvt. Ltd., Delhi
2	Mechanics of Materials	Adarsh Swaroop	New Age International
3	Strength of materials.	Bhavikatti, S.S.	Vikas publishing house pvt Ltd.
4	Strength of Materials	M. Khurmi, R.S.	S. Chand & Co., Delhi
5	Strength of Materials	Singer, F.L.	Harpe Collins Publishers India Delhi
6	Strength of materials	S Ramamurtham & Narayan	Danpat Rai

7	Mechanics of Materials, 4 <sup>th</sup> Edition	Beer and Johnson	McGraw-Hill Education 2020
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**M. LEARNING WEBSITE & SOFTWARE: -**

1. [www.nptel.com/iitm/](http://www.nptel.com/iitm/)
2. [www.howstuffworks.com/](http://www.howstuffworks.com/)
3. [www.vlab.com](http://www.vlab.com)
4. [https:// en.wikipedia.org/wiki/strength of materials](https://en.wikipedia.org/wiki/strength_of_materials)

\* \* \*

**COURSE ID :**

**COURSE NAME : CONCRETE TECHNOLOGY**

**COURSE CODE :CEH401**

**COURSE ABBREVIATION :HCTE**

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	<b>04</b>	4
	Tutorial Learning	-----	
	Laboratory Learning	<b>02</b>	
	SLH-Self Learning	<b>02</b>	
	NLH-Notional Learning	<b>08</b>	

**B.ASSESSMENT SCHEME**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Practical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN			
<b>03</b>	<b>30</b>	<b>70</b>	<b>100</b>	<b>40</b>	<b>25</b>	<b>10</b>	<b>00</b>	<b>00</b>	<b>25</b>	<b>10</b>	<b>150</b>

(Total IKS hours for sem : 01hour )

**C: ABBREVIATIONS: -**

CL- Class Room Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

**Legends:** @ Internal Assessment, # External Assessment, \*# On Line Examination, @\$ Internal Online Examination.

FA-TH represents average of two class tests of 30 marks each conducted during the semester.

1. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
2. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.

3. Notional Learning hours for the semester are (CL+LL+TL+SL) hrs.\* 15 Weeks
4. 1(one) credit is equivalent to 30 Notional hrs.
5. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities.

#### **D.RATIONALE:**

Concrete is the most versatile invention of the modern infrastructure engineering and is undergoing phenomenal progress in attaining desired engineering qualities. The modern day building technologies are primarily due to concrete technology. The civil engineers have major role in construction industry and the job profile involves exposure to concrete technology. The course aims at understanding the properties ingredients, proportioning and evaluation of desired properties including strength in fresh and hardened state of its existence in desired shape and size. The special concretes, form work, admixtures and concept of mix design and ready mix concrete are all dealt with to expose the students to the state of art construction methods.

#### **Competency identified for the course:**

The MPEC 2023 curriculum design based on MSBTE K curriculum guideline and NEP2020 policy incorporates all self and tutorial such as notional hours and non-national hours of learning. Indian knowledge system is also intended to explore through additional hours of learning during the semester. Subject is allotted 3 hrs. of class room learning and 2hrs of practical (lab) and 2 hrs. of self-learning. All these hrs. Of learnings including IKS learning are aimed at achieving following skills sets.

#### **E. COURSE OUTCOMES (COs):**

**CEH401-1** Concrete composition and Production

**CEH401-2** Concrete ingredients properties and determination

**CEH401-3** Fresh concrete and properties

**CEH401-4** Concrete mix design methods, form work and IS code procedure

**CEH401-5** Tests on hardened concrete and strength factors

**CEH401-6.** Special Concretes and execution

**Competency, course outcomes and programme outcomes/programme specific outcomes  
(cp-co-po/pso) matrix**

[Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0"  
]

Competency and COs	Programme Outcomes POs and PSOs									
	PO 1 Basic and disciplined knowledge	PO 2 Problem analysis	PO 3 Design /development of solutions	PO 4 Engineering Tools/experimentation and testing	PO 5 The engineering practice for society, sustainability and environment	PO 6 Project management	PO 7 Life-long learning	PSO1 Plan and Design	PSO2 Construction and Maintenance	PSO3 Problem Solving on field
<b>Competency:</b> Apply study and apply principles of concrete technology as follows	2	1	2	2	2	1	2	1	1	1
<b>CEH401-1</b> <sub>1</sub> Explain procedure of production of concrete	3	1	1	2	1	-	1	1	2	1
<b>CEH401-2:</b> Explain, test and interpret properties of cement and aggregates	3	1	1	2	2	-	2	1	1	1
<b>CEH401-3:</b> Explain, test and interpret properties of fresh concrete	2	1	1	2	2	-	1	1	1	1
<b>CEH401-4:</b> Explain concrete mix design and formwork	2	2	2	2	2	2	2	1	2	2
<b>CEH401-5:</b> Explain, test and interpret properties of hardened concrete and quality control	2	1	2	2	1	1	2	1	1	2
<b>CEH401-6:</b> Explain and select special concretes for the purpose	2	1	1	1	1	1	1	1	1	2

## F. CONTENT:

### LABORATORY WORK

Laboratory manual on Concrete Technology developed by the department shall be used.(perform any 10 experiments and B,C and D compulsory

Sr. No	Laboratory Experience	Skills / Competencies to be developed	
A	Any ten experiments		
1	Determination of fineness of cement	<p>Follow IS code procedures for tests.</p> <p>Studying equipment.</p> <p>Understanding test procedure</p> <p>Accuracy in taking observation.</p> <p>Reinforcement of concepts.</p> <p>Performing calculation and plotting</p> <p>Graphs from observation. Interpreting test results.</p> <p>Classifying materials as per IS standards.</p>	<b>CEH401-2</b>
2	Determination of consistency of cement		<b>CEH401-2</b>
3	Determination of initial and final setting time of cement		<b>CEH401-2</b>
4	Determination of the Soundness of cement		<b>CEH401-2</b>
5	Determination of 3, 7- and 28-days strength of cement		<b>CEH401-2</b>
6	Determination of silt content of fine aggregate		<b>CEH401-2</b>
7	Determination of bulking of fine aggregate		<b>CEH401-2</b>
8	Determination of specific gravity of coarse aggregate and fine aggregate		<b>CEH401-2</b>
9	Determination of grading of aggregate by sieving		<b>CEH401-2</b>
10	Determination of bulk density of fine aggregate and coarse aggregate		<b>CEH401-2</b>
11	Determination of aggregate crushing value		<b>CEH401-2</b>
12	Determination of aggregate impact value		<b>CEH401-2</b>
13	Determination of workability of concrete by slump cone and/or compaction factor method		<b>CEH401-3</b>
14	Determination of compressive strength of concrete cubes (if available ready cubes)		<b>CEH401-5</b>
B	Determination of compressive strength of concrete with any one of the NDT equipment	Finding quality of material.	<b>CEH401-5</b>
C	Write IS code procedure for mix design (With help of a video) of any one of the Grade of concrete for data given by the teacher	Design Procedure.	<b>CEH401-4</b>
D	Field visit to construction site of RCC to study various concreting activities  Field visit to a ready-mix concreting plant		ALL COs

## I) THEORY:

### Section I

Sr no	Course content	Lecture hours (class room learning)	Theory Assessment marks
<b>CO: CEH-1</b> Concrete composition and Production			
1	<p><b>Introduction to Concrete and its production</b></p> <p><b>1.1 Introduction to concrete</b>            Definition of Concrete. Ingredients of Concrete, Importance of concrete as construction material. Historical background.            Process diagram of concrete. Role of each ingredient.            Admixtures: Definition and function. Accelerator, Retarder, Plasticizer, Super plasticizer. Pozzolan fly ash, silica fume, slag, metakaolin.</p> <p><b>1.2 Production of Concrete</b>            Process diagram of manufacture of concrete,            Batching of ingredients of concrete.            Mixing of concrete and concrete mixers,            Transportation of concrete: Modes &amp; precautions,            Placing of concrete &amp; Precautions,            Compaction of concrete: Definition, importance &amp; methods,            Finishing of concrete surface,            Curing of concrete: Definition, importance and methods</p>	10hours	12 marks
<b>CO: CEH-2</b> Concrete ingredients properties and determination			
2	<p><b>2.1 Properties and testing of cement</b>            Definition of cement. Chemical composition of Portland cement, Raw material and manufacturing process of Portland cement, Hydration of cement. Setting and Hardening of cement, Physical properties of cement &amp; standard specifications for Ordinary Portland Cement. Grades of OPC.            Types of cement and their applications: Rapid hardening cement, low heat cement, Portland pozzolana cement, sulphate resisting cement, blast furnace slag cement, white cement. ,Storage of cement</p> <p><b>2.2 Properties and testing of aggregates</b>            Definition of coarse and fine aggregate. Classification of aggregate, Properties of coarse and fine aggregates: Size, Shape, Texture, Strength, Specific gravity, Bulk Density, Water absorption, Bulking of sand, Soundness.            Determination of aggregate grading, Sieve analysis, Fineness modulus, Crushing value, Impact Value, Abrasion Value, Flakiness index, Elongation Index            Effect of aggregate properties on strength of concrete.</p>	12 hours	14marks
<b>CO: CEH-3</b> Fresh concrete and properties			

3	<b>Fresh concrete and its properties</b> 3.1 Definition of workability and affecting factors. Measurement of workability. Slump cone test, Compaction factor Test. Range of values of workability  3.2 Segregation : Definition, effects and precautions Bleeding : Definition, effects and precautions	08 hours	08 marks
<b>Total</b>		<b>30</b>	<b>34</b>

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
<b>CO: CEH-4</b> : Concrete mix design methods, form work and IS code procedure			
4	<b>Concrete mix design methods and formwork</b> <b>4.1 Introduction to Mix design</b> Definition and importance of mix design, Methods used for mix design (only list), Procedure of mix design by IS code method  <b>4.2 Formwork</b> Definition and purpose of formwork. Requirement of good formwork Materials used for formwork, Forms for beam, slab, column. Stripping of forms	10 hours	14 marks
<b>CO: CEH-5</b> Tests on hardened concrete and strength factors			
5	<b>Explain, test and interpret properties of hardened concrete and quality control</b>  <b>5.1 Properties of Hardened Concrete</b> Compressive strength of concrete. Factors affecting strength Characteristic strength. Grades of concrete Water-cement ratio law. Significance. Durability and impermeability of concrete <b>5.2 Inspection, testing and quality control</b> Aim of inspection and testing of fresh concrete. Concrete cube testing , Non-destructive testing of concrete : Definition and methods. Rebound Hammer test. Ultrasonic pulse velocity test . Core test method, Factors causing variation in the quality of concrete. Quality control, professional ethics and environmental issues	12 hours	14 marks

**CO: CEH-6 Special Concretes and execution**

<b>6</b>	<b>Special Concretes and execution</b> <b>6.1 Concreting under special circumstances</b> Hot weather concreting: Field situations. Effects of hot weather, precautions Cold weather concreting: Field situations. Effect of cold weather, precautions Underwater concreting: Field situations. Tremie method, Deep dump bucket method, grouting method, pumping, using bags. Precautions <b>6.2 Special concretes</b> Ready Mixed Concrete (RMC): Definition, advantages and precautions Mass concrete: Definition. Field situations. Precautions. Fiber Reinforced Concrete: Definition. Properties, Field applications. Polymerconcrete: Definition. types. Properties. Applications. Light weight concrete: Definition. Applications. Ferro-cement: Definition. Materials used. Applications. Shotcreting or Guniting : Definition and applications	<b>08 hours</b>	<b>08 marks</b>
	<b>Total</b>	<b>30</b>	<b>36</b>

**G. SLA (Self Learning Assessment)****Self learning/ Micro Projects: (One project to the group of 4/5 students)**

1. Market survey for study of cement/aggregates /admixtures /additives available in market and prepare a report.
2. Field visit to quarry and crusher for manufacture of coarse aggregate (stone metal) and prepare a report.
3. Field visit to observe formwork, scaffoldings and prepare a report.
4. Visit to site for quality control of material used for construction and prepare a report.
5. Collection of information for concreting methods, new trends in the field and prepare a report.
6. Demonstration through video film for different methods of concrete.
7. Collection of photographs from site for different operations and prepare chart/report.
8. Collection of data/stipulations from site for the mix design.
9. Collection of material testing reports from construction site.
10. Prepare a chart of IS code for testing of materials.
11. Prepare a chart of IS code specifications for apparatus /machines used for concrete practicals.
12. software-based exercises.

**INDUSTRIAL EXPOSURE**

<b>SN</b>	<b>Mode of Exposure</b>	<b>Topic</b>
1.	Field examples of course application	Topics of theory syllabus
2.	Market survey	Admixtures available in market
3.	Field visits	Concreting procedure, RMC plant etc.

**The assessment scheme for practicals and self learning as per MPEC2023 norms .**

**H: Specification table for setting question paper for semester end theory examination**

Topic No.	Name of topic	Distribution of marks (level wise)			Total Marks
		Remember	Understand	Apply	
1.	Introduction to Concrete and Production of Concrete	02	04	06	12
2.	Properties and testing of cement and aggregates	02	06	06	14
3.	Properties of fresh concrete	02	02	04	08
4.	Introduction to Concrete Mix Design and formwork	02	06	06	14
5.	Properties of Hardened Concrete and Quality Control	02	04	06	12
6.	Special Concretes	02	04	04	10
	<b>Total</b>	<b>12</b>	<b>26</b>	<b>32</b>	<b>70</b>

**I:-Assessment Criteria**

**i) Formative Assessment of Practical: -**

Every practical shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

**ii) Summative Assessment of Practical:**

End exam practical assignment shall be assessed for 25 marks as per following criteria:

Sr. no	Criteria	Marks allotted
1	Attendance at regular practical	05
2	Preparedness for practical	05
3	Neat & complete Diagram.	05
4	Observations & handling of instrument.	05
5	Oral Based on Lab work and completion of task	05
<b>TOTAL</b>		<b>25</b>

**iii) Assessment of SLA: -**

Every Self-learning assignment/microproject shall be assessed for 25 marks as per Following criteria

Sr.no	Criteria	Marks allotted
1	Attendance	05
2	Preparedness and workmanship	05
3	Presentation (neat figures/ diagrams/ tables/ graphs etc.)	05
4	Conclusion / Inference	05
5	Oral Based on microproject/ assignment/ activity	05
<b>TOTAL</b>		<b>25</b>

**J. Instructional Methods:**

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration

**K. Teaching and Learning resources:**

- |                      |   |
|----------------------|---|
| 1. Chalk board       | 2.LCD presentations                         |
| 3.Field visit to RMC | 4. Demonstrative charts                     |
| 5. Question Bank     | 6. Digital learning resources -NPTEL,Swayam |

**L.REFERANCE BOOKS**

a) Book / journals / IS code

SNo.	AUTHOR	TITLE	PUBLISHER
1.	M.S.Shetty	Concrete Technology	S.Chand& Co ltd., New Delhi
2.	M. L. Gambhir	Concrete Technology	Tata Mc Graw Hill
3	Neville	Properties of Concrete	Pearson Education India
4	Santhakumar	Concrete Technology	Oxford Press

## M. Learning Website & Software

### Websites :

- i) <http://www.youtube.com/watch?v=n-Pr1KTVSXo>
- ii) <http://www.youtube.com/watch?v=oM7SVIeoODs>

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Draft-VI

**COURSE ID** :  
**COURSE NAME** : **EMERGING TRENDS IN CIVIL ENGINEERING**  
**COURSE CODE** : **CEH402**  
**COURSE ABBREVIATION** : **HETC**

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	<b>04</b>	<b>3</b>
	Tutorial Learning	<b>00</b>	
	Laboratory Learning	<b>00</b>	
	SLH-Self Learning	<b>02</b>	
	NLH-Notional Learning	<b>06</b>	

**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Practical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
<b>03</b>	<b>30</b>	<b>00</b>	<b>70</b>	<b>00</b>	<b>00</b>	<b>00</b>	<b>00</b>	<b>00</b>	<b>25</b>	<b>10</b>	<b>125</b>

**(Total IKS Hrs for Sem : 00 Hrs)**

**C:** Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA - Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment  
Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

### D. i) RATIONALE:-

Civil Engineering sector has completed number of projects with conventional techniques to meet the needs of the society. But, in recent two decades, various new innovative techniques are being used worldwide, which our practicing engineers, are also partially using to achieve their goals. The emerging trends in Civil Engineering help to complete the undertaken projects within prescribed schedule, saves the natural resources and to make the projects eco- friendly. This subject helps to make awareness about soft computing techniques, new materials, advanced machineries, sustainable resource management and advancement in Civil Engineering.

### ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the student to attain the following industry identified outcome through various learning experiences:

- Recommend emerging techniques in civil engineering for the construction field.

### COURSE LEVEL LEARNING OUTCOMES (COS)

CEH402- 1 Reveal different applications of software's for planning, designing and execution of projects

CEH402 - 2 Suggest the advanced materials as per site condition.

CEH402 - 3 Recommend the suitable tools and equipment's for the given situation.

CEH402 - 4 Suggest the advanced resource management techniques for the given project.

CEH402 - 5 Use the feasible advance techniques for various civil engineering projects

CEH402 - 6 Use the feasible advance tool & equipment's various civil engineering projects

### Competency, course outcomes and programme outcomes/programme specific outcomes

#### (cp-co-po/ps) matrix

[ Note: Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0"

Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 Plan and Design	PSO2 Construction and Maintenance	PSO3 Problem Solving on field
CEH402-CO1- Reveal different applications of software's for planning, designing and execution of projects	1	1	2	3	3	3	3	3	2	3
CEH402 CO-2 Suggest the advanced materials	1	2	2	3	3	2	3	3	3	

Competency and Cos	Programme Outcomes POs and PSOs									PSO3 Problem Solving on field
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analyses	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 Plan and Design	PSO2 Construction and Maintenance	
as per site condition										3
CEH402 CO-3 Recommend the suitable tools and equipment's for the given situation	1	1	3	3	3	3	3	3	3	3
CEH402 CO-4 Suggest the advanced resource management techniques for the given project	1	1	2	3	3	3	3	3	3	3
CEH402CO-5 Use the feasible advance techniques for various civil engineering projects	1	1	2	3	3	3	3	3	3	3
CEH402CO-6 Use the feasible advance tool & equipment's various civil engineering projects	1	1	2	3	3	3	3	3	3	3

## E. CONTENT:-

- I) Practical exercises – Not Applicable
- II) Theory

### Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
<b>CO:CEH000-1: Reveal different applications of software's for planning, designing and execution of projects</b>			
1	<b>Soft Computing Techniques</b> 1.1 Introduction of soft computing techniques and its types, Merits and demerits of soft computing technique, Graphical User Interface Software (GUI). 1.2 Introduction, salient features and applications of software's -	11	12

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	REVIT, ETAB, 3D Architect Home, Build-Master, HEC-RAS, STRAP, WaterGEMS, Tekla, ArcGIS, QuikGrid, STAAO.Pro, SAFE, RISA-Connection, Civil 3D, Site 3D, SkyCiv Structural 3D, SAP 2000, MIDAS, LUSAS, BricsCAD, Estimate Master, ProEst, WinEst, Clear Estimate, Procure, Buildertrend, Building Management System (BMS), Plant Design and Management System (PDMS), Building Information Modeling (BIM), Primavera Pro, Microsoft Project (MSP)		
<b>CO: CEH000-2: Suggest the advanced materials as per site condition.</b>			
2	<p><b>Recent Construction Materilas</b></p> <p>2.1 <b>Building Materials-</b> Artificial sand, Sensi tile, carbon fibre, Bricks made up of cigarette butts, 3D printed bricks, Translucent wood, laminated timber, 3D Tiles</p> <p>2.2 <b>Road Materials-</b> Geo-synthetics, Noise-reducing asphalt, Porous Pavement, Plastic Roads, solar roads, Anti Icing Roads, Piezoelectric roads</p> <p>2.3 <b>Concrete Materials-</b> Portland Pozzolana Cement, Portland Slag Cement, New admixtures - Masterglanium, Polycarboxylic Ether, Self-Healing Concrete, Fibre- Reinforced Concrete, High Strength concrete, High Performance Concrete, Nano concrete, Light transmitting concrete.</p> <p>2.4 <b>Sustainable Materials-</b> Ground Granulated Glass Blast-furnace Slag (GGBS) concrete, Aero-gel insulation, Cooling bricks, Green concrete, Timbercrete, Ferrock</p>	12	14
<b>CO: CEH000-3: Recommend the suitable tools and equipment's for the given situation</b>			
3	<p><b>Latest Tools and Equipments</b></p> <p>3.1 <b>Survey equipment-</b> LiDAR, Scan Station, Global Positioning System (GPS), Geographical Information System (GIS), Photogrammetry, Drones, Direct Reading Grade Rods, 3D Laser scanning, laser level</p> <p>3.2 <b>Material handling equipment-</b> Cranes, conveyors, hoists, forklifts, mobile concrete mixer, paver, road header, tunnel boring machine. Horizontal boring, Vertical boring, Line boring.</p>	10	8

**Section –II**

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
<b>CO: CEH000 -4: Suggest the advanced resource management techniques for the given project</b>			
4	<p style="text-align: center;"><b>Sustainable Resource Management</b></p> <p>4.1 Water resource management- Principles and techniques</p> <p>4.2 4R's in waste management-Reduce, Reuse, Recycle and Recover, Concept of Zero Waste</p> <p>4.3 Reuse of waste in construction-Fly Ash, Slag and Plastic Properties of renewable, recyclable material and recycling of construction debris with its applications.</p> <p>4.4 Renewable energy sources-solar energy, biomass, wind energy, ocean wave energy, Geo thermal Energy and hybrid power system.</p> <p>4.5 Energy Audit-Necessity and methods.</p> <p>4.6 Natural disaster management- Flood, Earthquake, Tsunami, Volcanic Eruption, Hurricanes, Landslides.</p> <p>4.7 Site Safety-necessity, principles, tools, techniques, laws rules and regulations.</p>	11	12
<b>CO:CEH00-5: Use the feasible advance techniques for various civil engineering projects</b>			
	<p style="text-align: center;"><b>Advancement in Construction</b></p> <p>5.1 Zero energy building, Green building, Mass housing- precast housing, prefab homes, pre-engineering building, Solar Paints, Building Integrated Photovoltaic (BIPV), Earthquake Resisting Controls-Isolation and Dissipation Pre-engineered building using Mivan technology, Façade Technology, Fire protection buildings, 3D printing.</p> <p>5.2. <b>Road construction techniques</b>-3D Printing, Road Printer, smart roads Anti-icing roads, Piezoelectric roads, Hyper loop construction, Precast arch bridge construction.</p> <p>5.3 <b>Coastal construction techniques</b>- Sound Proofing walls, water resistant roofs, high performance doors and windows, air and moisture barriers</p> <p>5.4 <b>Ground improvement techniques</b>- Advanced piling techniques - Stone Column, Vibro Flootation, Micro Piles, Soil Nailing, Vertical drains- Sand Drains, Pre-Fabricated Vertical Drains, Thermal Methods- soil heating and soil freezing.</p>	12	16

<b>CO:CEH00-6: Use the feasible advance tool and equipment's civil engineering projects</b>			
5	<b>6.1 Construction Equipment-</b> Earth moving equipment-Skid and crawler loaders, trenchers, scrapers, wheeled loading shovels, advanced plastering machine, Different types of Bridge launchers. <b>6.2 Steel Structure fabrication Equipment's-</b> Types of welding equipment's, Plasma cutting machine, etc anticorrosive paint's <b>6.3 Advance tools-</b> spray Painting machinery, reinforcement bar cutting and bending machine, rebar hook, drilling equipments sand blasting equipment(Working and applications to civil projects)etc	10	8

**\*\* No questions will be asked on IKS learning subtopics in any question papers.**

### **G: List of Activities Under SLA**

- Visit the Appropriate website and observe the relevant videos and other related learning material.
- Group discussion on sustainable resource management.
- Undertake small micro projects.

A suggestive list of micro project is given here. Similar micro-projects could be added by the concerned faculty.

- Prepare chart showing software and their applications.
- Prepare a model of any one construction material or machinery used in recent days.
- Prepare a report on advanced machinery and materials.
- Elaborate the process of mass housing, pre-engineered building etc.
- Make a poster showing site safety and its awareness.
- Prepare the charts showing different types of safety rules and regulations of site.

### **H : Specification table for setting question paper for semester end theory examination**

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	Soft Computing Techniques	6	4	2	12	CO1
I / 2	Recent Construction Materials	4	6	4	14	CO2

I / 3	Latest Tools and Equipment's	6	4	4	12	CO3
II /4	Sustainable Resource Management	4	6	2	12	CO4
II /5	Advancement in Construction	6	8	4	16	CO5
II /5	Advance tool and equipment's	2	4	2	08	CO6
Total Marks					70	

## I :-Assessment Criteria

### i) Formative Assessment of Practical :-Not Applicable

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Attendance/Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

### ii) Summative Assessment of Practical : Not Applicable

At the time of Practical Examination assessed for 25 marks as per following criteria:

Sr. no	Criteria	Marks allotted
1	Knowledge about the course	05
2	Preparedness for practical /Oral	05
3	Neat & complete Diagram/write up	05
4	Observations/Handling of instrument/ Communication/Presentation	05
5	Oral Based on Lab work and completion of task	05
<b>TOTAL</b>		<b>25</b>

## J) Instructional Methods:

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration

## K) Teaching and Learning resources:

Chalk board, LCD presentations, Demonstrative kits, Demonstrative charts.

## L) Reference Books:

Sr.No	Author	Title	Publisher with ISBN Number
1	MSBTE, Mumbai.	Learning Manual of Emerging Trends in Civil Engineering	MSBTE, Mumbai.
2	Dr. Manoranjan Samal	Advanced Construction Techniques and Equipment	S.K. Kataria & Sons, 2022, ISBN: 978-93-5014-751-1
3	Dr. R. P. Rethaliya	Advanced Construction and Equipment	Atul Prakashan, Ahmedabad, 1 January 2019, ISBN: 978-93-81518.94-6
4	Dr. R. Vigneswaran	Advanced Construction Technology	Magnus Publication, ISBN: 978-81-964838-0-7
5	K. Ganesh Babu, H. Sudarsana Rao, Y. Amarnath	Emerging Trends in Civil Engineering Select Proceedings of ICETCE 2018	Springer Publication, 12 January 2020 ISBN:978-9811514036
6	Mohit Bajpai Dr. A.V. Sudhakara Reddy and Dr. V. Lakshmi Devi	Emerging Trends in Engineering and Technology (Volume - 5)	Integrated Publicaions, New Delhi, ISBN:978-93-93502-97-1

## M) Learning Website & Software

Sr.No	Link / Portal	Description
1	<a href="https://www.engineeringcivil.com/software">https://www.engineeringcivil.com/software</a> .	Introduction of software in civil engineering
2	<a href="https://www.nbmcw.com/tech-articles/concrete/3725-new-construction-materials-for-modern-projects.html">https://www.nbmcw.com/tech-articles/concrete/3725-new-construction-materials-for-modern-projects.html</a>	Advance construction material
3	<a href="https://geniebelt.com/blog/10-innovative-construction-materials">https://geniebelt.com/blog/10-innovative-construction-materials</a>	Innovative construction material
4	<a href="https://www.viatechnik.com/blog/modern-construction-machines-theyre-used/">https://www.viatechnik.com/blog/modern-construction-machines-theyre-used/</a>	Modern construction machines
5	<a href="https://www.academia.edu/28172313/ADVANCED_BUILDING_CONSTRUCTION_EQUIPMENT">https://www.academia.edu/28172313/ADVANCED_BUILDING_CONSTRUCTION_EQUIPMENT</a>	Advance building construction equipments
6	<a href="https://theconstructor.org/construction/sustainability-construction-civil-engineering/9492/">https://theconstructor.org/construction/sustainability-construction-civil-engineering/9492/</a>	Concept of sustainability
7	<a href="https://www.susdrain.org/delivering-suds/using-suds/suds-components/suds-components">https://www.susdrain.org/delivering-suds/using-suds/suds-components/suds-components</a>	Sustainable drainage system(SuD)s
8	<a href="https://www.designingbuildings.co.uk/wiki/Advanced_construction_technology">https://www.designingbuildings.co.uk/wiki/Advanced_construction_technology</a>	Advanced construction technology
9	<a href="https://www.constructionjunkie.com/blog/2018/1/7/the-16-most">https://www.constructionjunkie.com/blog/2018/1/7/the-16-most</a>	Most interesting advances in

Sr.No	Link / Portal	Description
	<a href="#">-interesting-advances-in-construction-technology-of-2017</a>	construction technology
10	<a href="https://mysubs.in/buy/recent-trends-in-civil-engineering-and-technology-journal-subscription?gclid=Cj0KCQjw6lfoBRCiARIsAF6q06scZ5teDIexIYz_j85yy2ZH_v1kiQcytNvYf3AelfE3LcZndTbhrOwaAqv2EALw_wcB">https://mysubs.in/buy/recent-trends-in-civil-engineering-and-technology-journal-subscription?gclid=Cj0KCQjw6lfoBRCiARIsAF6q06scZ5teDIexIYz_j85yy2ZH_v1kiQcytNvYf3AelfE3LcZndTbhrOwaAqv2EALw_wcB</a>	Recent Trends In Civil Engineering & Technology (RTCET)
11	<a href="https://www.nobroker.in/blog/mivan-construction-technology-explained/">https://www.nobroker.in/blog/mivan-construction-technology-explained/</a>	Mivan construction technology

**COURSE ID:**  
**COURSE NAME** : ESTIMATING AND COSTING  
**COURSE CODE** : CEH403  
**COURSE ABBREVIATION** : HEAC

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	04	4
	Tutorial Learning	00	
	Laboratory Learning	04	
	SLH-Self Learning	00	
	NLH-Notional Learning	08	

**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
	FA-TH	SA-TH	TOTAL		Practical		SA-PR				
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
04	30	70	100	40	25	10	25#	10	-	-	150

**(Total IKS Hrs for Sem. : 02 Hrs)**

**C:** Abbreviations: CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA - Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment  
Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination.

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

## **D. i) RATIONALE:-**

Calculation of quantities and cost estimates for civil engineering works is one of the major functions for the civil engineer and he has to acquire the knowledge of calculating the quantities of each item of work from available drawings & to prepare the estimate of the work which is necessary for allocation of funds for the required purpose and further continue to execute the work as per the drawings and estimates. The ability of recording measurements for various items of work from drawings, finding rates for different items using schedule of rates and preparing the abstract constitutes the important step in the preparation of estimate.

This subject also has a strong linkage with proper supervision of construction work mainly because of its relation to work specifications and planning and execution of site activities like stacking of materials, ordering of equipment and materials, arranging for skilled and semiskilled labourers needed on site, preparing bills for payment of work already completed etc. For proper competence in this subject, one has to be skilled in reading and interpretation of drawings and also taking measurements of completed items. The subject of Estimating and costing is therefore very important as far as its strong relevance to the actual job of a site supervisor/engineer is concerned.

### **ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME**

Estimate for the given construction materials, labor, and resources required for construction projects accurately.

## **E. COURSE LEVEL LEARNING OUTCOMES (COS)**

CEH403-1 Understand P.W.D. procedures & mode of measurements as per IS-1200

Understand the methods and procedures of approximate estimates.

CEH403 -2 Understand the methods and procedures of detailed estimates.

CEH403 -3 Calculate quantities of various items of buildings/other structures and prepare the Abstract.

CEH403 -4 Draft detailed specifications for the items of civil engineering works.

CEH403 -5 Prepare Rate Analysis for the items of civil engineering works.

CEH403 -6 Calculate quantities of earthwork and prepare detailed estimate of road.

### **Competency, course outcomes and programme outcomes/programme specific outcomes**

#### **(cp-co-po/pso) matrix**

[ Note: Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0"

Competency and COs	PO 1 Basic & Discipline specific knowledge	PO 2 Problem analysis	PO 3 Design/development of solutions	PO 4 Engineering Tools, Experimentation & Testing	PO 5 Engineering practice for society, sustainability & environment	PO 6 Project management	PO 7 Life-long learning	PSO1 Plan and Design	PSO2 Construction and Maintenance	PSO3 Problem Solving on field
<b>Competency:</b> Apply principles of Estimating & Costing to solve engineering problems	3	3	2	2	1	1	1	1	1	2
<b>CEH403-1.</b> Understand P.W.D. procedures and mode of measurements as per IS-1200. Understand the methods and procedures of approximate estimates	3	3	2	2	2	2	1	2	1	2
<b>CEH403-2.</b> Understand the methods and procedures of detailed estimates. .	3	3	2	2	2	2	1	2	1	1
<b>CEH403-3.</b> Calculate quantities of various items of buildings and prepare the abstract	3	3	2	2	2	2	1	2	1	3
<b>CEH405-4.</b> Draft detailed specifications for the items of civil engineering works.	3	3	2	2	3	2	1	2	1	3
<b>CEH403-5.</b> Prepare Rate Analysis for the items of civil engineering works.	3	3	2	2	2	2	1	2	1	1
<b>CEH403-6.</b> Calculate quantities of earthwork and prepare detailed estimate of road	3	3	2	2	2	2	1	2	1	1

## F. CONTENT:-

### I) Practical exercises

The following practical exercises shall be conducted in the in practical sessions of batches of about 20- 22 students:

Sr. no	Laboratory experiences	CO
1	Preparing checklist of Items of following civil engineering works (Any three). <ul style="list-style-type: none"> <li>• Load bearing structure</li> <li>• Framed structure</li> <li>• Water bound Macadam road</li> <li>• Septic tank</li> </ul>	CEH403-1
2	Analysis of SSR for any five Different item of construction.	CEH403-1
3	Preparations of approximate estimate by	CEH403-1

Sr. no	Laboratory experiences	CO
	<ul style="list-style-type: none"> <li>• Plinth Area Method</li> <li>• service unit method</li> <li>• Typical bay method</li> </ul>	
4	Calculation of the quantities for Excavation, PCC, UCR, DPC of 1BHK load bearing residential building using long wall short wall method.	CEH403-3
5	Calculation of the quantities for Excavation, PCC ,UCR,DPC of 1BHK load bearing residential building using Center line method	CEH403-3
6	Preparation of detailed estimate with abstract for RCC (G+1) residential framed structure.	CEH403-3
7	Writing the rules of deduction for below mentioned items of work as per IS: 1200 <ul style="list-style-type: none"> <li>• Brick/ Stone Masonry</li> <li>• Plastering/ Pointing</li> </ul>	CEH403-1
8	Writing detailed specification for following item of work for Building construction <ul style="list-style-type: none"> <li>• M20 Concrete</li> <li>• Brick Masonry</li> <li>• Plastering</li> </ul>	CEH403-4
9	Rate Analysis for the following <ul style="list-style-type: none"> <li>• Building work - any Three items</li> <li>• Roads work - any one item</li> </ul>	CEH403-5
10	Taking of quantities of following items for small R.C.C. Hall <ul style="list-style-type: none"> <li>• Concreting for Footing, Column, Beam, Slab</li> <li>• Reinforcement for above items by preparing bar bending schedule</li> </ul>	CEH403-3
11	Detailed Estimate of any two of the following <ul style="list-style-type: none"> <li>• Septic tank.</li> <li>• Community well.</li> <li>• Water-supply from overhead tank to bath, W.C., basin, sink, geyser.</li> <li>• Estimate of Plumbing work from W.C., Bath connection to Public Sewer/ Septic Tank</li> </ul>	CEH403-3
12	Preparation of detailed estimate with abstract for RCC (G+1) residential framed structure using relevant available open source Software. (Optional)	CEH403-3
13	Determination of the earth quantity in embankment and cutting using Trapezoidal method.	CEH403-6
14	Determination of the earth quantity in embankment and in cutting using mid sectional area/ mean area method.	CEH403-6

## II) Theory

### Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
<b>COURSE OUTCOME CEH403-1.</b> Understand P.W.D. procedures and mode of measurements as per IS-1200 Understand the methods and procedures of approximate estimates.			
<b>1</b>	<p><b>Introduction</b></p> <p>1.1 Meaning of the terms estimating and costing, Roles and responsibility of Estimator</p> <p>1.2 Purpose of estimating and costing</p> <p>1.3 Meaning of check list. Purpose of check list and Check list of items of civil engineering structures</p> <p>1.4 Modes of measurements of items of work as per P.W.D and IS: 1200. Desired accuracy in taking measurements.</p> <p>1.5 SSR: Meaning, Purpose,</p> <p><b>Approximate Estimates</b></p> <p>1.6 Definition and purpose of approximate estimates</p> <p><b>1.7</b> Methods of approximate estimates used for buildings, Plinth area method, Cubical content method, Approximate quantity method, Service unit method and typical bay method. (Numerical on any method)</p> <p>1.8 Methods of approximate estimates used for Roads, Bridges/culverts, Railways, Water Supply and Irrigation projects.</p>	<b>11</b>	<b>10</b>
<b>COURSE OUTCOME CEH403-2.</b> Understand the methods and procedures of detailed estimates.			
<b>2</b>	<p><b>Detailed Estimates</b></p> <p>2.1 Detailed Estimate: Definition and Purpose, Data required for detailed estimate,</p> <p>2.2 Types and Uses of detailed estimates, Revised estimate, Supplementary estimate, Maintenance estimate, Repair and Special repair estimates.</p> <p>2.3 Factors to be considered during preparation of detailed estimate.</p> <p>2.4 Provisions in detailed estimate for contingencies, work charged establishment, Provisional items, Provisional sum, Provision for water supply and sanitary charges, Electrification charges, Centage charges, Tools and Plants,</p>	<b>06</b>	<b>07</b>

	Prime Cost and Daywork.		
3.1 <b>COURSE OUTCOME CEH403-3.</b> Calculate quantities of various items of buildings and prepare abstract. , water supply and sanitary Charges and electrification charges.			
<b>3</b>	<b>Preparing Detailed Estimate of Building</b> 3.1 Unit quantity method and total quantity method 3.2 Steps in preparing detailed estimate- Tacking out quantities, Abstracting. Measurement sheet, Abstract sheet and Face sheet 3.3 Procedure for taking out quantities for building work items such as Earth work in foundation , Foundation concrete, Stone/ Brick masonry work in foundation, plinth and superstructure by Long wall and short wall method and Centre line method 3.4 Procedure of detailed estimate for One room, Two room and complete 1B.H.K. load bearing structure <b>Procedure for R.C.C work by using</b> 3.6 Thumb rule for reinforcement quantity calculation for Slab, Beam, Column, Footing etc. 3.7 Preparing Bar bending Schedule for Lintel, Beam, Slab, Column and Footing 3.8 Detailed estimate of small R.C.C. structure such as Hall with column, footing, beams and slab including preparing schedule of reinforcement	<b>13</b>	<b>18</b>
	<b>Total</b>	<b>30</b>	<b>35</b>
Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.			

### Section –II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
<b>COURSE OUTCOME CEH403-4. Draft detailed specifications for the items of civil engineering works.</b>			
<b>4</b>	<b>Specifications</b> 4.1 Definition of specification and its necessity Purpose and legal aspect of specifications. 4.2 Types of specifications – General, Detailed/standard specifications. 4.3 Points to be considered in framing the specification of an item. 4.4 Drafting detailed specification for common items of civil engineering works such as P.C.C. ,R.C.C., Brick, Stone Masonry, Door, windows, specifications for plumbing, and Plastering 4.5 Standard specification book	<b>07</b>	<b>8</b>

<b>COURSE OUTCOME CEH403-5. Prepare Rate Analysis for the items of civil engineering works.</b>			
<b>5</b>	<b>Rate Analysis</b> 5.1 Definition, Necessity of Rate Analysis. 5.2 Factors affecting Rate Analysis 5.3 Data required for rate analysis 5.4 Market rates for materials and labours 5.5 Task work- definition and factors affecting the task work, Task works for various items of work 5.6 Transportation of construction materials – Capacities of Truck, Dumpers and carts and their costs. 5.7 Labour – Categories of labours 5.8 Overheads- General and job overheads, Contractors profit and water charges. 5.9 Calculation of quantities of materials required for various items of work such as B.B. Masonry, Half brick work, Stone masonry, Cement concrete, P.C.C. Flooring, Vitrified Tiled flooring, Cement plaster 5.10 Analysis of rates of civil engineering items such as P.C.C., R.C.C., Brick masonry in cement mortar in superstructure, U.C.R. masonry in cement mortar, P.C.C flooring and Ceramic flooring	<b>14</b>	<b>16</b>
<b>COURSE OUTCOME CEH403-6. Calculate quantities of earthwork and prepare detailed estimate of road.</b>			
<b>6</b>	<b>Calculation of Quantities of Earth work for different civil engineering works</b> 6.1 Methods of Mean area, <i>Mid</i> sectional area, Trapezoidal and Prismoidal formula (No derivations) for calculation of earth work. 6.2 Earth work calculation for Roads, Dam, Canals, Railway Embankment	<b>09</b>	<b>11</b>
	<b>Total</b>	<b>32</b>	<b>35</b>
Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.			

**\*\* No questions will be asked on IKS learning subtopics in any question papers.**

### **G : List of Assignments under SLA**

- Enlist the minimum ten salient provisions made in IS:1200 with special reference to load bearing structure.
- Enlist the minimum ten salient provisions made in IS:1200 with special reference to Framed structure.
- Prepare approximate estimate of minimum one civil engineering project..
- Prepare approximate estimate of minimum one residential building.
- Prepare detailed estimate of minimum one load bearing structure using available open source software.

- Collect the rebar reinforcement drawings of minimum one building and interpret the drawings with report.
- Prepare rate analysis of Painting work for OBD, Plastic emulsion, Oil paint, luster paint having minimum 150 m2 area.

**Note :**

Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.

The faculty must allocate judicious mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.

If a microproject is assigned, it is expected to be completed as a group activity. SLA marks shall be awarded as per the continuous assessment record.

\*\*\*If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

**H : Specification table for setting question paper for semester end theory examination**

Section /Topic No.	Name of topic	Distribution of marks (level-wise)			Total marks	CO
		Remember	Understand	Apply		
1/1	Introduction Approximate Estimates	04	04	02	10	CO-1
1/2	Detailed Estimates	02	02	03	07	CO-2
1/3	Preparing Detailed Estimates of Buildings	04	04	10	18	CO-3
2/4	Specifications	02	02	04	08	CO-4
2/5	Rate Analysis	04	04	08	16	CO-5
2/6	Calculation of Quantities of work for different civil engineering works	02	02	07	11	CO-6
	TOTAL	18	18	34	70	

**I :-Assessment Criteria**

**i) Formative Assessment of Practical :-**

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05

	Drawing / drafting skills	05
Affective	Attendance/Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

**ii) Summative Assessment of Practical :**

At the time of Practical Examination assessed for 25 marks as per following criteria:

Sr. no	Criteria	Marks allotted
1	Knowledge about the course	05
2	Preparedness for practical /Oral	05
3	Neat & complete Diagram/write up	05
4	Observations/Handling of instrument/ Communication/Presentation	05
5	Oral Based on Lab work and completion of task	05
<b>TOTAL</b>		<b>25</b>

**J) Instructional Methods:**

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration
- 4.

**K) Teaching and Learning resources:**

Chalk board, LCD presentations, Demonstrative kits, Demonstrative charts.

**L) Reference Books:**

Sr.No	Author	Title	Publisher with ISBN Number
1	Datta, B.N.	Estimating and Costing in Civil engineering	UBS Publishers Distributors Pvt. Ltd. New Delhi. ISBN:9788174767295
2	Chakraborti,M.	Estimating and costing, specification and valuation in civil engineering	Monojit Chakraborti, Kolkata (2006) ISBN-10: 818530436X ISBN-13: 978-8185304366
3	Patil, B.S.	Civil Engineering Contracts and Estimates	Orient Longman, Mumbai, Ed.2010 ISBN: 9788173715594, 8173715599
4	Rangwala,S.C.	Valuation of Real Properties	Charotar Publishing House Pvt. Limited (2008) ISBN:9788185594774, 8185594775
5	Birdie,G.S.	Estimating and Costing	Dhanpat Rai Publishing Company(P) Ltd.NewDelhi110002 ISBN : 978-93-84378-13-4

## LI) LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	<a href="https://mjp.maharashtra.gov.in/schedule-rate-dsr/">https://mjp.maharashtra.gov.in/schedule-rate-dsr/</a>	Schedule Rate (DSR) Maharashtra Jeevan Pradhikaran
2	<a href="https://mjp.maharashtra.gov.in/schedule-rate-dsr/">https://mjp.maharashtra.gov.in/schedule-rate-dsr/</a>	CPWD in house codes, manuals, schedules, technical specifications, design manuals and technical publications.
3	<a href="https://www.microsoft.com/en-in/microsoft-365/excel">https://www.microsoft.com/en-in/microsoft-365/excel</a>	Microsoft Excel 365 open source software
4	<a href="https://www.youtube.com/watch?v=IoBd5UhGifs">https://www.youtube.com/watch?v=IoBd5UhGifs</a>	Full Building Estimation in Excel sheet
5	<a href="https://youtube.com/playlist?list=PLMCExauCXvoOGL3nP49ee_-Uaftf1PAJ8q&amp;si=N4gNlyNL3PzLvRTx">https://youtube.com/playlist?list=PLMCExauCXvoOGL3nP49ee_-Uaftf1PAJ8q&amp;si=N4gNlyNL3PzLvRTx</a>	Estimating, Costing and Valuation
6	<a href="https://www.youtube.com/watch?v=iry2zEoPvsU">https://www.youtube.com/watch?v=iry2zEoPvsU</a>	Sinking Fund / Book Value / Scrap Value / Market Value / Salvage Value / Valuation
7	<a href="https://www.youtube.com/watch?v=C6O09yOa45c">https://www.youtube.com/watch?v=C6O09yOa45c</a>	Rate Analysis Of Civil Work   How to Prepare Rate Analysis   Rate Analysis for 1000 sqft house plan
8	<a href="https://www.youtube.com/watch?v=H5qIwRCOFn4&amp;list=PLv20kpHlalH1zD-oueYjooR-KdO6q_NLa&amp;index=4">https://www.youtube.com/watch?v=H5qIwRCOFn4&amp;list=PLv20kpHlalH1zD-oueYjooR-KdO6q_NLa&amp;index=4</a>	Administrative approval, Technical sanction and Budget provision
9	<a href="https://www.youtube.com/watch?v=ZAnIaZIMGtw&amp;list=PLv20kpHlalH1zD-oueYjooR-KdO6q_NLa&amp;index=5">https://www.youtube.com/watch?v=ZAnIaZIMGtw&amp;list=PLv20kpHlalH1zD-oueYjooR-KdO6q_NLa&amp;index=5</a>	Types of estimates - Approximate estimate and Detailed estimate
10	<a href="http://acl.digimat.in/nptel/courses/video/124105015/lec40.pdf">http://acl.digimat.in/nptel/courses/video/124105015/lec40.pdf</a>	Rebar Detailing
<p><b>Note :</b></p> <ul style="list-style-type: none"> <li>Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students</li> </ul>		



# **GOVERNMENT POLYTECHNIC, KOLHAPUR**

(An Autonomous Institute of Government of Maharashtra)

*Curriculum Document*

**CURRICULUM: MPECS-2023**

**(Outcome Based Curriculum)**

for

**DIPLOMA IN CIVIL ENGINEERING**

**Secretary**

**Chairman**

Programme-wise Board of Studies (PBOS)

Civil Engineering Programme

Government Polytechnic, Kolhapur

**CIVIL ENGINEERING - SAMPLE PATH - H SCHEME - 5th SEMESTER**

Sr.no	Course Title	Abbreviation	Course Type	Course Code	Level	Total IKS Hrs. for Sem	Learning Scheme						Credits	Roundup credits	Assessment Scheme						Based on LL & TL				Based on Self Learning		Total Marks
							Actual Contact Hrs./Week								Theory						Practical				SLA		
							CL	TL	LL	Self Learning (Activity/Assignment/MicroProject)	Notional Learning Hrs/Week				Paper Duration (Hrs)	FA-TH	SA-TH		Total		FA-PR	SA-PR		SLA			
							Max	Max		Max	min	Max	min	Max	min	Max	min	Max	min	Max	min						
1	Construction Management & Contracts accounts	HCAM	DSC	CEH404		0	8	0	4	3	15	3	3	3	30	70		100	40	25	10	25	@	10	25	10	175
2	Irrigation Engineering	HIRE	DSC	CEH406		0	4	0	1	1	6	1.2	1	3	30	70		100	40	25	10	0		0	25	10	150
3	Analysis of Structures	HAOS	DSC	CEH 405		0	8	0	0	2	10	2.00	2	3	30	70		100	40	0	0	0		0	25	10	125
4	Internship (16weeks)	HINT	INP	CCH505		0	0	0	0	0	10.00	10	0	0	0	0		0	0	100	40	100	#	40	0	0	200
5	<b>Project</b>	HPRJ	INP	CEH407		0	0	0	4	2	6	1.60	2	0	0	0		0	0	0	0	50	#	20	50	20	100
6	Enterpreneurship Development	HESU	SEC	CCH501		0	2	0	0	1	3	0.80	1	0	0	0		0	0	0	0	0		0	50	20	50
7	ROBOTICS AND AUTOMATION	HROB	SEC	CEH408		0	0	0	2	2	4	0.8	1	0	0	0		0	0	25	10	0		0	25	10	50
	<b>TOTAL</b>					0	22	0	11	11	44	19.4	20		90	210		300	120	175	70	175	0	70	200	80	850

**Legends :**

**Abbreviations:**

CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning

SLH-Self Learning Hours, NLH- Notional Learning Hours, IKS - Indian Knowledge System,

FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Course Category : Discipline Specific Course Core (DSC) , Discipline Specific Elective (DSE) : Value Education Course (VEC) , Intern./Apprenti./Project./Community (INP), Ability Enhancement Course (AEC) , Skill Enhancement Course (SEC), Generic Elective (GE) :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table. 7. Th

**PBOS Member Secretary**  
**Civil Engineering Deoartment**  
**Government Polytechnic Kolhapur**

**Head of Department**  
**Civil Engineering Deoartment**  
**Government Polytechnic Kolhapur**

**COURSE ID** : **HCAM**  
**COURSE NAME** : **CONSTRUCTION MANAGEMENT & CONTRACTS ACCOUNTS**  
**COURSE CODE** : **CEH404**  
**COURSE ABBREVIATION** : **HCAM**

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	08	3
	Tutorial Learning	00	
	Laboratory Learning	04	
	SLH-Self Learning	03	
	NLH-Notional Learning	15	

**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Practical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
03	30	100	100	40	25	10	25	10	25	10	175

**(Total IKS Hrs for Sem : 00 Hrs)**

**C:** Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* **6 Weeks**
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

**D. i) RATIONALE:-**

This is one of the important management level subjects. Civil Engineering technician in charge of construction work and as a supervisor acts as a link between skilled and semi-skilled workers and top management engineers. He has to solve the various problems arising at the site and guide the workers and ensure efficient use of resources i.e. men, machines, material, money, and time. He must be acquainted with different aspects of management, particularly in relation to construction. He has to provide good leadership to people working under him. This subject is intended to provide reasonably sufficient background regarding management in general and of civil engineering work.

**ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME**

The aim of this course is to help the student Manage various resources **for optimized completions of construction projects.**

1.Understanding and applying facts, concepts, principles and procedure for management of work.

Attitude- of i) precision ii) accuracy iii) safety iv) punctuality v) aesthetic presentation vi) hygiene vii) civic sense

**E. COURSE LEVEL LEARNING OUTCOMES (COS)**

CEH404 - 1-Understand nature of Management, principles and functions of management.

CEH404 - 2- Understand and Prepare networks and bar charts for the given construction project.

CEH404 -3- Understand the materials management and importance of inventory management

CEH404 - 4- Understand nature of Management, principles and functions of management

CEH404 - 5- Prepare tender documents for civil engineering works.

CEH404 -6- PWD accounting procedure and Introduction to valuation.

**Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/ps) matrix** [Note: Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “0” ]

Programme Outcomes POs and PSOs										
Competency and COs	PO 1 Basic& Discipline specific knowledge	PO 2 Problem analysis	PO 3 Design/development of solutions	PO 4 Engineering Tools, Experimentation & Testing	PO5 Engineering practice for society, sustainability & environment	PO 6 Project management	PO 7 Life-long learning	PSO 1 Plan and Design	PSO2 Construction and Maintenance	PSO3 Problem Solving on field
CEG404-1Understand nature of Management, principles and functions of management.	2	2	2	1	2	3	2	2	2	3
CEG404-2-Understand and Prepare networks and bar charts for the given construction project.	3	2	3	2	2	3	2	2	3	3

<b>CEH404-3</b> Understand the materials management and importance of inventory management	3	2	3	2	2	3	2	2	2	3
<b>CEH404-4</b> Understand nature of Management, principles and functions of management	3	2	3	2	2	3	2	2	2	3
<b>CEH404-5</b> Prepare tender documents for civil engineering works	3	2	3	2	2	3	2	2	2	3
<b>CEH404-6</b> PWD accounting procedure and Introduction to valuation	3	2	3	1	2	3	2	2	2	3

## F. CONTENT:-

### I) Practical exercises –

Sr.No	List of Practical's- Construction Management	Hrs Allotted
1	Prepare a brief report on role of construction industry in national development.	2Hr
2	Draw the flow chart of manpower required for a given type of project	2Hr
3	Forecast the time duration required for various activities of the given construction project to represent them through a network diagram	2Hr
4	Draw the bar chart / Gantt chart for the activities of given construction project by using MS Excel/MS Project	2Hr
5	Solve the numerical on CPM for finding duration of project and Critical path of the any one problem for the given data	
6	Draw resource allocation plan for plastering or painting or flooring activity on site	2Hr
7	Determination of EOQ (Economic order quantity) based on the given data. (Solve one Numerical)	2Hr
8	Carry out the ABC analysis for the given problem/data (Solve one Numerical)	
9	Prepare a report on minimum five expected causes of accidents on construction sites with their remedial measures. (Visit any one Industrial/Residential/Public construction building)	2Hr
	<b>List of Practicals- Contracts and Accounts</b>	
1	Study the PWD organization structure and different allied organizations like CIDCO,MHADA,METRO	02
2	Study the organization structure for different Private sector companies	02
3	Study the Different Tender notices for Construction.	02
4	Study the Tender form of PWD in relation with conditions of contract.	02
5	Collection of various forms from PWD.	02

## II) Theory

### Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
<b>CEH404 -1. Understand nature of Management, principles and functions of management</b>			
1	<p><b>Civil engineering construction industry &amp; Functions of Management</b></p> <p>1.1 Importance of construction industry in national development, Special characteristics of civil engineering works and classification of works</p> <p>1.2 Stage in construction work. such as pre-tender, post-tender, design, drawing, estimation, tendering etc., planning for execution, procuring material, supervision, inspection, payment and maintenance. Agencies associated with construction work and their duties and responsibilities.</p> <p>1.3 <b>Management</b> Concept and Objectives of Construction management</p> <p>1.4 <b>Functions of Management</b> Planning, Decision Making, Organizing, staffing, Directing, controlling, coordination Leadership, Communication</p> <p>1.5 <b>Project:</b> Basic Definitions, management functions, ethics, project life cycle- Project Initiation, Project Planning, Project Executing, Project Monitoring and Controlling, Project Closing. Project Characteristics and Constraints- Scope, time, cost, Quality; Stakeholder. Project Feasibility Analysis- Market analysis, Financial analysis- Net Present Value (NPV), Payback Period, Examine the business problem/opportunity, Identify the requirements, undertake a feasibility study, Rank the feasibility results-Define the criteria, give ranking scores, Identify the feasibility outcome. Project Management Frameworks and Standards, Project Management consultant (PMC)- roles &amp; responsibilities.</p>	06	<b>10</b>
<b>CEH404-2: Understand and Prepare networks and bar charts for the given construction project.</b>			
2	<p><b>MODERN MANAGEMENT TECHNIQUES</b></p> <p>2.1 Overview to CPM &amp; PERT Concept of CPM &amp; PERT: Introduction to Critical path method (CPM), Program evaluation &amp; review techniques (PERT), Network Diagramming of Projects Activity-on-arrow (AOA) Diagrams- Concept of Activity and Event, Time-Analysis of Networks- Forward Pass, Backward Pass, Probabilistic Durations- Optimistic Time, Pessimistic Time, Most Likely Time, Project Scheduling- ES and LS Schedules as Limits, Resource Scheduling, Time/Cost Trade-off</p> <p>2.2 Methods of Scheduling-Gantt Chart, Bar chart, Development of Bar charts and Gantt chart, Merits &amp; limitations of Bar chart &amp; Gantt chart.</p> <p>2.3 Various terms related with network analysis</p>	12	14

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	<b>2.4</b> Various Time estimates <b>2.5</b> Construction of Network Diagram <b>2.6</b> Computation of Critical Path.		
<b>CO:CEH500-3:Understand the materials management and importance of inventory management</b>			
3	<b>MATERIALS MANAGEMENT</b> 3.1 Scope and importance of material management 3.2 Objectives of material management 3.3 Duties of Material manager 3.4 Importance of purchase and Duties of purchasing officer 3.5 Inventory management and Techniques such as ABC analysis, EOQ,V-E-D analysis store management Modern trends in material management JIT/SAP / ERP etc. wastage management <b>6.2 Safety in civil engg.</b> Importance of safetyTerms used – accident cost, injury frequency rate Common causes relating to accidents at construction site,Precautions to be taken to avoid accidents Safety program and safety audit	06	10

Note- Computation of critical path problems to be solved in practical's. No problems to be asked in exam on time analysis.

### Section –II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
<b>CO: CEH404 -4: Execute the appropriate types of Contract for civil engineering work.</b>			
4	3.2 Contract and Contract Condition 3.3 Organization structure of PWD. 3.4 Methods of Execution of works as contract method, Departmental method, Built operate transfer (BOT) project-objectives, advantages, disadvantages etc. 3.5 P.W.D. procedure of executing works-Proposal, Administrative approval, Technical sanction. Budget Provision, Expenditure sanction,.Duties and responsibilities of the Junior Engineer, Site Engineer in P.W.D. 3.6 Contracts. 3.7 4.3.1-Definition of contract, Essentials of valid contract, objects of contract, Contract documents. 3.8 4.3.2-Types of Contracts, its meaning, advantages, disadvantages and suitability-Lump sum contract, item rate contract, Percentage rate contract, negotiated contract, target contract, Labour contract, Sub contract Demolition contract. 3.9 4.3.3-Clasification and registration of contractor as per PWD.	8	12

	<p>3.104.3.4-Built operate transfer(BOT) project-objectives, scope, advantages, disadvantages etc.</p> <p>3.114.4-Conditions of Contract.</p> <p>3.124.4.1-Importance of conditions of contract</p> <p>3.134.4.2-Important conditions such as -Time limit and its importance,Extension of time limit, Defective material and workmanship,Liquidation of contract,Defect liability period,Extra item, penalty, subletting of contract, Escalation of cost, termination of contract,</p> <p>3.144.5-Arbitration- Meaning, qualities of arbitrator, causes of dispute.</p>		
3.15CO: CEH404-5 Prepare tender documents for civil engineering works.			
5	<p>3.16Tender and tender Documents.</p> <p>3.173.1-Definition of tender, necessity of tender</p> <p>3.183.2-Classification of tender- local, Global, open limited and negotiated.</p> <p>3.193.3-Notice inviting tender- definition, necessity, Points to be included while drafting tender notice. Drafting of tender notice.</p> <p>3.203.4- Meaning of terms-Security deposit, Earnest moneydeposit(EMD),Validity Period,right to reject one or all tenders.rejection of lowest tender,rejection of all tenders.Corrigendum to tender notice &amp; its necessity.</p> <p>3.213.5- Indrocution to Tender documents- Index, tender notice, general instructions, special instructions, Drawing. Specifications, Schedule-A, Schedule-B, Schedule-C, contract conditions.</p> <p>3.223.6- Filling up of Tender by Contractor and Points observed by him.</p> <p>3.233.7- Procedure of submitting tender- Two envelop method</p> <p>3.243.8 -Procedure of opening tender- Preparing comparative</p> <p>3.25Statement, Scrutiny of tenders, acceptance of tender, award of contract,work order.</p> <p>3.263.9- E-Tendering procedure</p> <p>3.27Introduction to taxes and tax registration- Introduction to income tax GST, Royalty tax.</p>	8	12
3.28 CO:CEH404-6: PWD accounting procedure and Introduction to valuation			
6	<p><b>P.W.D. accounts And Introduction to valuation.</b></p> <p>6.1 Documents maintained in P .W.D. such as, Work order book, Measurement book(MB)</p> <p>6.2-Mode of Payment to contractor, Running account bills, Secured advance, Advance payment, Mobilization advance, Interim payment, final payment, retention money, reduce rate payments.</p> <p><b>Introduction to Valuations.</b></p> <p>6.3-Definition, Necessity(purpose)of Valuation.Role of Valuer. Definitions – Cost ,Price and Value, Difference Between Them, Characteristics of Value.</p> <p>6.4-Types Of Value:-Book Value, Scrap Value, Distress Value , Market Value Factors Affecting Value and depreciation definitions &amp;Types.</p>	8	12

**\*\* No questions will be asked on problems on valuation in question papers**

### G : List of task under SLA-

Sr.No	List of Self Learning Activity- <u>Construction Management</u>	Hrs Allotted
1	Prepare a report on different forms of inventory storage along with your interpretation.	1Hr
2	Download the labour laws documents from internet and wrote a brief summary on it.	2Hr
3	Collect the information about latest safety measures adopted at construction project. Collect information and prepare a report on any one top construction companies in India.	2Hr
4	Use any one free open ware software to collect information about modern techniques of material managemt. JIT/SAP/ERP/MSP/MSEXCEL/Primavera	2Hr
5	Interpret the network figures used in given civil engineering projects.	1Hr
6	Prepare the charts/report on various safety devices used at given construction site.(Visit any one Industrial/residential/public construction building)	1Hr
<b>List of Self Learning Activity- Contracts and Accounts</b>		
1.	Visit the ongoing site and study various aspects of Contracts conditions of contract and Tender documents.	2Hr
2	Refer different Website for E tendering and prepare report on it.	2Hr
3	Visit the ongoing site and study various aspects of accounting, measurement book, RA bills and various advances.	2Hr
4	Study the E tendering procedure advantages and limitations	2Hr
5.	Study the price escalation and unbalancing of tender and prepare a report on it.	1Hr

### H : Specification table for setting question paper for semester end theory examination

Top ic No.	Name of topic	Distribution of marks (Cognitive level-wise)			Total Marks	Course Outcome
		Reme mber	Understand	Application		
1	Civil engineering construction industry & Functions of Management	02	04	04	10	CO-1
2	Modern management techniques	02	08	04	14	CO-2
3	Materials management	00	06	04	10	CO-3
4	Contract and Contract Condition	02	06	04	12	CO-4
5	Tender and tender Documents.	02	06	04	12	CO-5
6	P.W.D. accounts And Introduction to valuation.	02	06	04	12	CO-6
Total		20	30	20	70	

### I :-Assessment Criteria

#### i) Formative Assessment of Practical:-

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05

	Drawing / drafting skills	05
Affective	Attendance/Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

### J) Instructional Methods:

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration
4. Construction projects case studies.

### K) Teaching and Learning resources:

Chalk board, LCD presentations, Demonstrative kits, Demonstrative Documents.

### L) Reference Books:

Sr. No.	Author	Title	Publisher
1.	B. V. Pathak	Construction Management	Nirali Prakashan Pune
2.	Harpal Sigh	Construction Management	Tata Mc. Graw Hill, New Delhi.
3.	Deodhar	Construction Management	Vrinda Publication, Jalgaon.
4.	Banga and Sharma	Industrial Organization and Economics	Khanna Publishers, New Delhi.
5.	Dr. O. P. Khanna	Industrial Organization and Management	Dhanpat Rai and Sons, Delhi
6.	M. Chakraborti	Estimating and costing, Specification and Valuation	M. Chakraborti, Calcutta
7.	B. S. Patil	Civil Engg.Contracts& Estimates	Orient Longman, Mumbai
8.	B. N. Datta	Estimating and costing	U B S Publishers Distributers Pvt. Ltd., New Delhi

### M) Learning Website & Software

Sr.no	Link	Description
1.	<a href="https://archive.nptel.ac.in/courses/105/103/105103206/">https://archive.nptel.ac.in/courses/105/103/105103206/</a>	Construction Method and Equipment Management
2.	<a href="https://www.youtube.com/watch?v=Cx7i2wXB0kA&amp;list=PLWnoy5z_3B_ObBvFtBlowxM05D-q0VAWEs&amp;index=16">https://www.youtube.com/watch?v=Cx7i2wXB0kA&amp;list=PLWnoy5z_3B_ObBvFtBlowxM05D-q0VAWEs&amp;index=16</a>	Project Scheduling
3.	<a href="https://www.youtube.com/watch?v=j6VIIIXT0Vs&amp;list=PLWnoy5z_3B_ObBvFtBlowxM05D-q0VAWEs&amp;index=22">https://www.youtube.com/watch?v=j6VIIIXT0Vs&amp;list=PLWnoy5z_3B_ObBvFtBlowxM05D-q0VAWEs&amp;index=22</a>	Accidents in Construction Industry
4.	<a href="https://www.youtube.com/watch?v=GAGoqqZSPH4&amp;list=PLWnoy5z_3B_ObBvFtBlowxM05D-q0VAWEs&amp;index=3">https://www.youtube.com/watch?v=GAGoqqZSPH4&amp;list=PLWnoy5z_3B_ObBvFtBlowxM05D-q0VAWEs&amp;index=3</a>	Overview of steps in execution of a project

**COURSE ID : HIRE**  
**COURSE NAME : IRRIGATION ENGINEERING**  
**COURSE CODE : CEH406**  
**COURSE ABBREVIATION : HIRE**

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	04	1
	Tutorial Learning	00	
	Laboratory Learning	01	
	SLH-Self Learning	01	
	NLH-Notional Learning	06	

**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Practical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
03	30	70	100	40	25	10	00	00	25	10	150

**(Total IKS Hrs for Sem : 00 Hrs)**

**C:** Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 06 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

### **D. i) RATIONALE:-**

Water is essential resource for all the living thing on earth, making its conservation crucial. India is an agricultural country majority of people live in villages. Agriculture industry is the back bone of Indian economy. India being the tropical country, there is uncertain and inequitable rainfall and that to in 3 to 4 months of monsoon season. Therefore, every drop of water is required to be harnessed appropriately using the relevant technological tools and principles. With increasing demand and unpredictable rainfall in India, efficient water management system is more important than ever. Irrigation structures like dams, diversion head-works, canals play a key role in this effort. Irrigation engineering deals in the planning, designing, constructing, and executing these hydraulic structures which are used to store, distribute and conserve the water sources.

The primary goal of Irrigation engineering is to control and regulate water for various purposes including flood control, irrigation, hydroelectric power development etc. This course will enable the students to use and apply the basic principles and practices related to irrigation engineering and utilization of supplied water at field.

The input to the course is the knowledge of survey for investigation, hydrology for calculation of yield from rainfall records and hydraulics for designing the storage, conveyance and outlet structures.

### **ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME**

The aim of this course is to help the student Apply facts, concepts, principles and procedure in contracts and accounting process.

1. Understanding and applying facts, concepts, principles and procedure in contracts and accounting process to administer departmental official procedure.

2. i) Prepare tender document

ii) Draft tender notice for various types of construction.

Attitude- of i) precision ii) accuracy iii) safety iv) punctuality v) aesthetic presentation vi) Hygiene vii) civic sense

### **E. COURSE LEVEL LEARNING OUTCOMES (COS)**

CEH406- 1- Evaluate the hydrological parameters of the given site.

CEH406- 2- Compute the Canal capacity for the crop water requirement of the given command area.

CEH406- 3- Understand and decide the types of MI Schemes for different situations.

CEH406- 4 Understand and analyses the storage capacity of reservoirs.

CEH406-5-Suggest the suitable type of dam for the given site condition.

CEH406- 6- Understand the canal network and plan Canal system for distribution of water.

**Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/ps) matrix** [Note: Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “0” ]

Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analyses	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 Plan and Design	PSO2 Construction and Maintenance	PSO3 Problem solving on field
CEH406 -1CO-1 Evaluate the hydrological parameters of the given site.	3	3	3	2	1	2	2	3	1	2
CEH406 -2 CO-2 Compute the Canal capacity for the crop water requirement of the given command area.	3	3	2	2	2	2	2	3	3	2
CEH406 -3 CO-3 Understand and decide the types of MI Schemes for different situations	3	3	3	2	2	2	2	3	3	2
CEH406 -4 CO-4 Understand and analyses the storage capacity of reservoirs	3	3	3	2	2	1	1	3	3	2
CEH406-5CO-5 Suggest the suitable type of dam for the given site condition.	3	3	3	2	2	2	2	3	3	2
CEH406 -6 CO-6 Understand the canal network and plan Canal system for distribution of water.	3	3	3	2	2	2	2	3	3	1

**F. CONTENT:-**

## I) Theory

### Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
<b>CEH406-1. Evaluate the hydrological parameters of the given site.</b>			
1	<b>Introduction to irrigation</b> 1.1 Definition of irrigation. 1.2 Necessity and Importance of irrigation. 1.3 Advantages and possible ill effect of irrigation projects. 1.4 Types of Irrigation projects. 1.5 Rainfall – Definition, Rain Gauge, Methods of calculating average rainfall: Arithmetic mean, Isohyetal, and Thiessen polygon method. Factors affecting rainfall, Characteristic of rainfall in India (emphasis on the rainfall in Maharashtra). 1.6 Run off - Definition, factors affecting runoff and various methods for run off calculation. 1.7 Definition – yield, Maximum Flood Discharge (MFD), Catchments its and types (No Examples)	03	08
<b>CEH406-2: Compute the Canal capacity for the crop water requirement of the given command area.</b>			
2	<b>Water Requirement For Crop</b> 2.1 Cropping seasons Crops in Maharashtra 2.2 Definitions - Crop period, Duty, Delta, base period, Cultivable Command Area, Gross Command Area, intensity of irrigation, factors affecting duty. 2.3 Relation between duty, delta and base period.	03	08
<b>CEH406 -3: Understand and decide the types of MI Schemes for different situations.</b>			
3	<b>Minor Irrigation Schemes</b> 3.1 Bandhara irrigation - Layout of Typical Bandhara irrigation scheme, advantages, disadvantage, selection of site 3.2 Percolation tanks : Necessity and Importance, selection of site, component parts & construction 3.3 K.T. Weir – Components & Construction 3.4 Lift Irrigation : Component, Layout, Suitability 3.5 Drip & Sprinkler Irrigation -Component, Layout, Suitability	05	18
	TOTAL	11	34

**Section –II**

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
<b>CEH406 -4 Understand and analyses the storage capacity of reservoirs.</b>			
<b>4</b>	<b>Reservoir Planning</b> <b>4.1</b> Technical Terms -Capacity of Reservoir, Height of dam, dead storage, live storage, Reservoir Losses sedimentation, Flood absorption capacity, Free Board, Gross storage <b>4.2</b> Simple problems on fixing control levels.	<b>03</b>	<b>04</b>
<b>CEH406-5 Suggest the suitable type of dam for the given site condition.</b>			
<b>5</b>	<b>Dams</b> 5.1 Types of Dams, Gravity & Earthen dams 5.2 Gravity Dams - components and their function, theoretical & Practical profiles. <b>5.3</b> Earthen Dams - Components & their functions, typical c/s of an earthen dam. Seepage through earthen dam & controlling methods. 5.4 Spillways, definition and Purpose, type of spillways with & without gates, Radial, rectangular gates 5.5 Outlet through Dams – Definition, Requirement of outlet 5.6 Energy Dissipation - Concept of energy dissipation	<b>05</b>	20
<b>CEH406 - 6 Understand the canal network and plan Canal system for distribution of water.</b>			
<b>6</b>	<b>Canals And Distribution Systems</b> 6.1 Canals -Classification based on alignments & its position in the network, typical canal sections , capacity of canal , time factor 6.2 Canal cross drainage work - C.D. works, such as aqueduct , siphons, super passage, level crossing 6.3 – Definition & function - canal head regulator, cross regulator, escape, irrigation outlet. 6.4 Canal Lining - Purpose & common materials used for canal lining 6.5 Water logging & salt efflorescence’s - causes and effect, preventive and remedial measures	05	12
	TOTAL	<b>13</b>	<b>36</b>

**\*\* No questions will be asked on IKS learning subtopics in any question papers.**

**G: List of Activities under SLA**

**Suggested Micro projects/Assignments/Activities for Specific Learning /Skills Development. (SELF LEARNING)**

**1) Practical Exercise and related skills to be developed**

- 1) Field visits & Assignment work.

Sr No.	Title of Practical Exercise	Skills / Competencies to be developed	Course Outcome
1	<b>Field visits and data collection</b> 1. Existing irrigation projects 2. Existing irrigation structures 3. Student should collect current rainfall data for nearby place and write the report on “Use of rainfall data 4. To collect the discharge data of nearby river for a particular day.	1. Information collection and presentation in the form of report.  2. Motivation through field exposure.	CEH406-2  CEH406-6  CEH406-1

## 2) Micro-projects-

### ● Prepare report on use of IoT in Irrigation Engineering.

- Prepare a report of cropping pattern, for the given minor or major irrigation project in your area with reference to growth in yield.
- Conduct online / internet survey for Watershed management project (s) in the Maharashtra State with a detailed report of at least five relevant technical inputs.
- Summarize the relevant information in the form of the report from internet regarding types of satellite imagery to capture the necessary details of the given water resource projects.
- Prepare a report on any one executed system of **Farm ponds or Jalayukt shivar schemes** with emphasis on its suitability, costing, utility and maintenance after undertaking the visit to it.
- Prepare a report on any one executed system of drip irrigation or lift irrigation scheme with emphasis on its suitability, costing, utility and maintenance after undertaking the visit to it.
- Visit to the nearby rain gauge station and obtain information for the average rainfall for the particular day.
- Visit to nearby earthen dam/gravity Dam to study and prepare report about their components & construction procedure.

NOTE: “These are the optional activities for extra learning of students”.

### Assignments-

- Compare Automatic & Non-automatic rain gauges based on any four points.
- Prepare details report of IMD rain gauge stations in your locality.
- Visit to a drip irrigation installation in your area & write brief report.
- Prepare a short report on well irrigation based on yield & season wise crops grown.
- Prepare a model of dam by using locally available material.
- Compare advantages & disadvantages of drip irrigation & sprinkler irrigation. Write the initiatives taken by state government for drip irrigation & sprinkler irrigation.
- Write a short report on cooperative equal water distribution system in your area.
- Measure evaporation of water in summer season by using available vessels & equipment’s.

NOTE: “These are the activities for extra learning of students”.

## H: Specification table for setting question paper for semester end theory examination

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	<b>Introduction to irrigation and Hydrology</b>	4	2	2	08	CEH406
I / 2	<b>Water Requirement For Crop</b>	0	4	4	08	CEH406
I / 3	<b>Minor Irrigation Schemes.</b>	4	8	6	18	CEH406
II / 4	<b>Reservoir Planning</b>	0	2	2	04	CEH406
II / 5	<b>Dams</b>	4	8	8	20	CEH406
II / 6	<b>Canals And Distribution Systems</b>	4	4	4	12	CEH406
<b>Total Marks</b>					<b>70</b>	

### **I :-Assessment Criteria**

#### **i) Formative Assessment of Practical:-**

Every assignment shall be assessed for 25 marks as per following criteria:

<b>Domain</b>	<b>Particulars</b>	<b>Marks out of 25</b>
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing/Drafting skills	05
Affective	Attendance/Discipline & punctuality	05
<b>TOTAL</b>		<b>25</b>

#### **ii) Summative Assessment of Practical: (Not Applicable)**

At the time of Practical Examination assessed for 25 marks as per following criteria:

<b>Sr. no</b>	<b>Criteria</b>	<b>Marks allotted</b>
1	Knowledge about the course	05
2	Preparedness for practical /Oral	05
3	Neat & complete Diagram/write up	05
4	Observations/Handling of instrument/ Communication/Presentation	05
5	Oral Based on Lab work and completion of task	05
<b>TOTAL</b>		<b>25</b>

#### **J) Instructional Methods:**

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration
4. Tender document and construction contracts case studies.

#### **K) Teaching and Learning resources:**

Chalk board, LCD presentations, Demonstrative kits, Demonstrative Documents.

#### **L) Reference Books:**

<b>Sr. No.</b>	<b>Author</b>	<b>Title</b>	<b>Publisher</b>
1.	S. K. Garg	Irrigation Engineering	Khanna publishers, New Delhi
2.	B. C. Punamia	Irrigation Engineering and water power engg.	Standard publishers and distri, Delhi
3.	J. G.Dahigaonkar	Irrigation Engineering	Wheeler publishing, Allahabad
4.	V. S. Gajare	Text book of irrigation engg.	Nirali prakashan, Pune 2
5.	Priyani V.B.	Irrigation Engineering	Charotar Book Stall, Anand
6.	Basak, N.N.	Irrigation Engineering	McGraw Hill Education India Pvt. Ltd. New Delhi

### **M) Learning Website & Software**

- a. <http://nptel.ac.in/courses/105105110/>
- b. <https://wrd.maharashtra.gov.in>
- c. <http://www.imd.gov.in>
- d. <http://www.mahaip.gov.in>
- e. [http://bhuvan.nrsc.gov.in/bhuvan\\_links.php](http://bhuvan.nrsc.gov.in/bhuvan_links.php)
- f. Charts/Models/Drawings

**COURSE ID :****COURSE NAME : ANALYSIS OF STRUCTURES****COURSE CODE : CEH 405****COURSE ABBREVIATION: HAOS****A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	08	2
	Tutorial Learning	-	
	Laboratory Learning	-	
	SLH-Self Learning	02	
	NLH-Notional Learning	10	

**B. ASSESSMENT SCHEME**

PAPER DURATION IN HRS	THEORY				BASED ON LL & TL				BASED ON SLA		TOTAL
	FA-TH	SA-TH	TOTAL		Practical				MAX	MIN	
03	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN			25
	30	70	100	40	-	-	-	-			

**(Total IKS hours for sem : 00 hour )****C: ABBREVIATIONS: -**

CL- Class Room Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

**Legends:** @ Internal Assessment, # External Assessment, \*# On Line Examination, @\$ Internal Online Examination.

FA-TH represents average of two class tests of 30 marks each conducted during the semester.

1. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.

2. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
3. Notional Learning hours for the semester are (CL+LL+TL+SL) hrs.\* 06 Weeks
4. 1(one) credit is equivalent to 30 Notional hrs.
5. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities.

## **D.RATIONALE:**

This course is a continuation of the course on Mechanics of materials. It deals mainly with the analysis of statically determinate and indeterminate structures. The goal is to develop an insight for the structural behavior of members, analysis of critical points in a stressed material; members for stresses, evaluation of BM and SF required for the design suggesting suitable section and material. Computation of slope and deflection in beams required to be checked in design. Empirical approaches to find strength of long columns.

### **Competency identified for the course:**

The MPEC 2023 curriculum design based on MSBTE K curriculum guideline and NEP2020 policy incorporates all self and tutorial such as notional hours and non-national hours of learning. Indian knowledge system is also intended to explore through additional hours of learning during the semester. Subject is allotted 6 hrs. of class room learning and 3 hrs. of self-learning. All these hrs. Of learnings including IKS learning are aimed at achieving following skills sets. As the semester includes internship training the contact sessions are to be met with in 9 weeks instead of 15 weeks.

## **E. COURSE OUTCOMES (COs):**

**CEH405-1** Combined direct and bending stress.

**CEH405-2** Principal stresses and strains – analytical and graphical solution

**CEH405-3** Long columns crippling load

**CEH405-4** Fixed beam analysis for various loading cases

**CEH405-5** Continuous and non-sway portal frame analysis

**CEGH05-6** Slopes and deflections of determinate beams using Macauley's method

**Competency, course outcomes and programme outcomes/programme specific outcomes  
(cp-co-po/pso) matrix**

[Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0" ]

**F. CONTENT:****THEORY :****Section I**

Sr. No	Topics	Teaching (Hours)	Theory evaluation
<b>Course Outcome: CEH405-1 Uniaxial and Biaxial bending –analysis of column section, dams, chimney –Combined direct and bending stress</b>		<b>08</b>	<b>12</b>
<b>1</b>	1.1 Concept of direct and eccentric loads. Field examples. 1.2 Tension members and short compression members subjected to eccentric loads with eccentricity about one principal axis, stress distribution at base, maximum and minimum stresses, condition for no tension middle third rule, core of section. 1.3 Stress distribution at base of column, pillars and Chimneys of uniform section subjected to lateral wind pressure		
<b>Course Outcome : CEH405 -2 Solve problems on principal stresses analytically and graphically</b>		<b>08</b>	<b>12</b>
<b>2</b>	2.1 Definition of principal stresses and principal planes. Different states of stresses. Field examples. 2.2 Normal and tangential stresses on oblique planes of a body subjected to axial stresses. 2.3 Normal and tangential stresses on oblique planes of a body subjected to stresses acting on two mutually perpendicular planes with or without shear stress. Resultant stress on oblique plane. 2.4 Condition for oblique plane to be principal plane, principal stresses, location of principal planes. Maximum shear stresses and their planes. 2.5 Mohr's circle for stresses on oblique plane of a body subjected to various states of stresses.		
<b>Course Outcome: CEH405-3 Long columns – empirical analysis</b>		<b>08</b>	<b>10</b>
<b>3</b>	3.1 Definition of short and long columns. Classification and end conditions for effective length. radius of gyration, slenderness ratio. Field examples 3.2 Euler's formula for long column, buckling load, safe load. Assumptions and limitations 3.3 Rankine's formula and its application		
	<b>Total</b>	<b>24</b>	<b>34</b>
Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.			

**Section II**

Sr. No.	Topics	Teaching (Hours)	Theory evaluation
<b>Course Outcome: CEH405 -4 Fixed beam concept and analysis</b>		<b>06</b>	<b>10</b>
<b>4</b>	4.1. Explain the effect of fixity in the given beam section-solve from first principles using Principle of Superposition. 4.2 Calculate fixed end moments for beam subjected to the given point load- for symmetrical and unsymmetrical loading. 4.3 Determine fixed end moments for the given beam subjected to UDL over entire span by first principle. 4.4 Find end moments and reactions for fixed beam under given loading Draw S.F. and B.M. diagrms for the given fixed beam and loading.		
<b>Course outcome: CEH405 -5 Continuous Beams and Non sway Portal frames</b>		<b>12</b>	<b>16</b>
<b>5</b>	5.1 Explain the effect of continuity in the given situation. 5.2 Draw deflected shape of continuous beam subjected to given load and end conditions. 5.3 Explain Calpeyron’s theorem of three moments used for the analysis of given continuous beam –numericals for two spans and for propped cantilever.Plot SFD and BMD.. 5.4 Moment Distribution Method(M.D.M.) used for analyzing the given indeterminate beam-continuous beam and portal frames-stiffness,relative stiffness and distribution factor. 5.5 MD method to analyse given continuous beam having same M.I.for the given condition.SFD and BMD 5.6 Analyse non-sway portal frmae using MD method and plot SFD and BMD.		
<b>Course Outcome: CEH405 -6 Slope and deflection of determinate Beams</b>		<b>06</b>	<b>10</b>
<b>6</b>	6.1 Calculate the slope and deflection for a cantilever beam under given loading conditions by double integration method. 6.2 Determine the slope and deflection for a simply supported beam under given loading conditions by double integration method. 6.3 Find the slope and deflection for a cantilever beam under given loading conditions by Macaulay’s method. 6.4 Calculate the slope and deflection for a simply supported beam under given loading conditions by Macaulay’s method.		
<b>Total</b>		<b>24</b>	<b>36</b>
Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.			

**G. SLA (Self Learning Assessment)**

Self-learning/ Micro Projects: (One project to the group of 4/5 students)

- i) 2D analysis of critical points –experimental stress analysis using epoxy models ; Photo elasticity; piezo-electric method and correlating to Course outcome.
- ii) Theories of failures –all / any of the seven approaches and case studies
- iii) Structural models for behavioral studies
- iv) Column theories –Pu-Mu interaction charts
- v) Simulation studies on dams/ columns/chimneys
- vi) Elastic theorems
- vii) Statically indeterminate structures –analytics
- viii) Sway and Non-sway portal frames
- ix) Conjugate Beam method
- x) Moment area method
- xi) Staructural analysis softwares and exploration –ETABS/STAAD/ANSYS/ABACUS/NISA etc

*The assessment scheme for self-learning as per MPEC2023 norms :*

**H: Specification table for setting question paper for semester end theory examination**

Topic No.	Name of topic	Distribution of marks (level wise)			Total Marks
		Remember	Understand	Apply	
1.	Combined direct and bending stress	02	04	06	12
2.	Principal stresses and strains	02	06	06	12
3.	Long column-Euler and rankine formulae	02	02	04	10
4.	Fixed Beam	02	06	06	10
5.	Continuous and non-sway portal frame	02	04	06	16
6.	Slope and deflection of determinate beams	02	04	04	10
	<b>Total</b>	<b>12</b>	<b>26</b>	<b>32</b>	<b>70</b>

**I:-Assessment Criteria****i) Assessment of SLA: -**

Every Self-learning assignment/microproject shall be assessed for 25 marks as per Following criteria

Sr.no	Criteria	Marks allotted
1	Attendance/periodic assessment	05
2	Preparedness –write up/inference /scope	05
3	Presentation (neat figures/ diagrams/ tables/ graphs etc.)	05
4	Conclusion / application	05
5	Oral Based on microproject/ assignment/ activity	05
		<b>25</b>

**J. Instructional Methods:**

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration

**K. Teaching and Learning resources:**

1. Chalk board
2. LCD presentations
3. Field visit to RMC
4. Demonstrative charts
5. Question Bank
6. Digital learning resources -NPTEL,Swayam

**L. REFERENCE BOOKS**

a) Book / journals / IS code

SNo.	AUTHOR	TITLE	PUBLISHER
1.	C. K. Wang	Statically indeterminate structures	Mc-Graw Hill international book company
2.	C. S. Reddy	Basic Structural analysis	Mc Graw Hill Education India
3	Vazirani , Ratwani and SK Duggal	Analysis of Structures Vol I & II	Khanna publishers
4	S. Timoshenko & DH young	Theory of structures	Mc-Graw Hill international book company
5	S. Ramamrutham	Theory of structures	Khanna Publishers
6	B.C. Punmia,Ashok Jain & arun Jain	Analysis of structures	S. Chand and company

**M. Learning Website & Software**

**Websites :**

- <http://www.ansys.com>
- <http://www.bentley.com>

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**COURSE NAME : INTERNSHIP (16 WEEKS)**  
**COURSE CODE : CCH505**  
**COURSE ABBREVIATION: HINP**

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	--	10
	Tutorial Learning		
	Laboratory Learning		
	SLH-Self Learning		
	NLH-Notional Learning		

**B. ASSESSMENT SCHEME: -**

PAPER DURATION	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
	FA- TH	SA- TH	TOTAL		Practical				MAX	MIN	
NIL	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN			200
	NIL	NIL	NIL	NIL	100	40	100#	40	-	-	

*Note: Students have to register for Internship with the help of Govt. agency such as BOAT (Board of Apprenticeship Training.*

*Students have to register Credits for Industrial Training are in-line of guidelines of NCrf : The industrial training is of 16 weeks considering 36-40 hours per week engagement of students (as per Guidelines of GR of Maharashtra Govt.) under Self Learning with guidance of industry supervisor / Mentor.*

**C. ABBREVIATIONS: -**

CL- Classroom Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH- Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

**Legends:** @ Internal Assessment, # External Assessment, \*# on Line Examination, @\$ Internal Online Examination.

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
  2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
  3. If candidate is not securing minimum passing marks in SLA of any course, then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
  4. Notional Learning hours for the semester are (CL+LL+TL+SL) hrs.\* 15 Weeks
  5. 1(one) credit is equivalent to 30 Notional hrs.
  6. \* Self learning hours shall not be reflected in the Time Table.
- \* Self learning includes micro project / assignment / other activities

## D. I. RATIONALE: -

Globalization has prompted organizations to encourage skilled and innovative workforce. Internships are educational and career development opportunities, providing practical/ hands-on experience in a field or discipline. Summer internship is an opportunity for students to get accustomed to modern industry practices, apply the knowledge and skills they've acquired in the classroom to real-world situations and become familiar with industry environments before they enter the professional world. Keeping this in mind, industrial training is incorporated to all diploma programmes as it enables the student to get equipped with practical skills, soft skills and life skills

### ii. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

**Apply skills and practices to industrial processes.**

## E. COURSE LEVEL LEARNING OUTCOMES (COS)

**CCH505.1:** Observe time/resource management and industrial safety aspects.

**CCH505.2:** Acquire professional experience of industry environment.

**CCH505.3:** Prepare report of assigned activities and accomplishments.

## COMPETENCY, COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX

[ Note: Correlation levels: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “-”:no correlation]

Competency and COs	Programme Outcomes POs and PSOs								
	PO 1 Basic and discipline specific knowledge	PO 2 Problem analysis	PO 3 design/ development of solutions	PO 4 Engineering Tools, experiment and testing	PO 5 Engineering practice for society, sustainability and environment	PO 6 Project management	PO 7 Life-long learning	PSO1	PSO2
Competency:	2	-	-	-	-	3	-	1	2
CCH505.1	2	-	-	1	-	1	1	1	2
CCH505.2	2	-	1	1	-	2	1	1	2
CCH505.3	1	-	-	2	-	2	-	1	2

## F. GENERAL GUIDELINES FOR ORGANIZING INDUSTRIAL TRAINING

The industry /organization selected for Industrial training/ internships shall be Government /Public Limited / Private limited / Startup /Centre of Excellence/ Skill Centers/ Skill Parks etc.

**Duration of Training** - 16 weeks students engagement time

**Period of Time slot** - Between 4th and 5th semester (16 weeks)

**Industry area** - Engineering Programme Allied industries of large, medium or small-scale, Organization/Govt./ Semi Govt Sectors.

## G. ROLE(S) OF DEPARTMENT AT THE INSTITUTE:

Following activities are expected to be performed by the concerned department at the Polytechnics.  
Table of activities to be completed for Internship

S. N	Activity	Suggested Schedule WEEKS
1	Collection of information about industry available and ready for extending training with its offered capacity of students (Sample Format 1)	10 <sup>th</sup> to 12 <sup>th</sup> week of 4 <sup>th</sup> Semester
2	Allocations of Student and Mentor as per availability (Mentor: Student Ratio (1:15))	13 <sup>th</sup> week of 4 <sup>th</sup> semester
3	Communication with Industry and obtaining its confirmation Sample letter Format	14 <sup>th</sup> week of 4 <sup>th</sup> semester
4	Securing consent letter from parents/guardians of students (Sample Format 2)	15 <sup>th</sup> week of 4 <sup>th</sup> semester
5	Enrollment of Students for industrial training (Format 3)	Before 12 <sup>th</sup> week of 4 <sup>th</sup> semester
6	Issue of letter to industry for training along with details of students and mentor (Format 4)	After 4 <sup>th</sup> Semester
7	Organize Internship Orientation session for students	After completion of 4 <sup>th</sup> semester exam
8	Progressive Assessment of industry training by Mentor	Each week during training period
9	Assessment of training by institutional mentor and Industry mentor	5 <sup>th</sup> Semester ESE

### Suggestions-

- Department can take help of alumina or parents of students having contact in different industries for securing placement.
- Students would normally be placed as per their choices, in case of more demand for a particular industry, students would be allocated considering their potentials. However, preference for placement would be given to students who have arranged placement in company with the help of their parents or relatives.
- Principal/HOD/Faculty should address students about industrial safety norms, rules and discipline to be maintained in the industry during training before relieving students for training.
- The faculty members during the visit to industry or sometimes through online mode will check the progress of the student in the training, student attendance, discipline, and project report preparation each week.

## **H. ROLES AND RESPONSIBILITIES OF STUDENTS:**

1. Students may interact with the mentor to suggest choices for suitable industry, if any. If students have any contact in industry through their parents or relatives, then the same may be utilized for securing placement for themselves and their peers.
2. Students must fill the forms/formats duly signed by institutional authorities along with a training letter and submit it to a training officer/mentor in the industry on the first day of training.
3. Students must carry with him/her Identity card issued by the institute during the training period.
4. Students should follow industrial dressing protocols, if any. In absence of specific protocol students must wear college uniform compulsorily.
5. Students will have to get all necessary information from the training officer/mentor at industry regarding schedule of training, rules and regulation of the industry and safety norms to be followed. Students are expected to observe these rules, regulations and procedures.
6. Students must be fully aware that if they disobey any rule of industry or do not follow the discipline then non- disciplinary action will be taken.
7. Students must maintain a weekly diary (Format 6) by noting daily activities undertaken and get it duly signed from industry mentor or Industrial training in charge.
8. In case students face any major problems in industry such as an accident or any disciplinary issue then they should immediately report the same to their mentor at the institute.
9. Prepare a final report about the training for submitting to the department at the time of presentation and viva- voce and get it signed from a mentor as well as industry training in charge.
10. Students must submit the undertaking as provided in Format 5.

## **I. TYPOGRAPHICAL GUIDELINES FOR INDUSTRY TRAINING REPORT**

1. Following is the suggestive format for preparing the training report. Actual report may differ slightly depending upon the nature of industry. The training report may contain the following
2. The training report shall be computer typed (English- British) and printed on A4 size paper.
3. Text Font -Times New Roman (TNR), Size-12 point
4. Subsection heading TNR- 12 point bold normal
5. Section heading TNR- 12 capital bold
6. Chapter Name/ Topic Name – TNR- 14 Capital
7. All text should be justified. (Settings in the Paragraph)
8. The report must be typed on one side only with double space with a margin 3.5 cm on the left, 2.5 cm on the top, and 1.25 cm on the right and at bottom.
9. The training report must be hardbound/ Spiralbound with a cover page in black color. The name of the candidate, diploma (department), year of submission, name of the institute shall be printed on the cover.
10. The training report, the title page should be given first then the Certificate followed by the acknowledgment and then contents with page numbers.

## **J. FORMAT OF INDUSTRIAL TRAINING REPORT**

Following format may be used for training report. Actual format may differ slightly depending upon the nature of Industry/ Organization.

- Title Page
- Certificate
- Abstract
- Acknowledgement
- Content Page

Chapter 1	Organization structure of Industry and general layout.
Chapter 2	Introduction to Industry / Organization (history, type of products and services, turnover and number of employees etc.)
Chapter 3	Types of Major Equipment/raw materials/instruments/machines/hardware/software used in industry with their specifications, approximate cost, specific use and routine maintenance done
Chapter 4	Processes/ Manufacturing techniques and methodologies and material handling procedures
Chapter 5	Testing of Hardware/Software/ Raw materials/ Major material handling product (lifts, cranes, slings, pulleys, jacks, conveyor belts etc.) and material handling procedures.
Chapter 6	Safety procedures followed and safety gears used by industry.
Chapter 7	Details of Practical Experiences in Industry/Organization if any in Production/Assembly/Testing/Maintenance
Chapter 8	Detailed report of the tasks undertaken (during the training).
Chapter 9	Special/challenging experiences encountered during training if any (may include students liking & disliking of workplaces).
Chapter 10	Conclusion
Chapter 11	References / sources of information

## K. LEARNING STRATEGIES DURING TRAINING AT INDUSTRY

Students should visit the website of the industry where they are undergoing training to collect information about products, processes, capacity, number of employees, turnover etc.

They should also refer to the handbook of the major machines and operations, testing, quality control and testing manuals.

L. Table - Distribution of End-Semester-Examination (ESE) marks of Industrial Training

Internal Examiner			External Examiner	Total ESE marks
Marks for Industrial Training Report	Marks for Seminar/Presentation	Marks for Oral/Viva-voce		
25	25	25	25	100

**Format-1**

(To be obtained on Company's Letter Head)

Collecting Information about Industry/Organization available for training along with capacity

- 1) Name of the industry/organization:
- 2) Address/communication details with email:
- 3) Contact person details:
  - a) Name:
  - b) Designation:
  - c) Email
  - d) Contact number/s:
- 4) Type:
  - a) Govt / PSU / Pvt /
  - b) Large scale / Medium scale / Small scale
- 5) Products/Services offered by industry:
- 6) a. Whether willing to offer Industrial training facility during June to August for Diploma in Engineering students: Yes / No.
  - a) If yes, whether you offer 16 weeks training: Yes/No
  - b) Possible Industrial Capacity:

Students	Programme name						Total
	Civil	Mechanical	Electrical	Information Technology	Metallurgy	Electronics & Telecommunication	
Male							
Female							
Total							

- 7) Whether accommodation available for interns Yes / No. If yes capacity: \_\_\_\_\_
- 8) Whether internship is charged or free:
 

If charged please specify amount per candidate: \_

Seal and signature of responsible person at Industry:

**Format-2**

(Obtaining Consent Letter from parents/guardians)

To,  
The principal,  
Government Polytechnic, Kolhapur .

Subject: Consent for Industrial Training.

Respected Sir,

I am fully aware that -

- i. My ward studying in fourth semester at Government Polytechnic, Kolhapur , has to undergo 16 weeks of Industrial training for partial fulfillment towards completion of Diploma in \_\_\_\_\_
- ii. For this fulfillment he/she has been deputed at \_\_\_\_\_ industry, located at-----  
for Industrial training /internship for the period from \_\_\_\_\_ to \_\_\_\_\_.

~~With respect to above~~ I give my full consent for my ward to travel to and fro from the mentioned industry.

Further I undertake that –

- a. My ward will undergo the training at his/her own cost and risk during training and/or stay.
- b. My ward will be entirely under the discipline of the organization where he/she will be placed and will abide by the rules and regulations in face of the said organization.
- c. My ward is NOT entitled to any leave during the training period.
- d. My ward will regularly submit a prescribed weekly diary, duly filled and countersigned by the training supervisor of the organization to the mentor faculty of the polytechnic.

I have explained the contents of the letter to my ward, who has also promised to adhere strictly to the requirements. I assure that my ward will be properly instructed to take his own care to avoid any accidents/injuries in the industry. In case of any accident neither industry nor the institute will be held responsible.

Signature :

Name : \_\_\_\_\_

Address : \_\_\_\_\_

Phone Number : \_\_\_\_\_



**Format-4**

(Issue Letter to the Industry/Organization for the training along with details of students and mentors on Institute Letter Head)

To,  
The HR Manager,

---

---

**Subject:** Placement for Industrial training of 16 weeks in your organization

**Reference:** Your consent letter no \_\_\_\_\_.

Sir,

With reference to the above we are honored to place the following students from this institute for Industrial training in your esteemed organization as per the arrangement arrived .

The purpose of this training is to equip the student with some essential skills relevant to the demands of the industry and world of work, as well as to provide exposure to the professional environment and work culture. It is hoped that this training may enhance his/her employability and livelihood opportunities. In view of the above, we kindly request your support in facilitating this Industrial Training for the student. He/she has been adequately oriented and guided on the expectations of this training, including the maintenance of a daily diary during the training period.

Additionally, the institute has secured the necessary consent and undertaking from the parent/guardian regarding the guidelines for exit training. In view of all the above industry shall refrain from involving students into the mundane and housekeeping activities. Your cooperation in this regard will be highly appreciated.

Diploma programme in \_\_\_\_\_

<b>Sr. No.</b>	<b>Roll No.</b>	<b>Name of Student</b>	<b>Name and designation of Mentor</b>
1.			
2.			

Kindly extend all possible cooperation to the students for above. Thanking you.

Yours Sincerely,

Principal  
Government Polytechnic, Kolhapur

CC- Mentor.

---

**Format-5**

(Undertaking by the students)

To  
The Principal,  
Government Polytechnic, Kolhapur

Subject: Undertaking regarding Placement for Industrial training of 16 weeks duration.

I Mr./Ms. \_\_\_\_\_ Roll No: \_\_\_\_\_  
Son/Daughter of \_\_\_\_\_ studying in  
\_\_\_\_\_ department at your Institute, am fully aware of the  
Industrial Training requirement and related responsibilities and participation in the  
\_\_\_\_\_ Industrial training from: \_\_\_\_\_ To \_\_\_\_\_. I  
assure you that I will be of good behavior and be obedient to the staff and mentor during the  
Industrial training. I will also abide and will not participate in all activity. I will also discipline  
myself within the rules and regulations of the Institution. I am also aware that I am participating  
in the Industrial Training at my own risk and I will not hold the Institute responsible in any way  
in any eventuality namely Accident  
/Injury/death or whatever mishap and I myself will be solely responsible for my safety.

Place:Kolhapur

Date:

Signature of the student

# GOVERNMENT POLYTECHNIC, KOLHAPUR

## Evaluation Sheet for Formative Assessment of Internship

Academic Year:

Department: Electrical Engineering

Semester: V

Course – Internship

Course Code - CCH505

Name of Coordinator:

Enrollment No	Name of Student	Marks (5 marks each week) by Mentor & Industry Supervisor jointly																PA Marks by Mentor faculty (20 Marks) [B]	Total [Marks] 100 [A]+[B]							
		WK 1	WK 2	WK 3	WK 4	WK 5	WK 6	WKN 7	WK 8	WK 9	WK 10	WK 11	WK 12	WK 13	WK 14	WK 15	WK 16			Total [80 Marks] [A]						

*Name and Designation of Mentor*

*Name and Designation of Industry Supervisor*

The faculty should visit the Industry at least for four times Online /Off line mode and He will give Marks for 4 Times Quarterwise. [Mentor will give marks 4 times ( 5 marks each time ) and total of 20 marks]

### EVALUATION BY MENTOR

Sr No.	Roll No	Quarter 1 Marks Out Of 5 By mentor	Quarter 2 Marks Out Of 5 By mentor	Quarter 3 Marks Out Of 5 By mentor	Quarter 4 Marks Out Of 5 By mentor	Average of column

**Week 1: From \_\_\_\_\_ To \_\_\_\_\_**

<b>Day</b>	<b>Activities carried out</b>	<b>Remark</b>
<b>1</b>		
<b>2</b>		
<b>3</b>		
<b>4</b>		
<b>5</b>		
<b>6</b>		

Signature of Mentor : \_\_\_\_\_

Signature of Industrial Supervisor : \_\_\_\_\_

**The same format need to follow for every week of the industrial training.**

**COURSE NAME : PROJECT**  
**COURSE CODE : CEH407**  
**COURSE ABBREVIATION : HPRJ**

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	-	2
	Tutorial Learning	-	
	Laboratory Learning	04	
	SLH-Self Learning	02	
	NLH-Notional Learning	06	

**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY			BASED ON LL&TL				BASED ON SLA		TOTAL	
	FA-TH	SA-TH	TOTAL	Practical		MAX	MIN				
--	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	100
	-	-	-	-			50#	20	50	20	

**C:** Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA - Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment  
Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination  
Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 6 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

## D. i) RATIONALE:-

This course is intended to understand facts, concepts and techniques of electrical equipment in order to troubleshoot and repair. The student will be able to develop the skill of cost estimation, procurement, fabrication, manufacture, test, and install of various components used in the electrical field. This will help the student to acquire skills and attitudes so as to do the function of supervisor in industry and also can start his/her own small scale enterprise.

## ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the student to attain the following industry identified outcome through various learning experiences:

1. Carry out the selected project work as a group member.

## E. COURSE LEVEL LEARNING OUTCOMES (COS)

CEH407-1 Plan and identify materials, processes and other resources optimally.

CEH407-2 Develop innovative and creative idea.

CEH407-3 Develop leadership, interpersonal skill and team work.

CEH407-4 Develop sense of environmental responsibility.

CEH407-5 Purchase raw material/standard parts and interpret the drawings, Construction, assemble, inspect & if necessary modify the parts/unit/assembly of the project work.

CEH407-6 Prepare a structured report.

### Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/ps) matrix

[ Note: Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0"

Competency and Cos	Programme Outcomes POs and PSOs								
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 Maintain various types of electrical equipments	PSO2 Maintain various sections of electrical power systems
CEH407-1 Plan and identify materials, processes and other resources optimally.	3.00	1.00	1.00	1.00	-	1.00	3.00	3.00	3.00
CEH407-2 Develop innovative and creative idea	3.00	3.00	3.00	2.00	-	1.00	2.00	3.00	3.00
CEH407-3 Develop leadership, interpersonal skill and team work.	-	--	-	-	2.00	2.00	-	3.00	3.00
CEH407-4 Develop	2.00	-	-	1.00	2.00	-	-	-	-

Competency and Cos	Programme Outcomes POs and PSOs								
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 Maintain various types of electrical equipments	PSO2 Maintain various sections of electrical power systems
sense of environmental responsibility.									
CEH407-5 Purchase raw material/standard parts and interpret the drawings, manufacture, assemble, inspect & if necessary modify the parts/unit/assembly of the project work.	1.00	1.00	-	1.00	-	-	-	3.00	3.00
CEH407-6 Prepare a structured report.	2.00	1.00	1.00	1.00	-	2.00	2.00	3.00	3.00

## F. CONTENT:-

Sr. No.	Topics/ Subtopics
CO: CEH407-1 Plan and identify materials, processes and other resources optimally.	
1	1.1 Literature survey 1.2 Project identification
CO: CEH407-2 Develop innovative and creative idea.	
2	2.1 Initial Design
CO: CEH407-3 Develop leadership, interpersonal skill and team work.	
3	3.1 Project Design
CO: CEH407-4 Develop sense of environmental responsibility.	
4	4.1 Identify impact of project on society and environment, if implemented in large scale.
CO:CEH407-5 Purchase raw material/standard parts and interpret the drawings, manufacture, assemble, inspect & if necessary modify the parts/unit/assembly of the project work.	
5	5.1 Project implementation 5.2 Project testing 5.3 Project installation or commissioning
CO: CEH407-6 Acquire knowledge and latest changes in technology.	
6	6.1 Report writing and presentation

## G. Self-Learning Activities for Diploma Project Course

During the course of the project, several self-learning activities were undertaken to develop technical knowledge, practical skills, and project management

abilities. These activities help enhance student understanding of the project domain and supported independent problem-solving. The key self-learning areas are summarized below:

1. **Understanding Project Background:**
  - Study similar projects, case studies, and past reports to understand the problem and solution approach.
2. **Tool and Software Learning:**
  - Learn essential tools such as, AutoCAD, Revit, and Excel through online tutorials and practice.
3. **Component Study and Selection:**
  - Gain knowledge of Building components by reading drawings and other specifications.
4. **Study and Simulation:**
  - Practice learning tool and simulation tools to validate project ideas before physical implementation.
5. **Practical Skill Development:**
  - Improve hands-on skills such as Drawing, Estimation of quantities, and costing, surveying, field measurements.
6. **Data Analysis and Testing:**
  - Learn to collect and analyze project-related data, conduct basic testing, and interpret results for system improvement.
7. **Report Writing and Documentation:**
  - Understood the structure and format of technical project reports, including proper formatting, flowcharts, and referencing.
8. **Presentation and Communication Skills:**
  - Practice delivering project presentations and responding to viva questions by studying sample videos and mock sessions.
9. **Time and Team Management:**
  - Develop task schedules, allocated responsibilities, and monitored project milestones using planning tools like Gantt charts.

## H. Assessment Criteria

### i) Formative Assessment of Project Work :-

Sr. No.	Evaluation Criteria	Marks
1.	Literature survey/review	5
2.	Project identification	5
3.	Initial design/ synopsis	5
4.	Detailed design	10
5.	Project implementation	5
6.	Project testing and installation	10
7.	Report writing	5
8.	Presentation	5
<b>Total</b>		<b>50</b>

### ii) Summative Assessment of Practical :

Sr.no	Criteria	Marks
1	Project demonstration & execution	20

2	Project presentation	20
3	Contribution in project	20
4	Subject knowledge	20
5	Question & answer	20
<b>Total</b>		<b>100</b>

**I. Instructional Methods:**

- a. Discussions.
- b. Industrial visits.
- c. Time bound assignments and work.
- d. Project Exhibition
- e. Mock presentation of project

**J. Teaching and Learning resources:**

1. Problem identification methods
2. Resources required for the study
3. Networking and market study
4. Softwares
5. Drawing
6. Other equipment as per the need of the project
7. Simulation tools
8. Computer

**K. Reference Books:**

1. Project related reference books.
2. Various electrical and electronics journals.
3. Company handbooks.

**L. Learning Website & Software**

- i. [www.nptel.iitm.ac.in](http://www.nptel.iitm.ac.in)
- ii. [http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-867-machine learning-fall-2006/](http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-867-machine-learning-fall-2006/)
- i. <http://www.indiabix.com/online-test/electrical-engineering-test/143>

**M. Guidelines for report writing**

**Arrangement of Contents:**

1. Cover Page or Title Page
2. Declaration
3. Certificate by Guide
4. Acknowledgment
5. Preface
6. List of Symbols
7. List of Abbreviations
8. List of Tables
9. List of Figures

10. Table of Contents
11. Abstract
12. Introduction
13. Review of literature
14. Research Methodology
15. Data Analysis & Finding
16. Suggestion & Conclusion
17. Bibliography
18. Appendix

**Paper & Typing dimension :**

Page : A4 (ON ONE SIDE)

Margin : TOP 15mm

: BOTTOM 15mm

: RIGHT 15mm

: LEFT 30mm

Font : Times New Roman

Size : 12 points (expect the cover page, title page, headings and titles)

Spacing between lines: 1.15 (expect the change in paragraph, cover page, title page, headings and titles)

Header : Title of the project & Academic Year

Footer : Short name of institute, page number (on left side)

**COURSE ID:****Course Name : ENTREPRENEURSHIP AND START-UPS****Course Code : CCH501****Course Abbreviation : HESU****A. LEARNING SCHEME:**

Scheme component	Actual Contact Hours / week	Credits
Classroom Learning (CL)	02	1
Tutorial Learning (TL)	-	
Laboratory Learning (LL)	02	
Self-Learning Hours (SLH)	00	
Notional Learning (NLH)	04	

**B. ASSESSMENT SCHEME:**

PAPER DURATION IN HRS	Theory				Based on LL & TL				Based on Self Learning		Total Marks
	FA-TH	SA-TH	Total		Practical				SLA		
			Max	Min	FA-PR	SA-PR		Max	Min		
-	-	-	-	-	50	20	25@	10			75

**(Total IKS Hrs for Sem: 1 Hrs)****C. ABBREVIATIONS:**

CL- Classroom Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

**Legends:** @ Internal Assessment, # External Assessment, \*# On Line Examination, @\$ Internal Online Examination

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course, then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL) hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all 5 assignments here in tabular format)

## D. i) RATIONALE:

Globalization, liberalization and Privatization along with revolution in information technology have opened up new opportunities transforming lives of masses. In this context, there is an immense opportunity of establishing manufacturing, service, trading, marketing and consultancy enterprises by diploma engineer. Our fast-growing economy provides ample scope for diploma engineers to succeed as an entrepreneur. Entrepreneurship requires distinct skill sets which are attempted to be developed through this course. To begin with, this course aims to develop the competency and the related outcomes in order to start small enterprises.

## i) INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the student to attain the following industry identified outcome through various learning experiences:

- 1) Understanding and applying business principles and labor laws.
- 2) Improved business skills, imagination and planning of enterprise.

## E. COURSE LEVEL LEARNING OUTCOMES (CO'S)

**CCH501-1:** Identify entrepreneurial attributes

**CCH501-2:** Identify the business opportunities that suits you

**CCH501-3:** Use the support systems to zero down to your business idea.

**CCH501-4:** Develop comprehensive business plans.

**CCH501-5:** Prepare plans to manage the enterprise effectively.

### Competency, course outcomes and programme outcomes/programme specific outcomes (CP-CO-PO/PSO) matrix

[ Note: Correlation levels: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0"]

Competency and Cos	Programme outcome POs and PSO's								
	PO 1 Basic and discipline specific knowledge	PO 2 Problem analysis	PO 3 Design/ development of solutions	PO 4 Engineering tools, experimentation & testing	PO 5 Engineering practices for society, sustainability and environment	PO 6 project management	PO 7 Life-long learning	PSO 1 Work in Mfg & service sector	Ps 2 Start entrepreneurial activity
<b>Competency</b>									
CCH501-1	2	2	2	-	-	3	2	-	3
CCH501-2	2	2	2	2	-	3	2	-	3
CCH501-3	2	2	2	2	-	3	2	-	3
CCH501-4	2	2	2	2	-	3	2	-	3
CCH501-5	2	2	2	2	-	3	2	-	3

## F. CONTENT:

### i) *Practical exercises*

The practicals in these sections are the sub components of the COs to be developed and assessed in the students for the attainment of the competency:

Sr. No.	Practical Outcomes (PrOs)	Relevant CO	Approx Hrs. Required
1	Submit a profile summary (about 500 words) of a successful entrepreneur indicating milestone achievement.	1	02*
2	Undertaking SWOC analysis to arrive at your business idea of a product / service.	1	02
3	Survey industries of your stream; grade them according to the level of scale of production, investment, turnover, pollution to prepare a report on it.	2	02
4	Visit a bank/Financial institution to enquire about various funding schemes for small scale enterprise.	2	02*
5	Collect loan application forms of national banks/other financial institutions.	2	02*
6	Compile the information from financial agencies that will help you set up your business enterprise.	3	02*
7	Compile the information from government agencies that will help you set up your business enterprise.	3	02*
8	Prepare Technological feasibility report of a chosen product/service.	3	02*
9	Prepare a set of short term, medium- and long-term goals for starting a chosen small-scale enterprise.	3	02*
10	Prepare marketing strategy for your chosen product/service.	4	02*
11	Compile the information about insurance schemes covering different risk factors.	4	02
12	Find the breakeven point for the business idea chosen by you.	4	02
13	Prepare a business plan for your chosen small-scale enterprise.	5	02*
14	Organize funfair for your class and write report of profit/loss.	5	02
15	Visit report of any industry: Brief history, types and details of services/support assistance being given, any other information which is useful to self-employer/entrepreneur.	5	02

A judicial mix of minimum 12 or more practical need to be performed, out of which, the Practicals marked as ‘\*’ are compulsory.

ii) THEORY

Sr. No.	Topics / Sub-topics	Lectures (Hours)
1	<p><b>Entrepreneurship Development- Concept and Scope</b></p> <p>1.1 Concepts and Overview of Entrepreneurship. Evolution and Growth of Entrepreneurship in India. Role of Entrepreneurship in Economic Development. Entrepreneurship as a career.</p> <p>1.2 Traits of successful intrapreneur / entrepreneur: Consistency, creativity, initiative, independent decision making, assertiveness, persuasion, persistence, information seeking,</p> <p>1.3 Entrepreneurship: Scope in local and global market.</p> <p>1.4 Intrapreneur and entrepreneur.</p> <p>1.5 Types of enterprises and their features: Manufacturing, Service and trading.</p> <p>1.6 Steps in Setting up of a business</p>	03
2	<p><b>Entrepreneurial Opportunities and Selection Process:</b></p> <p>2.1 Product / Service selection: Process, core competence, product / service life cycle, new product / service development process, mortality curve, Creativity and innovation in product / Service modification / development.</p> <p>2.2 Process selection: Technology life cycle, forms and cost of transformation, Factors affecting process selection, Location for an industry, Material handling.</p> <p>2.3 Market study procedures: Questionnaire design, sampling, Market survey, Data analysis</p> <p>2.4 Getting information from concerned stake holders such as Maharashtra Centre for Entrepreneurship Development (MCED), National Institute for Micro, Small and Medium Enterprises (NI-MSME, Prime Minister Employment Generation Program (PMEGP), Directorate of Industries (DI), Khadi Village Industries Commission (KVIC).</p>	04
3	<p><b>Support Systems:</b></p> <p>3.1 Categorization of MSME, Ancillary Industries.</p> <p>3.2 Support System-Government Agencies: MCED, NI- MSME, PMEGP, DI, KVIC.</p> <p>3.3 Support agencies for entrepreneurship guidance, training, registration, technical consolation, technology transfer and quality control, marketing and finance</p> <p>3.4 Breakeven point, return of investment and return on sales.</p>	03
4	<p><b>BUSINESS PLAN PREPARATION:</b></p> <p>4.1 Sources of Product for Business: Feasibility study.</p> <p>4.2 Ownership, Capital, Budgeting, Matching Entrepreneur with the project, Feasibility report preparation and evaluation criteria.</p> <p>4.3 Business plan preparation.</p>	03
5	<p><b>Managing Enterprise:</b></p> <p>5.1 Unique Selling proposition (U.S.P.): Identification, Developing a marketing plan.</p> <p>5.2 Preparing Strategies of handling Business: Policy making, negotiation and bargaining techniques.</p> <p>5.3 Risk management: [planning for calculated risk taking, initiation with low-cost projects, integrated futuristic planning, angel investors, venture capitalist.</p> <p>5.4 Incubation centres: Role and procedure.</p>	03

## G. SUGGESTED MICRO PROJECTS / ASSIGNMENTS/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING) UNDER SLA

*\*Complete any five assignments mentioned below or any one microproject or activity given by subject teacher.*

Other than the classroom and laboratory learning, following are the suggested student related Co-curricular activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare report of about 5 pages for each activity, also collect/record physical evident for their (student's) portfolio which will be useful for their placement interviews:

1. Download product development and innovative films from internet.
2. Prepare collage for "Traits of Successful entrepreneurs"
3. Identify your hobbies and interests and convert them into business idea.
4. Convert your project work into business.
5. Decide any product and analyze its good and bad features.
6. Choose any product and study its supply chain.
7. Visit industry exhibitions, trade fairs and observe nitty-gritty of business.
8. Perform a survey and identify local resources available for setting up of an enterprise.
9. Conduct a market survey for a project. Collect data on, manpower requirement, wages, raw material requirement, New construction materials specification, competitor's product price, features, dealer commissions, and marketing mix.
10. Prepare a business plan and organize a business plan competition.

## H. ASSESSMENT CRITERIA:

### *i) Formative Assessment of Practical: -*

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Observation and recording	10
Affective	Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

### *ii) Summative Assessment of Practical:*

Every practical assignment shall be assessed for 25 marks as per following criteria:

Sr.no	Criteria	Marks allotted
1	Understanding	05
2	Self-learning ability	05
3	Lateral and Creative thinking	05
4	Conversion of Idea into Business plan	10
<b>TOTAL</b>		<b>25</b>

### *iii) Assessment of SLA: -*

Every Self-learning assignment shall be assessed for 25 marks as per following criteria:

Sr.no	Criteria	Marks allotted
1	Punctuality	05
2	Presentation (neat figures/ drawing etc.)	05
3	Market Survey / Data collection	10
4	Team work	05
	<b>TOTAL</b>	<b>25</b>

## I. INSTRUCTIONAL METHODS:

- 1 Lectures cum Demonstrations,
- 2 Class room practices.
- 3 Use of projector and soft material for demonstration

## J. TEACHING AND LEARNING RESOURCES:

Chalk board, Power Point presentations and Demonstrative kits.

## K. REFERENCE BOOKS:

Sr. No.	Title of Books	Author	Publication
1	The entrepreneurial Instinct: How Everyone Has the Innate Ability to Start a Successful Small Business.	Mehta, Monica	McGraw-Hill Education, New Delhi, 2012, ISBN 978-0-07-179742-9
2	Entrepreneurship	Hisrich R. D.	McGraw-Hill Education, New Delhi, 2013, ISBN-13: 978-1259001635
3	Part I Readings in Entrepreneurship Education	Sareen S.B.	Entrepreneurship Development Institute of India (EDI), GOI, Ahmedabad, 2016; ISBN: 978-0078029169
4	Reading Materials of Entrepreneurship Awareness Camp	Gujral, Raman	Entrepreneurship Development Institute of India (EDI), GOI, Ahmedabad
5	Product Design and manufacturing	Chitale A.K.	PHI Learning, New Delhi, 2014; ISBN: 9788120348738
6	Entrepreneurship Development Small Business Entrepreneurship	Charantimath, Poornima	Pearson Education India, New Delhi; ISBN: 9788131762264
7	Entrepreneurship Development: Special Edition for MSBTE	CPSC, Manila	Tata McGraw Hill, New Delhi
8	Entrepreneurship Development Small Business Management	Khanka S. S.	S. Chand and sons, New Delhi, ISBN: 978-93-5161-094-6
9	Entrepreneurship Development	S. Anil Kumar	New Age International, New Delhi, ISBN: 9788122414349

#### **L. LEARNING WEBSITE & SOFTWARE: -**

1. <http://www.mced.nic.in/UdyojakSpecial.aspx?linktype=Udyojak>
2. <http://www.mced.nic.in/allproduct.aspx>
3. <http://www.mced.nic.in/Publications.html>
4. <http://niesbud.nic.in/docs/1standardized.pdf>
5. <http://www.entrepreneur.com/lists>
6. <http://www.nabard.org/content1.aspx?id=23andcatid=23andmid=530>
7. <http://www.nabard.org/Tenders.aspx?cid=501andid=24>
8. <http://www.nabard.org/content1.aspx?id=8andcatid=8andmid=488>
9. <http://www.businesstoday.in/markets>
10. [http://www.startupindia.gov.in/pdf/file.php?title=Sartup%20India%20Action%20Planandtype=Actionandq=Action%20Plan.pdfandcontent\\_type=Actionandsubmenupoint=action](http://www.startupindia.gov.in/pdf/file.php?title=Sartup%20India%20Action%20Planandtype=Actionandq=Action%20Plan.pdfandcontent_type=Actionandsubmenupoint=action)
11. <http://www.ediindia.org/institute.html>
12. <http://www.ediindia.org/centres.html>
13. <http://www.ediindia.org/publication.html>
14. <http://www.entrepreneur.com/article/247574>
15. <http://www.nstedb.com/index.html>
16. <http://www.nstedb.com/training/training.html>
17. <http://www.tatasocial-in.com/project-exposure>
18. <http://www.dcmsme.gov.in/schemes/TEQUPDetail.html>
19. <http://small.sidbi.in%20/thinking-starting-business/big-list-business-ideas-small-business>
20. <http://smallb.sidbi.in/entrepreneurship-stage/thinking-entrepreneurship>
21. [http://www.archive.india.gov.in/business/Industry\\_services/illustrative.php](http://www.archive.india.gov.in/business/Industry_services/illustrative.php)
22. <http://www.nsic.co.in/SCHSERV.ASP>

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**COURSE ID : HROB**  
**COURSE NAME : Robotics & Automation**  
**COURSE CODE : CEH408**  
**COURSE ABBREVIATION : HROB**

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	00	1
	Tutorial Learning	00	
	Laboratory Learning	02	
	SLH-Self Learning	02	
	NLH-Notional Learning	06	

**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Practical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
00	00	00	00	00	25	10	00	00	25	10	50

**(Total IKS Hrs for Sem : 00 Hrs)**

**C:** Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 9 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)



Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 Plan and Design	PSO2 Construction and Maintenance	PSO3 Problem solving on field
Maintain industrial robot		1	1	1	1	1	1	1	1	2
CEH408 -6 CO-6 Program robot for given application.		1	1	1	1	1	1	1	1	2

## F. CONTENT:-

### I) Practical exercises –

Sr.no	Practical title	Duration Hrs	COs
1.	Introduction to Industrial robotics and safety	0.5	
2.	Robot installation and control panel wiring	0.5	
3.	Demonstration of Tech pendant	0.5	
4.	Operate robot for basic motions using teach pendant	0.5	
5.	Demonstration of motor and drive	0.5	
6.	Demonstration of pneumatic system	0.5	
7.	Interfacing of end effectors	0.5	
8.	Interfacing of Sensors	0.5	
9.	Introduction to microcontroller and PLC	0.5	
10.	Interfacing of microcontroller and PLC with Industrial robot.	0.5	
11.	Robot programming basic- Basic robot program Instructions Move, point, wait, set, If, Else, Loop, HALT, JUMP	0.5	
12.	Robot programming for conditional Statements.	0.5	
13.	Industrial robot program for Merged movements circular and Arc arc movements	0.5	
14.	Setup and programming for Machine tending with Industrial Robotic Arm	0.5	
15.	Setup and Programming for vision system.	0.5	
16.	Setup and Programming for 2D path following	0.5	
17.	Setup and Programming for voice command	0.5	
18.	Setup and Programming for colour sensing	0.5	
19.	Setup and Programming for Material Sensing	0.5	
20.	Setup and Programming for Palletising	0.5	
21.	Setup and Programming for Magnetic Pick and place	0.5	
22.	Setup and Programming for Suction Pick and place	0.5	
23.	Setup and Programming for Gluing application	0.5	
24.	Setup and Programming for logistics sorting system	0.5	
25.	Setup and Programming for Robotic spray painting	0.5	
26.	Importing CAD to motion	0.5	
27.	Setup and programming for gasketing/Sealing	0.5	
28.	Demonstration of End effector manufacturing using 3D printing.	0.5	

29.	Maintenance and troubleshooting of industrial robot.	0.5	
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## II) Theory

### Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
<b>CEH 50 -1 Unit-I Introduction to Industrial Robotics &amp; Safety</b>			
1	1.1 Introduction, Definition, need, brief history of Industrial Robots 1.2 Automation: Type of automation, Need for Automation 1.3 Application of Robots in Industries 1.4 Types of Robots 1.5 Laws of Robot. 1.6 Safe Practices while Handling the Robot, Safety Symbols, Safety Gear, Applicable Safety Standards, General Safety Information, Safety Symbols on the Robotic Arm, Robot Controller, and Teach Pendant. 1.7 Risk Assessment, Workspace, and Safety Zones, Personal Safety Equipment Moving the Robot without Power Residual Risks.		
<b>CO: CEH500-2: Explain fundamental terminology in robotics.</b>			
2	2.1 Robot configurations-(Spherical), Cylindrical, Cartesian Polan Coordinate, Jointed arm (Articuted) SCARA (Selective Compliance Assembly Robot Arm). 2.2 Basic elements of Robot system (Robot Anatomy): Base, Manipulator arm, End Effectors, Sensors and transducers, Actuators and Drives, Control systems 2.3 Robot specification: Degree of Freedom, Work envelope, Load carrying capacity, Speed of movement, Accuracy, Repeatability, Control Resolution, Spatial resolution, 2.4 Basic Robot motions: - Vertical motions, Radial motions, Rotational motions, Pitch motions, Roll motions, Yaw motions. 2.5 Types mechanical joints used in Robotics system: - Linear Joint, Orthogonal joint, Rotational Joint Twisting Joint, Revolving Joint (Symbol, Notations) 2.6 Robots End Effectors: Types of End Effectors Gripper and Tools, Grippers-Mechanical, Pneumatic, Magnetic, Vacuum, adhesive, Considerations in gripper selection		
<b>CO: CEH500-3: Industrial Robot Selection</b>			
3	3.1 Why to use a Robot? 3.2 Selection and Classification of Industrial Robots. 3.3 Defining Parameters of Robots. 3.4 World Statistics of Industrial Robotics		

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	3.5 Robots in Industry 3.6 Major Robot Manufacturers		

### Section –II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
<b>CO: CEH000 -4: Industrial Robot: Actuators, Drives &amp; Sensors</b>			
4	4.1 Actuators and types: Pneumatic, Hydraulic and Electric 4.2 Explain the different drive system of industrial robot. 4.3 Select robot sensor for the given application. Need of Pneumatic System, Basic Components of Pneumatic System Compressor, Valves, Actuators 4.3 Different Electric Rotary Actuators, Recent Advances in Actuators 4.4. Drive and drive system: Pneumatic Hydraulic and Electric, Drive Systems. 4.5 Robotic Sensors: Introduction to Sensors		
<b>CO: CEH00-5: Industrial Robot: Installation, Programming &amp; Maintenance</b>			
5	5.1 Perform installation of industrial robot. 5.1 Industrial Robot Installation: Lifting and Mounting of Robotic Arm and Controller. 5.2 Use teach pendant industrial robot teaching. for 5.2 Connecting Power Cables, Encoder Cables, and Teach Pendant 5.3 Robot Operation, Switching Modes, Jogging, Homing the Robot 5.3 Operate the industrial robot for given condition. 5.4 Managing Robot Errors and Faults, Logging in and Configuring I/O 5.4 Perform maintenance industrial robot. 5.5 Robot Programming: Brief Introduction of to Teach Pendant, Robot Programming Instructions, Jogging of Robot, Overview of Teach Pendant, Robot Arm, and Robot Controller, Central Processing Unit (CPU) I/O Channels, CAN I/O Module, Removable Storage, Basic Robot Program Instructions MOVE, POINT, WAIT, SET, IF, ELSE LOOP, HALT, JUMP, 5.6 Maintenance of Industrial Robot: Inspection of Belts and Pulleys, Changing Belts, Parameters Measurement (Voltage/Current), Recommended Spares Troubleshooting, Fault List.		
<b>CO: EEG307-6: Application of PLC&amp; Microcontroller in robotics</b>			

6	6.1 Identify type of robot 6.2 Robots in material handling Pick and 6.3 Explain the application of microcontroller in industrial robot. 6.3 Robots in automated assemblies & inspections. 6.4 Basics and Configuration of Arduino. 6.5 Basics of Microprocessors 6.6 Configuration and Use of Raspberry Pi		
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**\*\* No questions will be asked on IKS learning subtopics in any question papers.**

### **G : List of task under SLA**

<b>Sr.no</b>	<b>List of task under SLA</b>	<b>Hrs Allotted</b>
1.	Study different types of robots used in the industry	2
2.	Study basic Axis of rotation and principle	2
3.	Study the different component parts and their working	2
4.	Study the different applications in various industries.	2
5.	Study the economic aspects of robotics and automation.	2
6.	Study the impact of automation on the social life.	2
7.	Study the different perspectives how the future industries will work and grow by using robotics and automation	2
8.	Study the different applications in civil engineering projects.	2
9.	Study the different robots available for 3D printing for house construction and the material used for it	2

### **H : Specification table for setting question paper for semester end theory examination**

#### **I :-Assessment Criteria**

##### **i) Formative Assessment of Practical:-**

Every assignment shall be assessed for 25 marks as per following criteria:

<b>Domain</b>	<b>Particulars</b>	<b>Marks out of 25</b>
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Attendance/Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

**ii) Summative Assessment of Practical: Not Applicable for this course**

At the time of Practical Examination assessed for 25 marks as per following criteria:

Sr. no	Criteria	Marks allotted
1	Knowledge about the course	05
2	Preparedness for practical /Oral	05
3	Neat & complete Diagram/write up	05
4	Observations/Handling of instrument/ Communication/Presentation	05
5	Oral Based on Lab work and completion of task	05
<b>TOTAL</b>		<b>25</b>

**J) Instructional Methods:**

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration

**K) Teaching and Learning resources:**

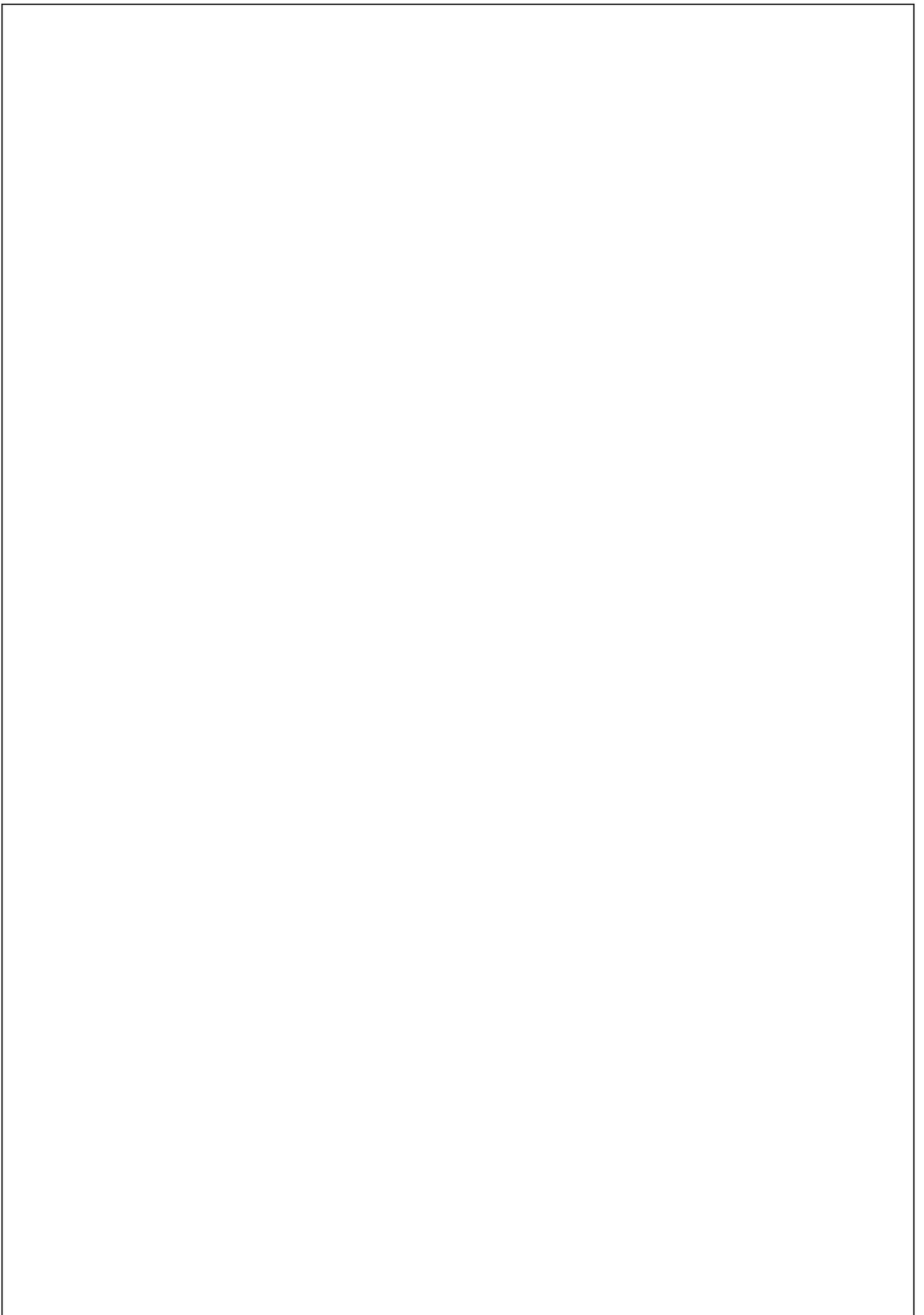
Chalk board, LCD presentations, Demonstrative kits, Demonstrative Documents.

**L) Reference Books:**

Sr. No.	Author	Title	Publisher
1.	Industrial Robotics	Mikell P Groover Michell Weiss, Roger N. Nagel, Nicholas G.Odrey & Ashish Dutta	McGraw Hill Education(India) Pvt.ltd Chennai 2012 ISBN(13)978-1-25-900621-0
2.	Introduction to Industrial Robotics	RAMchandran Nagarajan	Pearson Education India New Delhi 2006, ISBN 978-93-325-4480-2
3.	Robotics and Industrial Automation	R.K Rajput	S.Chand Limited, 2008 ISBN: 97881219

**M) Learning Website & Software**

Sr.no	Website	Name
1.	<a href="https://ifr.org/">https://ifr.org/</a>	International Federation of Robotics
2.	<a href="https://www.exeter.ac.uk/">https://www.exeter.ac.uk/</a>	In collaboration with COROT Project
3.	<a href="https://www.gre.ac.uk/">https://www.gre.ac.uk/</a>	In collaboration with COROT Project
4.	<a href="https://nptel.ac.in/courses/112105319">https://nptel.ac.in/courses/112105319</a>	NPTEL Course - Industrial Robotics: Theories for Implementation
5.	<a href="https://nptel.ac.in/courses/112105249">https://nptel.ac.in/courses/112105249</a>	NPTEL Course - Robotics
6.	<a href="http://www.mechanalyzer.com/downloads-roboanalyzer.html">http://www.mechanalyzer.com/downloads-roboanalyzer.html</a>	Simulation Software- Roboanalyzer
7.	<a href="http://vlabs.iitkgp.ernet.in/mr/exp0/index.html#">http://vlabs.iitkgp.ernet.in/mr/exp0/index.html#</a>	Virtual Lab - IIT Kharagpur





# **GOVERNMENT POLYTECHNIC, KOLHAPUR**

(An Autonomous Institute of Government of Maharashtra)

*Curriculum Document – 6<sup>th</sup> Semester*

**CURRICULUM: MPECS-2023**

**(Outcome Based Curriculum)**

for

**DIPLOMA IN CIVIL ENGINEERING**

**Secretary**

**Chairman**

Programme-wise Board of Studies (PBOS)

Civil Engineering Programme

Government Polytechnic, Kolhapur

**SAMPLE PATH - H SCHEME - 6th SEMESTER**

Sr.no	Course Title	Abbreviation	Course Type	Course Code	Level	Total IKS Hrs. for Sem	Learning Scheme						Assessment Scheme						Based on LL & TL				Based on Self Learning		Total Marks		
							Actual Contact Hrs.Week						Theory						Practical				SLA				
							CL	TL	LL	Self Learning (Activity/Assignment/Micro Project)	Notional Learning Hrs/W week	Credits	Roundup credits	Paper Duration(Hrs)	FA-TH	SA-TH	Total	FA-PR	SA-PR	SLA	Total						
Max	Max	Max	min	Max	min	Max	min	Max	min	Max	min	Max	min	Max	min												
1	Design of Steel &RCC structure	HDSR	DSC	CEH502		0	4	0	2	2	8	4	4	3	30	70	100	40	25	10	25	#	10	25	10	175	
2	Solid Waste Management	HSWM	DSC	CEH506		0	4	0	2	2	8	4	4	3	30	70	100	40	25	10	0		0	25	10	150	
3	Environmental Engineering	HENV	DSC	CEH505		0	4	0	2	2	8	4	4	3	30	70	100	40	25	10	25	#	10	25	10	175	
4	Maintenace and repairs of structure	HMRS	DSC	CEH507		0	4	0	0	2	6	3	3	3	30	70	100	40	0	0	0		0	25	10	125	
5	Internet of Things (IOT)	HIOT	SEC	CEH508		0	0	1	1	2	1	1	1	0	0	0	0	0	25	10	0		0	25	10	50	
<b>Elective-2</b>																											
6	Town & Country Planning	HTCP	DSC	CEH409		0	4	0	2	2	8	4	4	3	30	70	100	40	25	10	25	@	10	25	10	175	
	Plumbing Services	HPSR	DSC	CEH410		0	4	0	2	2	8	4	4	3	30	70	100	40	25	10	25	@	10	25	10	175	
	Quality Control	HQOC	DSC	CEH411		0	4	0	2	2	8	4	4	3	30	70	100	40	25	10	25	@	10	25	10	175	
<b>TOTAL</b>						0	20	0	9	11	48	20	20		120	280	400	160	75	30	50	0	20	100	40	850	

**Legends :**

**Abbreviations:**

CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning

SLH-Self Learning Hours, NLH- Notional Learning Hours, IKS - Indian Knowledge System,

FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Course Category : Discipline Specific Course Core (DSC) , Discipline Specific Elective (DSE) : Value Education Course (VEC) , Intern./Apprenti./Project./Community (INP), Ability Enhancement Course (AEC) , Skill Enhancement Course (SEC), Generic Elective (GE) :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

**PBOS Member Sectory  
Civil Engineering Deoartment  
Government Polytechnic Kolhapur**

**Head of Department  
Civil Engineering Deoartment  
Government Polytechnic Kolhapur**

**COURSE ID :** CEH502  
**COURSE NAME :** DESIGN OF STEEL AND RC STRUCTURES  
**COURSE CODE :** CEH502  
**COURSE ABBREVIATION:** H D S R

**Prerequisite knowledge :** ANALYSIS OF STRUCTURES

### A. LEARNING SCHEME:

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	04	4
	Tutorial Learning	-	
	Laboratory Learning	02	
	SLH-Self Learning	02	
	NLH-Notional Learning	8	

### B.ASSESSMENT SCHEME

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON PRACTICAL		TOTAL
	FA-TH	SA-TH	TOTAL		FA-PR		SA-PR		MAX	MIN	
			MAX	MIN	MAX	MIN	MAX	MIN			
03	30	70	100	40	25	10	25#	10	25	10	175

(Total IKS hours for sem : 02hour )

### C: ABBREVIATIONS: -

CL- Class Room Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

**Legends:** @ Internal Assessment, # External Assessment, \*# On Line Examination, @\$ Internal Online Examination.

FA-TH represents average of two class tests of 30 marks each conducted during the semester.

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2. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
3. Notional Learning hours be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities.

### **D.RATIONALE:**

The civil engineering diploma programme aims at producing better supervisory technical manpower in construction industry. The construction is primarily carried out either using manufactured steel sections or reinforced concrete. This course gives primary information about steel sections used, fabrication of steel sections using bolted and welded connections. The state of the art design approach of reinforced beam and slab designs, column and footing design using limit state method. The relevant codal specifications for steel (IS 800) and IS 456 for RCC are emphasized along with loading standards (IS 875). The ductile detailing for seismic sustainability is also highlighted.

### **Competency identified for the course:.**

The MPEC 2023 curriculum design based on MSBTE K curriculum guideline and NEP2020 policy incorporates all self and tutorial such as notional hours and non-national hours of learning. Indian knowledge system is also intended to explore through additional hours of learning during the semester. Subject is allotted 4 hrs. of class room learning and 4hrs. of practicals for design and drafting.. All these hrs. of learnings including IKS learning are aimed at achieving following skills sets. As the semester includes internship training the contact sessions are to be met with in 9 weeks instead of 15 weeks.

### **E. COURSE OUTCOMES (COs):**

- i) CEH502 -1 Use steel sections ,steel structures, loading standards and steel code for practice.
- ii) CEH502-2 Design the connections bolted /welded for the given steel joints.
- iii) CEH502 -3 Limit state method of RC design, Limit state of collapse and serviceability to design of rectangular beams and flanged sections.
- iv) CEH502-4 Design of shear reinforcement and development length for beam and slabs.
- v) CEH 502-5 Design various slabs for the given edge condition
- vi) CEH502-6 Design of axially loaded short columns and footings.

### **Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/pso) matrix**

[Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0" ]

Competency and COs	Programme Outcomes POs and PSOs									
	PO 1 Basic and disciplined knowledge	PO 2 Problem analysis	PO 3 Design /development of solutions	PO 4 Engineering Tools/experimentation and testing	PO 5 The engineering practice for society, Sustainability and environment	PO 6 Project management	PO 7 Life-long learning	PSO1 Plan and Design	PSO2 Construction and Maintenance	PSO3 Problem Solving on field
<b>Competency:</b> Apply principles of structural design to solve engineering problems	3	2	3	1	2	1	2	2	1	1
<b>CEH502-1</b> Use steel sections, steel structures, loading standards and steel code for practice.	2	1	1	1	-	-	2	2	1	1
<b>CEH502-2</b> Design the connections bolted /welded for the given steel joints.	2	2	1	1	1	-	2	2	1	1
<b>CEH502-3</b> Limit state method of RC design, Limit state of collapse and serviceability to design of rectangular beams and flanged sections.	3	2	3	2	2	-	2	3	2	2
<b>CEH502-4</b> Design of shear reinforcement and development length for beam and slabs.	3	2	2	1	1	-	2	2	1	1
<b>CEH502-5</b> Design various slabs for the given edge condition	3	2	2	1	1	-	2	2	1	1
<b>CEH502-6</b> Design of axially loaded short columns and footings	3	2	2	1	1	-	2	2	1	1

**F. CONTENT:****THEORY :**

Sr. No.	Topics	Teaching (Hours)	Theory evaluation
<b>Course Outcome: CEH502-1 Steel structure, sections, loads and steel code</b>		<b>08</b>	<b>08</b>
<b>1</b>	1.1 Steel as construction material. 1.2 Steel structures: Towers, Roof trusses, Water Tanks, Bridges, Gantry and Crane girders, Columns, Chimney, building frames etc. 1.3 Types, grades and strength of steel sections, Steel Table, IS 808-1989. Stress Strain graph for mild steel. 1.4 Loads acting on steel structures according to IS 875-1987 part I to IV. 1.5 Limit State Method of design: Meaning and types of limit states, loads, design criteria, limit states of strength, limit states of serviceability. 1.6 Factors of safety and load factors as per IS 800:2007.		
<b>Course Outcome: CEH502 -2 Bolted and welded connections</b>		<b>10</b>	<b>12</b>
<b>2</b>	2.1 Types of fasteners and uses, modes of failure, 2.2 specifications of bolt holes for bolted connections. 2.3 Strength of bolt in shear, tension, bearing and efficiency of joint. 2.4 Analysis and design of bolted joints for axially loaded plate, single and double angle members 2.5 Welded connections: Butt and Fillet welds, size of weld, throat thickness 2.6 Analysis and design of fillet welded joint for plate, single and double angle members subjectable to axial load.		
<b>Course Outcome: CEH502 -3 Limit state of collapse –flexure ;beams-rectangular and flanged.</b>		<b>12</b>	<b>14</b>
<b>3</b>	3.1 RCC: functions of reinforcement, material properties, types of limit states, partial safety factors for material strength, characteristic strengths, characteristic load, design load as per IS 456:2000. 3.2 Types of loads and combinations as per IS:875:2002 3.3 Limit State of collapse (flexure) : assumptions, steel, strain diagram and stress- strain relationship for concrete and block diagram for singly reinforced section, design parameters and constants, ultimate moment of resistance 3.4 Primary tension (Under reinforced) section and balanced sections.		

	<p>3.5 JS specifications regarding spacing, cover, minimum reinforcement, effective span for beams.</p> <p>3.6 Analysis and design: determination of design constants, Ultimate moment of resistance, ultimate load carrying capacity, design of rectangular sections for collapse load and deflection.</p> <p>3.7 Doubly reinforced section –why and where, design and moment of resistance of doubly reinforced section.</p> <p>3.8 analysis of flanged sections – T and L beams – effective flange width and Moment of resistance.</p>		
	<b>Total</b>	<b>30</b>	<b>34</b>
Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.			

Sr. No.	Topics	Teaching (Hours)	Theory evaluation
<b>Course Outcome: CEH502 -4 limit state of collapse – Shear and Bond</b>		<b>06</b>	<b>10</b>
<b>4</b>	<p>4.1 Limit state of Collapse –Shear Shear reinforcement types ; design of vertical stirrups ; inclined stirrups and bent up bars as per IS :456-2000 provisions.</p> <p>4.2 Bond: Meaning of bond as per IS code provisions. Meaning and calculation of development length in tension and compression. Anchorage value</p>		
<b>Course outcome: CEH -5 Design of one way and two way slabs s/s on all the four edges</b>		<b>12</b>	<b>16</b>
<b>5</b>	<p>5.1 Slabs, support conditions, I.S.specifications regarding main steel, distribution steel, spacing and cover for reinforcement, effective span, minimum reinforcement.</p> <p>5.2 Limit state of serviceability for slabs for deflection criteria only.</p> <p>5.3 Design of one way and cantilever slab including development length check only.</p> <p>5.4 Design of two-way slab with four edges discontinuous and provision of torsion reinforcement at corners (As per IS 456:2000, table no 26 case no 9 only). Check for deflection only.</p> <p>5.5 Design of two way slab s/s on all the four edges without torsion steel at corners.</p> <p>5.6 Design of dog legged stair case –geometrical detailing, loading, effective span, design and detailing.</p>		
<b>Course Outcome : CEH -6 Design of axially loaded short columns and footings.</b>		<b>12</b>	<b>10</b>

<b>6</b>	6.1 Limit state of collapse in compression, assumptions, effective length, slenderness ratio, short and long columns, and minimum eccentricity. 6.2 IS specifications for reinforcement in column. 6.3 Load analysis for a column : load on an axially loaded column from beams at a different floor levels in a building 6.4 Design of axially loaded short square and rectangular column. 6.5 Various RC footings: Isolated and Sloped footings, combined footings, piles 6.6 IS specifications for reinforcement in footing 6.7 Design of isolate footing: Flexure, design from BM and one way shear only.		
<b>Total</b>		<b>30</b>	<b>36</b>
Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.			

PRACTICALS : All the Ten practicals are to be executed as progressive practical formative assessment

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1.1	Draw five standard rolled sections –single	I	02
1.2,	Draw five commonly used built up sections.	I	02
2.1	Design a bolted connection for the given data and compare it with design using open source software/IS code.	II	02
2.2	Draw types of welds and types of welded joints.	II	02*
3.1	Write five IS clauses related to partial safety factors, characteristic strengths, characteristic load and design load from IS 456:2000.	III	02
3.2	Draw cross section, strain -stress diagram for singly reinforced section giving design parameters and constants.	III	02*
3.3	Draw stress block diagram for Under- reinforced, over-reinforced and balanced sections showing all details.	III	02
4.1	Write five IS clauses related to shear reinforcement in beams and slabs from IS 456:2000.	IV	02
4.2	Write the procedure to calculate development length of main reinforcement in beams and slabs.	IV	02
5.1	Write four IS clauses related to each for slab, beam and column from IS 456:2000.	III,V	02

5.2	Draw diagrams showing transfer of loads from one way simply supported slab and two way simply supported slab to the supporting beam as per I. S. 456:2000.	III,V	
5.3.	Draw typical reinforcement detailing of dog legged stair.	V	02
6	Check the given drawing as per JS 456:2000 specifications with respect to reinforcement detailing. (Working drawing / Blue print should be collected from the suitable site.)-Professional drawing	III, IV, V	02
7.1	Design one cantilever slab from the given data.	V	02
7.2	Design a one way simply supported slab from the given data.	V	02
7.3	Design a two way simply supported slab from the given data.	V	02
8	Seismic detailing of beam –column joint, column, column footing	III,VI	02
9	Software applications in RC Design	VI	02
10	Field visit report	VI	02

## Section I

### G. SLA (Self Learning Assessment)

**Self learning/ Micro Projects: (One project to the group of 4/5 students**

- i) Analysis and Design of Retaining walls.
  - ii) Analysis and design of water tanks.
  - iii) Structural analysis and design software exploration
  - v) Spherical domes –reinforcement detailing with an insight for analysis
  - vi) Seismic analysis and detailing
  - vi) Multistorey /high rise building case study
  - vii) Bridge design aspects
  - viii) Box culvert RC design
  - ix) Aquaduct /canal RC design
  - x) Swimming tank analysis and design
  - xi) Industrial steel shed
- any other topic involving steel /RCC /Combined construction

The assessment scheme for practicals and self learning as per MPEC2023 norms :

## H: Specification table for setting question paper for semester end theory examination

The course under title design of steel and RCC structures introduced clubbing steel structures (20 marks) and RCC structures(50 marks) with 30 marks based on two unit tests covering 6 course outcomes 2 on steel and 4 on RCC.

Topic No.	Name of topic	Distribution of marks (level wise)			Total Marks
		Remember	Understand	Apply	
1.	Steel structures, sections, codes	2	2	4	08
2.	Bolted and welded connections	4	4	4	12
3.	Limit state collapse –flexure for beams	4	2	8	14
4.	Limit state for shear and bond	2	4	4	10
5.	Design of slabs –one way and two way slabs	4	4	8	16
6.	Square column and footings	2	4	4	10
	<b>Total</b>	<b>12</b>	<b>26</b>	<b>32</b>	<b>70</b>

## I:-Assessment Criteria

### i) Formative Assessment of Practical: -

Every practical shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

### ii) Summative Assessment of Practical:

End exam practical assignment shall be assessed for 25 marks as per following criteria:

Sr. no	Criteria	Marks allotted
1	Attendance at regular practical	05
2	Preparedness for practical	05
3	Neat & complete Diagram.	05
4	Observations & handling of instrument.	05
5	Oral Based on Lab work and completion of task	05
<b>TOTAL</b>		<b>25</b>

**iii) Assessment of SLA: -**

Every Self-learning assignment/microproject shall be assessed for 25 marks as per Following criteria

Sr.no	Criteria	Marks allotted
1	Attendance/periodic assessment	05
2	Preparedness –write up/inference /scope	05
3	Presentation (neat figures/ diagrams/ tables/ graphs etc.)	05
4	Conclusion / application	05
5	Oral Based on microproject/ assignment/ activity	05
<b>TOTAL</b>		<b>25</b>

**J. Instructional Methods:**

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration

**K. Teaching and Learning resources:**

- |                      |   |
|----------------------|---|
| 1. Chalk board       | 2.LCD presentations                         |
| 3.Field visit to RMC | 4. Demonstrative charts                     |
| 5. Question Bank     | 6. Digital learning resources -NPTEL,Swayam |

**L. REFERENCE BOOKS**

a) Book / journals / IS code

SNo.	AUTHOR	TITLE	PUBLISHER
1.	Park and Paulay	Reinforced Concrete structures	John Wiley and Sons Inc.
2	L S Negi	Steel structures	Tata-Mcgraw Hill
3	S K Duggal	Steel structures	Mc Graw Hill
4	Karve and Shah	Limit state Design of RC structures	Structural publishers , Pune
5	Syal and Goel	Limit state Design	S. Chand publications

6	Sushilkumar	Treasures of RC design	Standard Book house
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7	P .Dayaratnam	Behaviour, Analysis and Design of structures	Oxford and IBH publishing house
8	N Subramanyam	Reinforced Concrete structures	Oxford Publishers
9	Dr ramchandra & Virendra Gehlot	Design of Steel structures	Scientific Publications
10	Dr SR Bhagat,Vedpathak and Ms Lomate	Design of steel structures	Nirali prakashan

## M. Learning Website & Software and special publications

- i) SP :16
- ii) SP :60
- iii) SP : 24
- iv) BIS publications IS :600;IS :456; IS :1893; IS 875; IS :13920
- v) STAAD PRO
- vi) STRUD
- vii) ETABS
- viii) [www.bentley.com](http://www.bentley.com)
- ix) Design of G +3 storeyed RC building by Karve and Shah
- x) [www.iitk.ac.in/nicee/IITK-GSDMA/EQ22.pdf](http://www.iitk.ac.in/nicee/IITK-GSDMA/EQ22.pdf)
- xi) [en.wikipedia.org/wiki/Intze\\_Principle](http://en.wikipedia.org/wiki/Intze_Principle)
- xii) [en.wikipedia.org/wiki/Reinforced\\_concrete](http://en.wikipedia.org/wiki/Reinforced_concrete)

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**COURSE ID : HSWM**  
**COURSE NAME : SOLID WASTE MANAGEMENT**  
**COURSE CODE : CEH506**  
**COURSE ABBREVIATION : HSWM**

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	04	4
	Tutorial Learning	00	
	Laboratory Learning	02	
	SLH-Self Learning	02	
	NLH-Notional Learning	08	

**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Practical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
03	30	70	100	40	25	10	00	00	25	10	150

**(Total IKS Hrs for Sem : 0 8Hrs)**

**C:** Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA - Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment  
Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

**i) RATIONALE:-**

Industrialization and urbanization is increasing day by day. As a result of this, the generation of solid waste is a major problem all over the country within the urban as well as rural area and it is increasing day by day. In view of this, the management of solid waste produced is of prime need to keep the environment safe and clean. Information on classification and characteristics of solid waste will enable to decide appropriate technology about the collection and transportation of waste

produced. Various disposal methods of solid waste will enable to recommend suitable method of disposal of solid waste with economy and acceptable environmental constraints including reuse and recycle wherever applicable. Content on other types of solid waste such as biomedical waste, construction waste, E-waste and plastic waste will be useful in deciding appropriate method for collection, transportation and disposal of these wastes. Thus, the knowledge of solid waste management with the concept like recycling, recovery and reuse will lead to proper disposal with acceptability. This will further lead to keeping the natural resources condemnation free.

## ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the student Apply principles collection, handling and disposing of the solid waste. **Cognitive** : Understanding the art of collection and transporting the solid waste.

**Psychomotor**: i) Designing the disposal methods ii) Fixing the capacity of transporting equipments iii) Designing sorting equipments.

**Affective**: Attitude of i) Calculative aspect ii) accuracy iii) safety iv) aesthetic presentation v) hygiene vi) civic sense

## E. COURSE LEVEL LEARNING OUTCOMES (COS)

CEH506 -1-Identify the different sources, types and characteristics of solid wastes.

CEH506 -2-Execute the Storage, collection techniques and transporting of solid waste.

CEH506 -3-Execute relevant method for biomedical waste disposal and awareness about health aspects in solid waste management.

CEH506 -4-Implement sanitary land filling, composting and Incineration method of disposal

CEH506 -5- Implement Industrial waste & E waste management.

CEH506 -6-Implement the relevant laws related to solid waste management.

## Competency, course outcomes and programme outcomes/programme specific outcomes

(**cp-co-po/pso**) matrix [Note: Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0" ]

Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 Plan and Design	PSO2 Construction and Maintenance	PSO3 Problem solving on field
CEH 506 -1CO-1 Identify the different sources, types and characteristics of solid wastes.	3	2	2	2	3	2	2	3	3	2

Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analyses	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 Plan and Design	PSO2 Construction and Maintenance	PSO3 Problem solving on field
CEH 506 -2 CO-2 Execute the Storage, collection techniques and transporting of solid waste.	3	2	2	2	3	2	2	3	3	2
CEH 506-3 CO-3 Execute relevant method for biomedical waste disposal and awareness about health aspects in solid waste management.	3	2	2	2	3	2	2	3	3	2
CEH 506 -4 CO-4 Implement sanitary land filling composting and Incineration method of disposal.	3	2	2	2	3	2	2	3	3	2
CEH 506 -5CO-5 Implement Industrial waste & E waste management	3	2	2	2	3	2	2	3	3	2
CEH 506 -6 CO-6 Implement the relevant laws related to solid waste management	3	2	2	2	3	2	2	3	3	2

## F. CONTENT:-

### I) Practical exercises –

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1	Submit your observations along with your comments on parameters of different solid waste by viewing the reel video/simulation/photographs.	I	02
2	Undertake the survey through internet or actual site view to prepare a report on the methodology used in collection and transportation of Solid waste including equipment, specifications used therein	II	02*

3	View the relevant video/simulation/photographs/print material/non-print material of the operations in transfer station to draw the flow chart for the same.	II	04*
4	Design the organization chart for the agency managing solid waste for a given area with a report on w.r.t. population to be served, pattern, machineries, equipment, manpower used.	II	02*
5	Submit your observations along with your comments on solid waste management techniques by viewing the relevant video/simulation.	II	02
6	Submit your observations along with your comments on solid waste disposal plant by viewing the actual site or relevant video/simulation/photographs.	III	04*
7	Submit your observations along with your comments on composting plant by viewing the actual site or relevant video/simulation/photographs.	III	04*
8	Submit your observations along with your comments on Bio gas plant by viewing the actual site or relevant video/simulation/photographs.	III	04
9	Prepare the specifications of vermin-composting plant for the given type of building with suggested action plan to implement it by viewing the relevant video/simulation/ photographs.	III	04*
10	Submit your observations along with your comments on working of vermin-composting plant by viewing the actual site or relevant video/simulation.	III	02
11	Submit your observations along with your comments on solid waste management system by landfills techniques by viewing the relevant video/simulation.	III	02
12	Submit your observations along with your comments on disposal of bio-medical waste by viewing the relevant video/simulation.	IV	04*
13	Prepare the specifications for the disposal of bio-medical waste by viewing the relevant video/simulation.	IV	04*
14	Submit your observations along with your comments on the problems of human agencies dealing with solid waste management by viewing the relevant video/simulation.	IV	02
15	Submit your observations along with your comments on the disposal of E-waste by viewing the relevant video/simulation.	V	02
16	Submit your observations along with your comments on the disposal of Industrial waste by viewing the actual site or relevant video/simulation.	V	02
17	Compile the relevant provisions Central Pollution Control Board (CPCB) and State Pollution Control Board (SPCB) pertaining to solid waste management by viewing in the relevant video/simulation/search engine.	V	02
18	Interpret the Municipal Solid Waste Management Rules, 2016 by viewing in the relevant video/simulation/search engine.	VI	02*
19	Interpret the <b>Biomedical</b> Waste Management Rules, 2016 viewing in the relevant video/simulation/search	VI	02
20	Interpret the E- Waste Management Rules, 2016. by viewing in the relevant video/simulation/search engine.	VI	02
21	Interpret the Construction and demolition Waste Management Rules, 2016" by viewing in the relevant video/simulation/search engine.	VI	02
22	Interpret the Hazardous and other waste Management Rules,2016; by viewing in the relevant video/simulation/search engine.	VI	02

23	Interpret the Plastic Waste Management Rules, 2016 by viewing in the relevant video/simulation/search engine	VI	02
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**Note:** *L A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. A judicious mix of minimum 6 to 8 or more practical*

*UOs/tutorials need to be performed, out of which, the practicals marked as are compulsory, so that the student reaches the 'Precision Level' of Dave's 'Psychomotor Domain Taxonomy' as generally required by the industry.*

## II) Theory

### Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
<b>CEH 50 6-1. Identify the different sources, types and characteristics of solid wastes.</b>			
1	<b>Fundamentals of Solid Waste-</b> 1.1 Definition of solid waste 1.2 Meaning of different solid waste — Domestic Waste, commercial waste, industrial waste, market waste, agricultural waste, biomedical waste, E-waste, hazardous waste, institutional waste 1.3 Sources of solid waste, Classification of solid waste — hazardous and non- hazardous waste. 1.4 Physical and chemical characteristics of municipal solid waste. 1.5 Impact of solid waste on environment. 1.6 Solid waste management techniques — solid waste management hierarchy, waste prevention and waste reduction techniques. 1.7 Factors affecting the solid waste generation.	6	12
<b>CEH506-2: Execute the Storage, collection techniques and transporting of solid waste.</b>			
2	<b>Storage, Collection and Transportation of Municipal Solid Waste-</b> 2.1 Storage of solid waste- colour code 2.2 Collection methods of solid waste 2.3 Tools and Equipment-Litter Bin, Broom, Shovels, Handcarts, Mechanical road sweepers, Community bin - like movable and stationary bin 2.4 Transportation of municipal waste- Transportation vehicles with their capacity -Animal carts, Auto cart, bicycle, tractors or Trailers, Trucks. Dumpers. Compactor vehicles. 2.5 Transfer station- meaning, necessity, location 2.6 Role of rag pickers and their utility for society 2.7 Organization pattern of solid waste management system	10	12

**CEH506-3: Execute relevant method for biomedical waste disposal and awareness about health aspects in solid waste management.**

3	<p><b>Biomedical waste, Health aspects and Public involvement in Solid Waste Management.</b></p> <p><b>Biomedical Waste (BMW) Management</b></p> <p>3.1 Definition of Biomedical Waste.</p> <p>3.2 Categories of Biomedical waste as per WHO and Sources of Biomedical Waste</p> <p>3.3 Collection and storage of BWM- colour code, packaging and labeling</p> <p>3.4 Transportation of BMW – internal and external</p> <p>3.5 Treatment/ Disposal Methods</p> <p><b>Health aspects and public Involvement in solid waste management</b></p> <p>3.6 Health aspects during handling and processing- Health problem arises in handling SWM, Do's and Don'ts to avoid Health Problems</p> <p>3.7 Public involvement and participation in solid waste management practices.</p>	8	10
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## Section –II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CEH506-4: Implement sanitary land filling, composting and Incineration method of disposal.			
4	<p><b>Solid Waste treatment/disposal</b></p> <p><b>Composting</b></p> <p>4.1 Concept of composting of waste, Principles of composting process. Factors affecting the composting process</p> <p>4.2 Methods of composting —</p> <p>A) Manual Composting — Bangalore method, Indore Method</p> <p>B) Mechanical Composting — Dano Process</p> <p>C) Vermicomposting</p> <p>4.3 Benefits of composting</p> <p><b>Land filling</b></p> <p>4.4 Factors to be considered for site selection as per CPCB</p> <p>4.5 Land filling methods-Area method, Trench method and Ramp method.</p> <p>4.6 Leachate and biogas control from landfill</p> <p>4.7 Advantages and disadvantages of landfill method</p> <p><b>Incineration of waste:</b></p> <p>4.8 Introduction, Need</p> <p>4.9 Types of incinerators - Moving Grate Incinerator, Rotary kiln Incinerator, Fluidized bed Incinerator</p> <p>4.10 Advantages and disadvantages of incineration process</p> <p><b>Pyrolysis of waste</b></p> <p>4.11 Definition, Types, Merits and demerits</p> <p>4.12 Products of incineration process</p>	12	16
CEH506-5: Implement industrial waste & E waste Management.			
5	<p><b>Industrial &amp; E-Waste Management</b></p> <p><b>Industrial waste Management:</b></p> <p>5.1. Industrial Responsibility- reuse, recycle</p> <p>5.2 Treatment methods for industrial waste</p> <p>5.3 Disposal of Industrial waste- Problems and process of disposal</p> <p><b>E-waste Management</b></p> <p>5.4. Definition of E- waste, Varieties of E- wastes, Dangers of E- waste,</p> <p>5.5. Recycling of E- waste.</p> <p>5.6. Disposal of E- waste.</p>	8	10
CEH506-5: Implement the relevant laws related to solid waste management.			

6	<b>Legal Aspects of Solid Waste Management</b> 6.1. Legal aspects- present scenario 6.2. Municipal Solid Waste Management Rules, 2016 6.3. Biomedical waste Management Rules 2016 6.4. E- Waste Management Rules, 2016 6.5. Construction and Demolition Waste Management Rules, 2016 6.6. Hazardous and other wastes Management Rules, 2016 6.7. Plastic Waste Management Rules, 2016 6.8. Role of Central Pollution Control Board and Maharashtra Pollution Control Board in management of solid waste from various sources.	8	10
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**\*\* No questions will be asked on IKS learning subtopics in any question papers.**

## G : List of task under SLA

Sr.No	List of Assignment (under SLA)	Hrs Allotted
1	Carry out comparative study of vehicles used for collection of solid wastes from various sources.	01
2	Collect the relevant technical and commercial information of tools, equipment, vehicles and machineries used for collection, segregation, transportation, processing and disposal of solid waste with specifications	02
3	Preparation of report about route used for collection and transportation of solid waste of the city and optimization of it.	02
4	Preparation of report regarding solid waste management practices adopted in the campus of the Educational Institute	02
5	Writing a report on case studies for solid waste management practices of specific cities	03
6	Writing a detailed report on legal aspects about E-Waste Management Rules, 2016	02
7	Writing a detailed report on legal aspects about Construction and demolition Waste Management Rules, 2016	02
8	Writing a detailed report on legal aspects about Hazardous and other wastes Management Rules, 2016	02
9	Writing a detailed report on legal aspects about Plastic Waste Management Rules, 2016	02
10	Develop a specific model regarding solid waste management practices	02
11	Preparation of models concerned with solid waste management practices like incineration, pyrolysis etc.	02
12	Preparation of charts, PPT presentation concerned with solid waste management practices	02
13	Creation of awareness about good habits of scientific and better solid waste management practices	02
14	Any other suitable topic for various solid waste management practices in the area, town, city or country as a whole	02

## H : Specification table for setting question paper for semester end theory examination

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	Fundamentals of Solid Waste	04	04	04	12	CEH506-1
I / 2	Storage, Collection and Transportation of Municipal Solid Waste	04	04	04	12	CEH506-2
I / 3	Biomedical waste, Health aspects and Public involvement in Solid Waste Management.	02	02	06	10	CEH506-3
II / 4	Solid Waste treatment/disposal	04	08	04	16	CEH506-4
II / 5	Industrial & E-Waste Management	02	04	04	10	CEH506-5
II / 6	Legal Aspects of Solid Waste Management	02	04	04	10	CEH506-6
Total Marks					70	

## I :-Assessment Criteria

### i) Formative Assessment of Practical: -

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Attendance/Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

### ii) Summative Assessment of Practical: **Not Applicable for this course**

At the time of Practical Examination assessed for 25 marks as per following criteria:

Sr. no	Criteria	Marks allotted
1	Knowledge about the course	05
2	Preparedness for practical /Oral	05
3	Neat & complete Diagram/write up	05
4	Observations/Handling of instrument/ Communication/Presentation	05
5	Oral Based on Lab work and completion of task	05
<b>TOTAL</b>		<b>25</b>

### J) Instructional Methods:

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration
4. Visit to case studies.

**K) Teaching and Learning resources:** Chalk board, LCD presentations, Demonstrative Documents.

### L) Reference Books:

Sr. No.	Author	Title	Publisher
1.	Dr. A. D. Bhide	Solid Waste Management	Indian National Scientific Documentation Centre, New Delhi Edition 1983 ASIN B0018MZ0C2
2.	Gorge Techobanoglous; Kreith Frank	Solid Wastes	McGraw Hill Publication, New Delhi
3.	D.L.Manjunath	Environmental studies	PEARSON Publication, New Delhi
4.	Anindita Basak	Environmental studies	PEARSON Publication, New Delhi
5.	K. Sasikumar.	Solid waste management	PHI learning, New Delhi
6	S. M. Khopkar	Environmental Pollution Analysis	New Age International (p) Limited, Delhi.
7	C. S.Rao	Environmental Pollution Control	New Age International (p)

		Engineering.	Limited, Delhi.
8	Anubha Kaushik & C.P Kaushik	Perspectives in Environmental Studies	New Age International (p) Limited, Delhi.
9	B.B. Hosetti	Prospect and Perspectives of Solid Waste Management	New Age International (p) Limited, Delhi.

### M) Learning Website & Software

1. [www.hsagolden.com](http://www.hsagolden.com)

3. [www.yousee.in](http://www.yousee.in)

5. [www.epa.gov/epaoswer/non-hw/municipal/index.htm](http://www.epa.gov/epaoswer/non-hw/municipal/index.htm)  
management

2. [www.almitrapatel.com](http://www.almitrapatel.com)

4. [www.skgsangha.org](http://www.skgsangha.org)

6. En. [Wikipedia.org/waste-](http://Wikipedia.org/waste-)

**COURSE ID : HENV**  
**COURSE NAME : ENVIRONMENTAL ENGINEERING**  
**COURSE CODE : CEH505**  
**COURSE ABBREVIATION : HENV**

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	04	4
	Tutorial Learning	00	
	Laboratory Learning	02	
	SLH-Self Learning	02	
	NLH-Notional Learning	08	

**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Practical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
03	30	70	100	40	25	10	#25	10	25	10	175

**(Total IKS Hrs for Sem :1Hrs)**

**C:** Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

### **C. i) RATIONALE:-**

Water is the basic need for all living beings. Water plays a critical role in maintaining a balance between living things and the environment in which they live. The quest for pure water can benefit the life and health of everyone. Water purification is now confronted with myriads of difficulties. Problems caused due to sources receiving greatly increased pollution loads of domestic and industrial wastes. The water supply and drainage schemes are being commissioned on large scale so as to make water available for drinking, industrial use and provide drainage arrangement at all places in rural and urban areas. This subject is intended to teach the students, the concepts, principles and constructional procedures to understand various water supply and sanitary engineering Schemes; which will enable them to apply this knowledge for design, construction and supervise the various elements of construction related to water supply and sanitary engineering projects.

### **ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME**

Understanding and applying principles of environmental engineering to engineering problems.

### **E. COURSE LEVEL LEARNING OUTCOMES (COS)**

CEH505-1- Identify the sources of water, forecast population, estimate quantity and analyze quality of Water

CEH505- 2- Know the standards of purity of water, Understand water purification process and design, Construction and maintenance aspects of treatment units.

CEH505- 3- Understand systems of conveyance and distribution of water and identify relevant types of valves

CEH505- 4- Know the principles of sanitation and objects of sewage disposal, identify the sources of Waste water, Draw labeled system of plumbing for building sanitation  
Know the methods of Collection and disposal of dry refuse (solid waste) in villages and towns.

CEH505- 5- Know the methods of carrying sewage and Understand design, construction and maintenance of water carriage system of sewerage.

CEH505-6- Understand analysis of sewage and Suggest waste water treatment.

**Competency, course outcomes and programme outcomes/programme specific outcomes (cp-co-po/ps) matrix** [Note: Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “0” ]

Programme Outcomes POs and PSOs										
Competency and COs	PO 1 Basic & Discipline specific knowledge	PO 2 Problem analysis	PO 3 Design/development of solutions	PO 4 Engineering Tools, Experimentation & Testing	PO 5 Engineering practice for society, sustainability & environment	PO 6 Project management	PO 7 Life-long learning	PSO1 Plan and Design	PSO2 Construction and Maintenance	PSO3 Problem Solving on field
<b>Competency:</b> Apply principles of environmental engineering (water supply and sanitary engineering) to solve engineering problems.	3	3	3	2	2	2	2	3	3	2
<b>CEG505-1</b> Identify the sources of water, forecast population, estimate quantity and analyze quality of water.	3	3	3	2	1	2	2	3	1	2
<b>CEG505-2</b> Know the standards of purity of water. Understand water purification process and design, construction and maintenance aspects of treatment units.	3	3	2	2	2	2	2	3	3	2
<b>CEG505-3</b> Understand systems of conveyance and distribution of water and identify relevant types of valves.	3	3	3	2	2	2	2	3	3	2
<b>CEG505-4</b> Know the principles of sanitation and objects of sewage disposal. Identify the sources of waste water. Draw labeled system of plumbing for building sanitation. Know the methods of collection and disposal of dry refuse (solid waste) in villages and towns.	3	3	3	2	2	1	1	3	3	2
<b>CEG505-5</b> Know the methods of carrying sewage and understand design, construction and maintenance of water carriage system of sewerage.	3	3	3	2	2	2	2	3	3	2
<b>CEG505-6</b> Understand analysis of sewage and suggest waste water treatment.	3	3	3	2	2	2	2	3	3	1

**F. CONTENT:-**

**I) Practical exercises** – Practical exercises contain assignments, market survey reports, information brochure, leaf-lets and pamphlets on the following:

Sr. no	Practical Description	Time Hours
1	Determine Turbidity. By turbidimeter	2
2	Determine Temporary, Permanent and Total Hardness. By titration.	2
3	Determine PH value by using--i) Universal indicator- ii) PH paper- iii) Digital PH meter	2
4	Chloride concentration. By titration	2
5	Residual Chlorine by O.T. / S. O. test.	2
6	Dissolve Oxygen. By using D.O. meter	2
		2

	<b>Conduct test on waste -water sample to determine its-</b>	
7	Determine Dissolve Oxygen content.	2
8	Determine PH value	2
9	Determine B.O.D.	2

## II) Theory

### Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
<b>CEG505-CO1 Identify the sources of water, forecast population, estimate quantity and analyze quality of water.</b>			
1	<p><b>Water sources, quantity and water analysis. 1.1-Sources of Water Supply-</b></p> <p>1.1.1-surface and sub-surface sources like river, lake, canal, reservoir, impounding reservoir and open well, tube well, springs, artesian well, infiltration gallery (only brief idea). Requirements of source of water.</p> <p>1.1.2- Necessity of water supply scheme.</p> <p>1.1.3-Need for protected water supply, waterborne diseases.</p> <p>1.1.4-Intake structures –definition, types -river intake reservoir intake, canal intake. Factors governing the location of intake.</p> <p>1.1.5-Flow diagram of water supply scheme from source to Consumer</p> <p><b>1.2-Water Demand and Its Quantity Estimation –</b></p> <p>1.2.1- Water demand-Types of demands- domestic, public, industrial, commercial, fire, losses and waste ; minimum requirements as per IS -1172</p> <p>1.2.2- Factors affecting rate of demand</p> <p>1.2.3- Variation in rate of demand –Hourly ,Daily , Monthly and seasonal variations .Per capita demand , Design period</p> <p>1.2.4- Estimating population-Methods of population forecasting (only introduction no mathematical problems ask in examination) Necessity of population Forecasting.</p> <p><b>1.3-Quality of Water –</b></p> <p>1.3.1-Meaning of term potable /wholesome water</p> <p>1.3.2-Impurities present in water and its classification.</p> <p>1.3.3-Water analysis –Need, Characteristics of water and Tests on water : physical tests – temperature, colour, turbidity, taste &amp; odor. Chemical tests- total solids, hardness, PH-value, chlorides, chlorine ,iron and manganese ,dissolve oxygen, fluoride ,nitrogen and its compounds .Biological tests- Total count of bacteria ,E coli index , MPN,</p> <p>1.3.4-Collection of water sample-procedure, precautions to Be</p>	12	14

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	taken. Standards for potable water as per IS.		

**CEG505-CO-2. Know the standards of purity of water, Understand water purification process and design, construction and maintenance aspects of treatment units.**

2	<p><b>Water Purification –</b></p> <p>2.1-<b>Screening</b>-Types of screens.</p> <p>2.2-<b>Aeration</b> - Objects and methods of aeration.</p> <p>2.3-<b>Sedimentation</b>- Plain sedimentation-Objects and Theory of plain sedimentation, Detention period, Types of sedimentation tank</p> <p>2.4-<b>Sedimentation with coagulation</b>- Purpose, Principles of coagulation, Different chemicals used as coagulant, Advantages of alum, Feeding devices- wet feeding and dry feeding, Mixing devices, Clariflocculator. Jar test for optimum coagulant dose.</p> <p>2.5-<b>Filtration</b>–Objects and Theory of filtration, Requirements of sand and gravel for filtration. Classification of filters-slow sand filters (only overview), rapid sand filters and pressure filters. Rapid sand filters(Gravity type)-filter media, base material ,its depth and grading, construction ,working and design aspects, Loss of head and negative head, Back washing process.</p> <p>2.6-<b>Disinfection</b>– Objects of disinfection, Minor methods of disinfection. Chlorination- Properties of chlorine, Action of chlorine, application of chlorine . Different forms of chlorination, Break point chlorination, Residual chlorine and its importance. Tests for chlorine- Orthotolidin test, Starch–iodide-test.</p> <p>2.7-<b>Advanced water treatments</b> –Electrolysis, Reverse Osmosis.</p> <p>2.1 2.8-<b>Domestic appliances</b>- Working of water purifier, Working of R.O., Domestic plant, Softener, content of bottled mineral water (Questions not to set on these sub-topics).</p>	12	14
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**CEG505-CO-3 Understand systems of conveyance and distribution of water and identify relevant types of valves.**

3	<p><b>Conveyance and distribution of Water –</b></p> <p>3.1-Conveyance- meaning, Different types of pipes used for conveyance of water.</p> <p>3.2-Joints in CI and concrete pipes .Laying and testing of pipe line.</p> <p>3.3-Valves- sluice valve, air relief valve, reflux valve, scour valve their functions, use and location on pipe line.</p> <p>3.4-Distribution System - Zoning of area, methods of distribution-gravity, pumping and combined system (dual system). Methods of lay-out of distribution pipes- Dead end system ,Grid iron system , Circular system and radial system, their suitability , Merits and demerits</p> <p>3.5-Service reservoirs- purpose and types-E.S.R, G.S.R.</p>	03	06
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**Section –II**

Sr. no.	Topics/Subtopics	Learning	Classroom
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		(Hours)	learning evaluation Marks
<b>CEG505-CO-4 Know the principles of sanitation and objects of sewage disposal, identify the sources of waste water, Draw labeled system of plumbing for building sanitation. Know the methods of collection and disposal of dry refuse (solid waste) in villages and towns.</b>			
4	<p><b>Building Sanitation and Solid Waste from Society-</b></p> <p><b>4.1- Building Sanitation-</b></p> <p>4.1.1-Necessity and principals of sanitation.</p> <p>4.1.2-Definitions of terms used-sewage, sullage, garbage, refuse, rubbish, night-soil, storm water, sanitary sewage, domestic sewage, bacteria etc .</p> <p>4.1.3Aims and objects of sewage disposal.</p> <p>4.1.4- Meaning, Principles of house drainage ,</p> <p>4.1.5- Definitions of terms related to building sanitation- Pipes - waste pipe, soil pipe, rain water pipe, vent pipe, Antisiphonage pipe.</p> <p>4.1.6- Building sanitary fitting- Traps –definition ,purpose, Requirements of good trap, Types- Nahni trap ,</p> <p>Gully trap , Intercepting trap, P-Q-S trap, their functions use and location. water closets –Indian and European type , Urinals , Flushing cistern , Wash basins , sinks</p> <p>4.1.7- Plumbing system of drainage-Single stake system, One pipe system, One pipe system partially ventilated, Two pipe system. Choice of the system.</p> <p>4.1.8- Lay-out plan of house drainage system, Minimum size of drain and its slope, Inspection and Junction chambers their necessity, location, size and shape.</p> <p>Testing of house drainage system and its maintenance.</p>	08	12
<b>CEG505-CO-5 Know the methods of carrying sewage and Understand design, construction and maintenance of water carriage system of sewerage.</b>			
5	<p><b>Collection, Conveyance of sewage and system of sewerages</b></p> <p>5.1-Methods of carrying refuse –conservancy system, water carriage system.</p> <p>5.2-Conservancy system -meaning of term conservancy system, its advantages and disadvantages. Removal of night soil and disposal of excreta .Septic tank – principles, working and design. soak pit and drains. Gobar gas plant – construction and operation</p> <p>5.3-Water Carriage System –Meaning of term Water carriage system, its advantages and disadvantages.</p> <p>5.4-Quantity of sewage – sources of sanitary sewage, factors affecting quantity of sewage. Dry-Weather flow,Wet- Weather flow, Systems of sewerage-Separate system, combined system, Partially separate system.</p> <p>5.5-Design aspect of sewers – Minimum velocity (Self</p>	08	12

	cleansing velocity),Maximum velocity (Non-scouring velocity). Size of sewer, Materials used for sewers. Laying and testing of sewers. 5.6-Sewer Appurtanances -Man-hole-types , purpose, location. Catch basins, Street Inlets .Ventilation of sewers.		
<b>CEG505-CO-6 Plan and design rural housing at low cost</b>			
6	<p><b>Characteristics and Treatment of Sewage- 6.1-Quality of Sewage-</b></p> <p>6.1.1-Characteristics of sewage. Physical ,chemical and biological 6.1.2-BODand its significance. Aerobic and anaerobic decomposition.</p> <p>6.1.3-COD and its significance.</p> <p>6.1.4-Maharashtra pollution control Board Norms for the discharge of treated sewage.</p> <p><b>6.2-Sewage Treatment-</b></p> <p>6.2.1-Object of sewage treatment. Degree of treatment Flow diagram of sewage treatment plant for a small town including primary and secondary treatment.</p> <p>6.2.2-Primary treatment- meaning, Introduction and functions of screens, Grit chamber, Detritus tank, Skimming tank and Clarifier. Sludge digestion tank</p> <p>6.2.3-Secondary treatment-meaning. 6.2.3.1-Trickling filters and its working.</p> <p>6.2.3.2-Activated Sludge process-Flow diagram and its working only.</p> <p>6.2.4-Disposal of sewage, Oxidation pond, Oxidation ditch.</p>	08	12

**\*\* No questions will be asked on IKS learning subtopics in any question papers.**

**G : List of task under SLA**

Sr.no	Description	Time Hrs
1.	Visit to residential / public building to study different systems of plumbing and sanitary fittings like W.C., Urinals, Flushing Cisterns, Traps, I.C. etc. and prepare the lay-out-plan of house drainage system and show all details like sanitary units , traps, pipes, drains, I.C. etc.	2
2.	Test the water sample from bore well/ tap water/raw water from nearby river, pond etc. to determine its characteristics.	2
3.	Test the waste-water sample from Locally available area to determine its characteristics.	2
4.	Study of local water sources and suggest the remedial measures for control of its pollution.	2
5.	Visit and preparation of detailed report on site where recycling and utilization of treated waste-water is being implemented.	2
6.	Comparative study of chemical and natural coagulants for turbidity removal.	2
7.	Study Emerging techniques for water purification and waste water treatment in different countries.	2

## H : Specification table for setting question paper for semester end theory examination

Topic No.	Name of topic	Distribution of marks (Cognitive level-wise)			Course Outcome	Total Marks
		Remember	Understand	Application		
1	Water sources, quantity and water analysis.	04	06	04	CEH505-1	14
2	Water Purification.	04	06	04	CEH505-2	14
3	Conveyance and distribution of Water.	02	02	02	CEH505-3	06
4	Building Sanitation and Solid Waste from	02	06	04	CEH505-4	12
5	Collection, Conveyance of sewage and system of sewerages.	02	06	04	CEH505-5	12
6	Characteristics and Treatment of Sewage.	02	06	04	CEH505-6	12
	<b>Total</b>					70

## I :-Assessment Criteria

### i) Formative Assessment of Practical:-

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Attendance/Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

### ii) Summative Assessment of Practical:

At the time of Practical Examination assessed for 25 marks as per following criteria:

Sr. no	Criteria	Marks allotted
1	Knowledge about the course	05
2	Preparedness for practical /Oral	05
3	Neat & complete Diagram/write up	05
4	Observations/Handling of instrument/ Communication/Presentation	05
5	Oral Based on Lab work and completion of task	05
<b>TOTAL</b>		<b>25</b>

## J) Instructional Methods:

Class room practices. Lectures cum Demonstrations Classroom practices Massive open online courses (*MOOCS*) may be used to teach various topics/subtopics.

About *15-20% of the topics/subtopics* which relatively simpler or descriptive in nature is to be given to the students for *self-directed learning*.

## K) Teaching and Learning resources:

Chalk board, LCD presentations, Demonstrative kits, Demonstrative Documents.

## L) Reference Books:

### a. Reference books-

Sr. No.	Author	Title	Publisher
1.	G.S. Birdie & J. S. Birdie	Water supply & Sanitary Engg.	Dhanpat Rai & Sons, Delhi
2.	S. C. Rangwala	Water supply & Sanitary Engg.	AnandCharotar , Delhi
3.	V.N. Gharpure	Water supply Engg.	Engg. Book Publishers co.Pune
4.	V.N. Gharpure	Sanitary Engg.	Engg. Book Publishers co.Pune
5.	Kamala A. & Katthrao D.L	Environmental Engg.	New York-Tata Mcgraw hill
6	Gupta & Others	Environmental Engg. System	NiraliPrakashan Mumbai

### b) Codes of Practice: IS, BIS and international codes:

1. IS 14543: 2004 IS Code for testing of drinking water.
2. IS 8403: 1977 Code of practice disposal of Effluent from septic Tank.
3. Drinking water specifications (IS 10500: 1991)
4. BIS standard for effluent disposal printed in 1963, revised in 1968.
5. Code of practice for selection, installation & main water supply in building --- IS 2065

## M) Learning Website & Software

i) [http://www.kolhapurcorporation.gov.in/english/Town\\_Planning\\_Department.html](http://www.kolhapurcorporation.gov.in/english/Town_Planning_Department.html)

ii) <http://tcpo.gov.in/>

iii) <https://dtp.maharashtra.gov.in/en>

**COURSE ID :** CEH507  
**COURSE NAME :** MAINTENANCE AND REPAIRS OF STRUCTURES  
**COURSE CODE :** CEH507  
**COURSE ABBREVIATION :** HMRS

**Prerequisite knowledge :** Analysis, design and construction of structures

#### A. LEARNING SCHEME:

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	04	3
	Tutorial Learning	-	
	Laboratory Learning	00	
	SLH-Self Learning	02	
	NLH-Notional Learning	06	

#### B.ASSESSMENT SCHEME

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
	FA-TH	SA-TH	TOTAL		Practical				MAX	MIN	
03	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	125
	30	70	100	40	00	00	00	00	25	10	

(Total IKS hours for sem : 02hour )

#### C: ABBREVIATIONS: -

CL- Class Room Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

**Legends:** @ Internal Assessment, # External Assessment, \*# On Line Examination, @\$ Internal Online Examination.

FA-TH represents average of two class tests of 30 marks each conducted during the semester.

1. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.

2. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
3. Notional Learning hours be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities.

#### **D.RATIONALE:**

The civil engineering diploma programme deals with the infrastructure building and the course of study followed has footprints of understanding forces and their effects in mechanisms. Behavioural studies through principles and concepts. Analytical tools for engineering parameters shear force and bending moment distribution providing a base for design through checks and code protocols. The structures constructed need to be monitored for its value and assessment of the suitability for its intended purpose during its life. The structures exhibit numerous distress during its service exhibiting structural and non-structural cracks. The present course deals with investigation of the structure for its functional value, durability and strength parameters. The approach has to be scientific and diagnostic tools are to be technology based. Remedial measures are to be dealt with as the case may be. Broad overview of the schedule forms the course content for the subject.

#### **Competency identified for the course:**

The MPEC 2023 curriculum design based on MSBTE K curriculum guideline and NEP2020 policy incorporates all self and tutorial such as notional hours and non-national hours of learning. Indian knowledge system is also intended to explore through additional hours of learning during the semester. Subject is allotted 4 hrs. of class room learning. All these hrs. of learnings including IKS learning are aimed at achieving following skills sets as contact sessions of 15 weeks.

#### **E. COURSE OUTCOMES (COs):**

- i)CEH507-1 Cause and maintenance protocol for different structures.
- ii)CEH507-2. Diagnostic tests to measure distress in structures.
- iii)CEH507-3 Spectra of materials and application techniques for maintenance.
- iv)CEH507-4 Cracks and repairs in Masonry structure.
- v)CEH507-5 Cracks and repairs in RCC structures.
- vi)CEH507-6 Structural audit format and budget provision.

#### **Competency, course outcomes and programme outcomes/programme specific outcomes**

##### **(cp-co-po/pso) matrix**

[Note : Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “0” ]

Competency and COs	PO 1 Basic & Discipline specific knowledge	PO 2 Problem analysis	PO 3 Design/development of solutions	PO 4 Engineering Tools, Experimentation & Testing	PO5 Engineering practice for society, sustainability & environment	PO 6 Project management	PO 7 Life-long learning	PSO1 Plan and Design	PSO2 Construction and Maintenance	PSO3 Problem Solving on field
<b>Competency:</b> Apply principles of maintenance and rehabilitation of structures	3	3	2	1	2	1	2	2	1	3
<b>CEH507-1</b> Cause and maintenance protocol for different structures	2	2	2	2	3	1	2	2	2	3
<b>CEH507-2</b> Diagnostic tests to measure distress in structures	3	2	3	2	3	1	2	2	3	3
<b>CEH507-3</b> Spectra of materials and application techniques for maintenance	3	3	3	3	2	1	2	2	3	3
<b>CEH507-4</b> Cracks and repairs in Masonry structure	3	3	3	3	2	1	2	2	3	3
<b>CEH507-5</b> Cracks and repairs in RCC structures	3	3	3	3	2	1	2	2	3	3
<b>CEH507-6</b> Structural audit format and budget provision	3	3	3	3	2	1	2	2	3	3

**F. CONTENT:****THEORY : SECTION-1**

Sr. No.	Topics	Teaching (Hours)	Theory evaluation
<b>Course Outcome: CEH507-1 Introduction to maintenance and repair ,objectives and scheduling</b>		<b>10</b>	<b>10</b>
<b>1</b>	1.1 Terminologies : Maintenance and repair, retrofitting,, re-strengthening, rehabilitation and restoration 1.2 Necessity , purpose and importance of maintenance and repair 1.3Factors influencing the maintenance and repair 1.4 Benefits and limitations of maintenance and repair 1.5 Scheduling maintenance and repair		
<b>Course Outcome : CEH507-2 Distress and dilapidation causes and detection</b>		<b>16</b>	<b>14</b>
<b>2</b>	2.1 Causes of damages due to distress, earthquake, wind flood, dampness, corrosion, fire, dilapidation, termites 2.2 Systematic approach of damages detection –structural and nonstructural cracks etc through visual observations. 2.3 Non-destructive tests as diagnostic approach- Rebound hammer, Ultra sound test, rebar locator, cover gauge, crack detection test, chloride test, sulphate attack test, pH measurement, half- cell potentiometer		
<b>Course Outcome: CEH507-3-materials for Maintenance and Repair</b>		<b>10</b>	<b>10</b>
<b>3</b>	3.1 Factors governing the choice or suitability for repair and maintenance. 3.2 Anti Corrosion coating materials –cement slurry mortar;polumer modified cement slurry; Epoxy zinc 3.3Adhesives for dampness/maintenance treatment –solvent free; epoxy polyester adhesive, acrylic adhesive, water borne adhesive coats,polyvinyl acetate and vinyl acetate co-polymer. 3.4 Mortar repair materials [ cementitious mortar, resin mortar, polymer modified cementitious mortar. 3.5 Joint sealant materials–oleo resinous mastics,,bitumen/rybber based sealants and acrylic resin sealant. 3.6 Grout materials : Cement, Cement plus sand, cement sand plus additive materials and normal epoxies 3.7 Water proofing roof materials ; PolyIsobutylene (PIP) sheet,glass fibre reinforced plastics ,bitumen and bituminous emulsions and latex cement coating. 3.8Surface coating materials for concrete protection ,Bituminous cutbacks, chlorinated rubber coating, epoxy coating and coal tar epoxy coating. 3.9 special repairing materials – plastic or aluminium nipples,polymer putty or 1:3 cement sand mortar and galvanized steel wire fabric and clamping rods.		
	<b>Total</b>	<b>36</b>	<b>34</b>

Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.

**SECTION-2**

Sr. No.	Topics	Teaching (Hours)	Theory evaluation
<b>Course Outcome CEH507 -4 maintenance and repairs of masonry structures</b>		<b>12</b>	<b>10</b>
<b>4</b>	<p>4.1 causes of common damage in masonry constructions –foundation settlement, bulging of walls, mortar unit displacemt, bond failure, thermal and vegetation induced damages.</p> <p>4.2 mortar joints disintegration; mortar composition, age effect on mortar strength .</p> <p>4.3 Sequential repair by scaling and application of new coats with proper formwork and scaffolding.</p> <p>4.4 repair techniques with grouting materials, epoxy, putty</p> <p>4.5Repairs for minor and medium cracks include epoxy injection,scaling, shotcrete, stitching and guniting.</p> <p>4.6 Repairing for major cracke(more than 5mm width) include fixing mesh across cracks, dowel bars, RCC band and installing ferrocement plates at corners and propping.</p> <p>4.7Dampness treatment in masonry includes water proofing coats, DPC in brick walls, plastering with cement and gum.</p> <p>4.8 For masonry foundation repair includes compaction to prevent settlement, providing sand piles, stone pillars and grouting cement slurry.</p>		
<b>Course outcome: CEH -5 Maintenance and Repairs of RCC structures</b>		<b>12</b>	<b>16</b>
<b>5</b>	<p>5.1 Repairs for cracks in RCC –probable location, causes .</p> <p>5.2 RC roof dampness –causes and repair techniques, brick tile topping with mud phuska ,lime concreting ,ferro cement topping , coba , water proofing treatment with polymer coats.</p> <p>5.3For structural cracks in RC member –epoxy injection, grooving and scaling, stitching and rebaring, grouting ,spalling replacement, jacketing ,shotcrete and guniting.</p> <p>5.4 Corrosion steel remedies includes protective coating of exposed steel, additional reinforcing bar compensation.</p> <p>5.5 Repair methods for honeycomb and larger voids.</p>		
<b>Course Outcome : CEH -6 Structural audit and budget provision</b>		<b>10</b>	<b>10</b>
<b>6</b>	<p>6.1 necessity and importance of structural audit and budget provision</p> <p>6.2Inspection for structural distress, survey and description, recommendations for measures.</p> <p>6.3 Protocol for structural audit and budgetary support for maintenance and repair</p> <p>6.4 Format or template for structural audit including general information, data, observations, adjacent and surrounding influential factors.</p> <p>6.5 Overview of common structural audit procedures adopted by various professional bodies including PWD, Zilla parishad, Institution of Engineers, Valuationers, bankers.</p>		
<b>Total</b>		<b>34</b>	<b>36</b>

Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.

**SLA-**The practical outcomes are the subcomponents of the six Cos listed and to be assessed for the competency gained.

S. No.	Practical Outcome	Unit No.	Approx hours required
1.	List of the causes of damages in structures with photographs	I	2
2.	Extent of efflorescence in masonry or concrete for damaged or undamaged structure	II	2
3.	Various materials used in maintenance with application evidence	III	4
4.	Rebound hammer test for strength assessment	II	2
5	Ultrasound Pulse velocity test for strength assessment	II	2
6	Rebar locator, Cover gauge , corrosion measure test	II	2
7	Masonry structure maintenance and repair with photographs	IV	2
8	RCC structure maintenance and repair with photographs	V	4
9	Structural audit of a small public building by visual observation	VI	2
10	Typical structural audit of a residential building / apartment / public building	VI	4
11	Miscellaneous topics like state of the art techniques for diagnosis strength deterioration, repair method	II, III	2

## Section I

### G. SLA (Self Learning Assessment)

**Self learning/ Micro Projects: (One project to the group of 4/5 students)**

- i) structural retrofitting masonry structure.
- ii) Structural retrofitting of RC Column .
- iii) Rehabilitation of entire structure under distress.
- v) Raising the foundation /plinth height/floor level of the building
- vi) Nanomaterials for maintenance and repair of structures.
- vi) Multistorey /high rise building case study –structural audit

- vii) structural audit of a heritage building
- viii) PWD norms for structural audit of their buildings.
- iX) strength assessment of bridge and remedial measures.
- ix) Structural audit of water works –dams/ canals
- x) Structural audit of miscellaneous structures- statues, hoardings, towers .
- xi) Structural audit of water tanks
- xii) Any topic related to civil engineering infrastructure.

*The assessment scheme for practicals and self learning as per MPEC2023 norms :*

### **H: Specification table for setting question paper for semester end theory examination**

Topic No.	Name of topic	Distribution of marks (level wise)			Total Marks
		Remember	Understand	Apply	
1.	Causes, purposes and scheduling of maintenance and repair	2	4	4	10
2.	Diagnostic tests for strength assessment	2	8	4	14
3.	Materials for maintenance and repairs	2	4	4	10
4.	M and R for masonry structures	2	4	4	10
5.	M and R for RCC structures	4	4	8	16
6.	Structural audit format and budget provision	2	4	4	10
	<b>Total</b>	<b>12</b>	<b>26</b>	<b>32</b>	<b>70</b>

### **I:-Assessment Criteria**

#### **i) Formative Assessment of Practical: -**

Every practical shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

#### **ii) Summative Assessment of Practical:**

End exam practical assignment shall be assessed for 25 marks as per following criteria:

Sr. no	Criteria	Marks allotted
1	Attendance at regular practical	05
2	Preparedness for practical	05
3	Neat & complete Diagram.	05
4	Observations & handling of instrument.	05
5	Oral Based on Lab work and completion of task	05
<b>TOTAL</b>		<b>25</b>

**iii) Assessment of SLA: -**

Every Self-learning assignment/microproject shall be assessed for 25 marks as per Following criteria

Sr.no	Criteria	Marks allotted
1	Attendance/periodic assessment	05
2	Preparedness –write up/inference /scope	05
3	Presentation (neat figures/ diagrams/ tables/ graphs etc.)	05
4	Conclusion / application	05
5	Oral Based on microproject/ assignment/ activity	05
<b>TOTAL</b>		<b>25</b>

**J. Instructional Methods:**

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration

**K. Teaching and Learning resources:**

1. Chalk board
2. Presentations /youtube materials.
3. PWD and ZP formats
4. NDT testing manuals

**L. REFERENCE BOOKS**

a) Book / journals / IS code

SNo.	AUTHOR	TITLE	PUBLISHER
1.	Gahlot P S ,Sharma ,Sanjay	Building repair and maintenance management	CBS Publishers ,New Delhi
2	Nayak B S	Maintenance Engineering for Civil engineers	Khanna Publications
3	Guha P K	Maintenance and Repairs	New Central Book agency, New Delhi

		of buildings	
4	Hachin Son, BD	Maintenance and Repairs of buildings	Newness-Butterworth, London.

**COURSE ID** : HIOT  
**COURSE NAME** : Internet of things  
**COURSE CODE** : CEH508  
**COURSE ABBREVIATION** : HIOT

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	00	1
	Tutorial Learning	00	
	Laboratory Learning	01	
	SLH-Self Learning	01	
	NLH-Notional Learning	02	

**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Practical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
00	00	00	00	00	25	10	00	00	25	10	50

**(Total IKS Hrs for Sem : 00 Hrs)**

**C:** Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)



Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analyses	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 Plan and Design	PSO2 Construction and Maintenance	PSO3 Problem solving on field
CEH 50 -5CO-5 Integrate IoT services with cloud computing for scalable data storage, processing, and real-time analytics		1	1	1	1	1	1	1	1	1
CEH 50 -6 CO-6 Understand the fundamentals of 3D printing technology and its applications		1	1	1	1	1	1	1	1	2

## F. CONTENT:-

### I) Practical exercises –

Sr.no	Practical title	Duration Hrs	COS
1.	Circuit Design for IoT System Door automation solution	0.5	
2.	Block based IoT programming for Home Security Solution	0.5	
3.	Build the IoT Home Security solution using IR, Camera and Buzzer	0.5	
4.	Build the energy saving solution with smart lighting	0.5	
5.	Demonstrate a timer based smart Irrigation solution	0.5	
6.	Build the IoT based water quality testing solution	0.5	
7.	Demonstrate IoT in Healthcare Smart pulse rate and Oxygen Monitoring solution	0.5	
8.	Demonstrate IoT in Healthcare Smart Saline Monitoring solution	0.5	
9.	Demonstrate IoT in Healthcare Assistive Communication solution	0.5	
10.	Construct IoT application in Weather Forecasting- Wind speed Temperature and Humidity Monitoring	0.5	
11.	Build IoT in agriculture Smart Scalable Irrigation solution using LoRAa protocol	0.5	
12.	Create a smart Energy Monitoring solution(PF, Voltage, Current, Energy consumption etc.)	0.5	
13.	Build a Home security solution Digital lock with camera	0.5	
14.	Build IoT solution for Rain Sensing automatic Roof	0.5	
15.	Create IoT solution for vehicle overload detection & warning	0.5	
16.	Develop a home and building Fire Safety solution	0.5	
17.	Build a transportation and safety solution	0.5	
18.	Create a Public safety smart crowd Management System	0.5	
19.	Build a Smart LPG Monitoring Solution	0.5	
20.	Build a smart city Waste Management solution	0.5	
21.	Create IoT application for air quality Monitoring	0.5	

22.	Develop a Smart City Smart Parking Management System	0.5	
23.	Create a smart Stress Monitoring solution using GSR sensor	0.5	
24.	Create your own Iot Solution	0.5	
25.	Calibration of 3D printer-bed level,temperature calibration, filament flow calibration	0.5	
26.	Setting up infill density, infill pattern,orientation of object, support material wall thickness and converting .stl file to .gcode file in slicing software.	0.5	
	Printing and assembling multiple parts to create a functional object.	0.5	

## II) Theory

### Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
<b>CEH 50 -1 Unit-I Fundamental Building Blocks of IOT</b>			
1	1.1 Why Learn IoT 1.2 Impact of IoT on World and Job Opportunities 1.3 Fundamental BuildingBlocks of IoT Application. 1.4 Demonstrate example use case highlighting the following: 1.5 steps of application buildingFundamental building blocks of the use case	2	10
<b>CO: CEH500-2: IoT Gateway and Microcontroller &amp; Microprocessor</b>			
2	2.1 Know your IoT Gateway 2.2 Microcontrollers - Arduino / ESP32 2.3 Microprocessor - Raspberry Pi 4B	2	12
<b>CO: CEH500-3: Sensors and Communication Protocols in IoT</b>			
3	3.1 Working Principles of Sensors 3.2 Sensor Calibration 3.3 IoT Communication Protocols -Bluetooth, WiFi, SPI, USB, UART, I2C	2	12

### Section –II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
<b>CO: CEH000 -4: Software Stack for IoT Application</b>			
4	4.1 Circuit Designer Overview 4.2 Block Programming 4.3 Python Direct IDE 4.4 Introduction to Python 4.5 Learn Python using Blocks	2	14

<b>CO: CEH00-5: IoT Services and Cloud Computing</b>			
5	5.1 Unlocking power of IoT 5.2 Mobile browser to IoT Gateway Communication 5.3 Cloud Connectivity for IoT Application 5.4 How to open AWS account 5.5 AWS Cost Management	2	14
<b>CO: EEG307-6: Introduction to 3D printing</b>			
6	6.1 Basic principle of 3D printing, steps in 3D printing process 6.2 3D printer components and its calibration 6.3 Common basic slicer settings (layer height, fill density, supports, platform adhesion - skirt, brim, raft, shell thickness) 6.4 Post-processing techniques, need of post-processing, steps in post processing	2	8

**\*\* No questions will be asked on IKS learning subtopics in any question papers.**

### **G: List of task under SLA**

Sr.No	List of task under SLA	Hrs Allotted
1	Study the online courses by NPTEL or swayam or any learning platform with standard certification	02
2	Study the different types of sensors and its application to various industries.	02
3	Study the Smart waste management systems	02
4	Study the IoT in construction management (equipment tracking, worker safety)	02
5	Study the IoT-based predictive maintenance	02
6	Study the Integration with Building Information Modeling (BIM)	02
7	Study the Automated irrigation systems for green buildings	02
8	Study the IoT-based flood detection and alert system	02
9	Study the Smart concrete curing monitoring system	02
10	Study the IoT-based construction site safety system	02

### **H : Specification table for setting question paper for semester end theory examination**

#### **I :-Assessment Criteria**

##### **i) Formative Assessment of Practical:-**

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Attendance/Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

**ii) Summative Assessment of Practical: Not Applicable for this course**

At the time of Practical Examination assessed for 25 marks as per following criteria:

Sr. no	Criteria	Marks allotted
1	Knowledge about the course	05
2	Preparedness for practical /Oral	05
3	Neat & complete Diagram/write up	05
4	Observations/Handling of instrument/ Communication/Presentation	05
5	Oral Based on Lab work and completion of task	05
<b>TOTAL</b>		<b>25</b>

**J) Instructional Methods:**

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration

**K) Teaching and Learning resources:**

Chalk board, LCD presentations, Demonstrative kits, Demonstrative Documents.

**L) Reference Books:**

Sr. No.	Author	Title	Publisher
1.	David hanes,Gonzalo Salgueiro,Patrick Grossetti	IoT Fundamentals Networking Technologies,Protocols,and Use cases for the Internet of things	Cisco Press ISBN;978-1-58714-456-1599
2.	N.Ida	Sensors, Actuators and Their Interfaces	Scitech Publishers2014
3.	Simen Monk	Raspberry Pi Cookbook	Publisher(s) O'Reilly Media, Inc ISBN9781098130923
4.	Bernd Scholz-Reiter, Florian Michahelles	Architecting the Internet of things	Springer2016 ISBN 978-3-642-19157-2

**M) Learning Website & Software**

- **NPTEL Course:** *Introduction to Internet of Things*
- **Coursera:** *IoT for Beginners* (Microsoft)
- **YouTube Channels:**
- Great Learning
- Engineering Projects
- Tech StudyCell
- **Arduino & Raspberry Pi Official Documentation**
- **MIT Open Course Ware:** Smart City and IoT modules

**COURSE ID : HTCP**  
**COURSE NAME : TOWN AND COUNTRY PLANNING**  
**COURSE CODE : CEH409**  
**COURSE ABBREVIATION : HTCP**

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	04	4
	Tutorial Learning	00	
	Laboratory Learning	02	
	SLH-Self Learning	02	
	NLH-Notional Learning	08	

**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Practical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
03	30	70	100	40	25	10	@25	10	25	10	175

**(Total IKS Hrs for Sem : 01 Hrs)**

**C:** Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

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4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

## D. i) RATIONALE:-

The civil engineering branch has great responsibility to protect the environment and to distribute the nature's gifts to all in a rational manner. In this context the student shall have the knowledge of available basic resources like land, water, light, air. It is ultimate responsibility of the planner to see that any resource is not over stretched or over consumed. The student / planner have to consider socio-economic structure of the region.

## ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

Understanding interdependency of regions and the environment, he should be able to suggest draft plan for future, keeping in view the healthy atmosphere and room for expansion to all components.

## E. COURSE LEVEL LEARNING OUTCOMES (COS)

CEH409 - 1- Plan the town using basic town planning principles and Carry field survey to collect various data.

CEH409 - 2- Work to improve slum areas, select the ideal site for industries, public buildings, provide Facilities like parks and playgrounds.

CEH409 - 3- Plan residential area using neighborhood concept.

CEH409 - 4 - Plan the region as per MR&TP act.

CEH409 - 5- Plan the buildings as per building bye laws of local authority.

CEH409 - 6- Plan and design rural housing at low cost.

### Competency, course outcomes and programme outcomes/programme specific outcomes

(cp-co-po/pso) matrix [Note: Correlation levels: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), "0" ]

Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 Plan and Design	PSO2 Construction and Maintenance	PSO3 Problem solving on field
CEH409- CO-1 Plan the town using basic town planning principles & and Carry field survey to collect various data.	3	3	1	1	2	1	1	2	2	2
CEH409 CO-2 Work to improve slum areas, select the ideal site for	2	3	3	2	3	2	1	2	2	3

Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analyses	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 Plan and Design	PSO2 Construction and Maintenance	PSO3 Problem solving on field
industries, public buildings, provide Facilities like parks and playgrounds.										
CEH409 CO -3 Plan residential area using neighbourhood concept.	3	3	2	2	2	1	1	2	2	2
CEH409 CO-4 Plan the region as per MR&TP act.	3	3	2	2	3	2	1	2	2	3
CEH409 CO-5 Plan the buildings as per building bye laws of local authority.	3	3	2	2	3	2	1	2	2	2
CEH409 CO-6 Plan and design rural housing at low cost.	3	3	3	2	2	2	1	2	2	3

## F. CONTENT:-

**I)Practical exercises** – Practical exercises contain assignments, market survey reports, information brochure, leaf-lets and pamphlets on the following:

Sr. no	Laboratory experiences	CO
1	*Land sub divisioning problem	CO - 1
2	*Planning of housing scheme leading to detailed neighborhood planning	CO – 3
3	*Case studies of town planning schemes having report and drawing	CO – 4
4	*Collection of building bye-laws of local authority	CO – 5
5	*Parking bye laws for different types of public buildings	CO – 6
6	*Forms of town and country planning. i.e local planning, country planning, regional planning, national planning, international planning,	CO - 1
7	*Study Five Year Plans	CO - 2
8	*Agencies for housing schemes i.e. State Housing Board, Co- operative Housing Societies, Private Enterprises, Individuals, brief description of each.	CO – 3
9	*Prepare detail report on Planning legislation in Maharashtra state ( MR & TP act)	CO – 4

**Note : Out of above suggestive LLOs -**

'\*' Marked Practicals (LLOs) Are mandatory.

Sr. no	<b>Laboratory experiences</b>	<b>CO</b>
Minimum 80% of above list of lab experiment are to be performed. Judicial mix of LLOs are to be performed to achieve desired outcomes.		

## II) Theory

### Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CEH409 CO -1 Plan the town using basic town planning principles and Carry field survey to collect various data.			
1	<p><b>Introduction: Nature and purpose of town and country planning</b></p> <p>1.1 Meaning and scope of the subject.            1.2 Evolution of town planning.            1.3 Objects of town planning            1.4 Principles of town planning            1.5 Growth of towns –concentric, satellite, Ribbon develop, etc.            1.6 Forms of town and country planning. i .e local planning, country planning, regional planning, national planning, international planning,            1.7 Various types of surveys. i.e. Town or city survey, regional survey, National survey, Civil survey            1.8 Zoning - Definition Types of zoning, Land use analysis.            1.9 Landscape Architecture. – Objects and salient features of the landscape architecture.</p>	12	14
CEH409-CO-2 Work to improve slum areas, select the ideal site for industries, public buildings, provide Facilities like parks and playgrounds.			
2	<p><b>Various techniques and practice</b></p> <p>2.1 Introduction to 5-year plan            2.2 Master plan – Definition, objects, necessity, Data to be collected, details to be shown on master plan drawings, stages in the preparation of master plan            2.3 Housing – Housing problem in India, classification of housing,            2.4 Slums – Definition, Causes, effects of slums on town life, precautions to be taken against slum formation, slum clearances            2.5 Industries – Classification of industries, selection of site for industries, planning of industrial estate            2.6 Public Buildings - Grouping of public buildings in various categories, site selection of public buildings</p>	08	14

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	2.7 Parks and play grounds – Types of re-creation systems, various forms of recreation amenities i.e. type of parks and play grounds.		
CEH409CO-3 Plan residential area using neighborhood concept			
3	<b>Neighbour-hood planning</b> 3.1 Concept and principles of NH planning 3.2 Importance of NH planning 3.3 Features of NH Planning 3.4 Agencies for housing schemes i.e. State Housing Board, Co- operative Housing Societies, Private Enterprises, Individuals, brief description of each.	03	06

### Section –II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CEH409 CO-4 Plan the region as per MR&TP act			
4	<b>Law in relation to planning</b> 4.1 Necessity of planning law and legislation 4.2 Existing legislation for clearance, development and control of urban land ( only list) 4.3 Land acquisition act (Introduction only) 4.4 Aims of land acquisition act 4.5 Planning legislation in Maharashtra state ( MR & TP act) : Categories of MR & TP act i.e brief details like agency, functions contents, procedure etc. 4.6 Framework and functions of local authorities 4.7 Local authorities a) Village panchayat & panchayat samiti b) Zilha Parishads c) Municipal councils (A,B,C,) class, Municipal Corporations	08	12
CEH409 CO-5 Plan the buildings as per building bye laws of local authority			
5	<b>Building bye-laws</b> 5.1 Definition 5.2 Objects of bye-laws 5.3 Importance of bye-laws 5.4 Applicability of bye-laws 5.5 Set-back & light plane 5.6 Floor space index (FSI), Floating FSI- definition, explanation with one example	06	12
CEH409 CO-6 Plan and design rural housing at low cost			
6	<b>Planning of rural development</b> 6.1 Village planning – Necessity, difference between rural & urban areas, types of villages. 6.2 Principles of village planning	08	12

6.3 General principles of rural housing design		
6.4 Rural housing problem in India		
6.5 Rural housing scheme		
6.6 Introduction to low-cost housing & agro industries		

**\*\* No questions will be asked on IKS learning subtopics in any question papers.**

### G : List of task under SLA

1. Collect the information of, “Deen Dayal Upadhyaya Grameen Kaushalya Yojana” and prepare a report on it with reference to the nearby village or rural settlement.
2. Summarize the salient features of the National Rural Employment Guarantee Act, 2005 (NREGA) that has been executed successfully for the given rural area and present the same in the form of the report.  
(Note: “These are the just suggestive topics. Faculty must design Microproject/Activities/ Assignments based on Course Outcome requirements”.)

### H : Specification table for setting question paper for semester end theory examination

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	Introduction	04	04	06	14	CO -1
I / 2	Various techniques and practice	04	04	06	14	CO - 2
I / 3	Neighbour-hood planning	02	04	00	06	CO - 3
II / 4	Law in relation to planning	02	04	06	12	CO - 4
II / 5	Building bye-laws	02	04	06	12	CO - 5
II/6	Planning of rural development	02	04	06	12	CO - 6
Total Marks					70	

### I :-Assessment Criteria

#### i) Formative Assessment of Practical:-

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Attendance/Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

#### ii) Summative Assessment of Practical: **Not Applicable for this course**

At the time of Practical Examination assessed for 25 marks as per following criteria:

Sr.	Criteria	Marks
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no		allotted
1	Knowledge about the course	05
2	Preparedness for practical /Oral	05
3	Neat & complete Diagram/write up	05
4	Observations/Handling of instrument/ Communication/Presentation	05
5	Oral Based on Lab work and completion of task	05
<b>TOTAL</b>		<b>25</b>

### **J) Instructional Methods:**

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration
4. MR & TP Act and various recent acts related to Urban Planning.

### **K) Teaching and Learning resources:**

Chalk board, LCD presentations, Demonstrative kits, Demonstrative Documents.

### **L) Reference Books:**

Sr. No.	Author	Title	Publisher
1.	G.H.Hiraskar	Fundamentals of town planning	Dhanpatrai Publications Ne Delhi
2.	S.C.Rangwala	Town Planning	Charotar Publishing Hous Anand
3.	N.K.Gandhi	Study of town and country planning	-

### **M) Learning Website & Software**

- i) [http://www.kolhapurcorporation.gov.in/english/Town\\_Planning\\_Department.html](http://www.kolhapurcorporation.gov.in/english/Town_Planning_Department.html)
- ii) <http://tcpo.gov.in/>
- iii) <https://dtp.maharashtra.gov.in/en>

**COURSE ID** : HQCO  
**COURSE NAME** : QUALITY CONTROL  
**COURSE CODE** : CEH411  
**COURSE ABBREVIATION** : HQCO

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	04	4
	Tutorial Learning	00	
	Laboratory Learning	02	
	SLH-Self Learning	02	
	NLH-Notional Learning	08	

**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
	FA-TH	SA-TH	TOTAL		Practical				MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
03	30	70	100	40	25	10	@25	10	25	10	175

**(Total IKS Hrs for Sem : 00 Hrs)**

**C:** Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA - Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment  
Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination  
Note : ( TNR 11 font)

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

### **D. i) RATIONALE:-**

The entire construction activities are ultimately judged by the achievement of specified quality standards. Hence clear understanding of the concepts, principles and practices of Quality Control are necessary. It has now become evident that, in common with other majority management functions, successful conduct of the Quality function demands much specialized knowledge and many specialized tools and apply the knowledge. This subject is planned to enable the students to acquire this specialized knowledge and to develop proficiency in use of the tools and methods to make the knowledge effective.

### **ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME**

The aim of this course is to help the student to attain the following industry identified outcome through various learning experiences:

1. Applying knowledge of components of Quality Control program for development of Infrastructure
2. Conduct under construction site visits.
3. Attitude of i) precision ii) accuracy iii) safety iv) punctuality v) aesthetic presentation

### **E. COURSE LEVEL LEARNING OUTCOMES (COS)**

HQCO411- 1- Decide the steps in quality control program and plan the quality circles.

HQCO411- 2- Classify the data and present the data in different manners.

HQCO411- 3- Decide the Organization structure and ISO standards

HQCO411- 4-Prepare the plan for inspection and sampling of construction works

HQCO411- 5-Decide factors controlling Quality of conformance

HQCO411- 6-Decide the applicability of Total quality management system

in Construction Project

## Competency, course outcomes and programme outcomes/programme specific outcomes

### (cp-co-po/ps0) matrix

[ Note: Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “0”

Competency and COs	Programme Outcomes POs and PSOs									
	PO 1 Basic knowledge and Discipline Knowledge	PO 2 Problem Analysis	PO 3 Design /Development of solutions	PO 4 Engineering Tools, Experimentation & Testing	PO 5 Engineering Practices for society, sustainability and environment	PO 6 Project Management	PO 7 Life-long learning	PSO1 Plan and Design	PSO2 Construction and Maintenance	PSO3 Problem Solving on field
<b>Competency: Applying knowledge of Quality Control for development of Infrastructure :</b>	3	3	3	2	3	2	-	3	3	1
<i>CEG411-1 Decide the steps in quality control program and plan the quality circles</i>	3	3	3	3	2	3	1	2	2	1
<i>CEG411-2 Classify the data and present the data in different manners.</i>	3	3	3	1	1	1	-	3	3	1
<i>CEG411-3 Decide the Organization structure and ISO standards</i>	3	2	2	2	2	2	2	2	2	1
<i>CEG411-4 Prepare the plan for inspection and sampling of construction works</i>	3	3	2	2	3	2	3	2	2	1
<i>CEG411-5 Decide factors controlling Quality of conformance</i>	3	2	1	1	2	3	3	2	2	1
<i>CEG411-6 Decide the applicability of Total quality management system in construction project</i>	3	2	2	2	2	3	3	2	2	1

## F. CONTENT:-

### I) Practical exercises

The following practical exercises shall be conducted in the Institute in practical sessions of batches of about 20- 22 students:

Sr No.	Title of Practical Exercise	Skills / Competencies to be developed	Course Outcome
A	<b>Seminar:</b> Students can select any topic from contents by text book, professional magazines, technical papers published and websites of. Make a seminar presentation of 10 minutes using power point and make a report. Weightage is assigned for contents and Presentation skills. (Students can work in a group of two.)	<ol style="list-style-type: none"> <li>Developing Self learning ability.</li> <li>Developing Presentation skills.</li> </ol>	CEH412-1 CEH412-2 CEH412-3 CEH412-4 CEH412-5 CEH412-6

<b>B</b>	<b>Visits and detailed Report</b> 1. To collect data of construction work and plot frequency distribution, histogram, polygon and cumulative frequency. 2. To inspect different items of construction work. 3. To study the sampling plan of any one Civil Engineering construction.	1. Time management, team working. 2. Understand, prepare and interpret the drawings related to work. 3. Understand the procedure for inspection of different items of construction work.	CEH412 -2 CEH412 -6
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## II) Theory

### Section I

Sr. no.	Topics	Teaching (Hours)	Theory evaluation Marks
<b>Course Outcome CEH411-1 Decide the steps in quality control program and plan the quality circles</b>			
<b>1</b>	<b>Introduction</b> <b>1.1 Basic Concepts Definition, Terminology</b> 1.1.1 Meaning of Quality - Meaning of quality control 1.1.2 Steps in quality control program. 1.1.3 Objectives of quality control, quality characteristics 1.1.4 Quality of design, factors controlling of Quality of design.  <b>1.2 Quality Circle</b> 1.2.1 Definition , 1.2.2 Scope of quality circles, advantages and limitations of quality circles 1.2.2 Basic organizational structure of quality circles , 1.2.4 Basic problem solving techniques (Brain storming )	<b>10</b>	<b>14</b>
<b>Course Outcome CEH411-2 Classify the data and present the data in different manners</b>			
<b>2</b>	<b>Fundamentals of statistical concepts</b> 2.1 Frequency, Frequency distribution, frequency plot, use of Frequency plot-case study, classification of data.  <b>2.3</b> Graphic presentation of frequency distribution i.e. histogram, polygon, cumulative frequency graph etc. presenting the data.  2.4 Concept of universe and sample statistics normal distribution curve, its construction, actual and ideal normal distribution curve.  2.5. Measures of central tendency i.e. Arithmetic mean, The median, the mode comparison of mean mode and median.	<b>06</b>	<b>10</b>
<b>Course Outcome CE411-3 Decide the Organization structure and ISO standards</b>			

<b>3</b>	<b>Organization structure and ISO standards</b>  <b>3.1 Organization For Quality Control</b> 3.1.1 Quality control Department, Structure of the Department, 3.1.2 Staffing and job specifications,  <b>3.2 Introduction To ISO 9000.</b> 3.2.1 Introduction to ISO series ,History of ISO 9000 series standards, 3.2.2 ISO 9000 standards in general ,Outstanding features of ISO9000 3.2.3 Series of standards 3.2.4 Benefits by becoming an ISO 9000 company.	<b>06</b>	<b>10</b>
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### Section –II

Sr. no.	Topics	Teaching (Hour s)	Theory evaluation Marks
<b>Course Outcome CEH411-4 Prepare the plan for inspection and sampling of construction works</b>			
<b>4</b>	<b>Inspection and Sampling</b> <b>4.1 Inspection</b> 4.1.1 Importance of inspection& types, inspection of works in construction, 4.1.2 Inspection planning, accuracy of inspection 4.1.3 Budgeting for inspection & approaches to reduce the inspection cost.  <b>4.2 Sampling by Attributes</b> 4.2.1 Importance of sampling inspection, acceptance sampling 4.2.2 Lot formation, terminology of sampling plans - single,double, multiple, sequential. 4.2.3 Procedure of lot acceptability, normal reduced &tightened inspection. 4.2.4 Design of sampling plans	<b>12</b>	<b>16</b>
<b>Course Outcome CEG411-5 Decide factors controlling Quality of conformance</b>			
<b>5</b>	<b>Quality Assurance</b> 5.1 Concept of quality assurance 5.2 Responsibilities of quality assurance 5.3 Quality audit 5.4 Quality of conformance, factors controlling Quality of conformance.	<b>6</b>	<b>10</b>
<b>Course Outcome CEG408-6Decide the applicability of Total quality management system in construction project</b>			

<b>6</b>	<b>Total quality management</b> 6.1 Historical review and evolution of TQM 6.2 Deming and Juran approaches to TQM 6.3 Seven tools of TQM 6.4 Total quality culture 6.5 Bench marking, quality function deployment, Kaizen, six sigma	<b>5</b>	<b>10</b>
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Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks

only

**\*\* No questions will be asked on IKS learning subtopics in any question papers.**

## G : List of Micro project/Assignments under SLA

### Micro project-

1.	<p><b>Suggested Micro-projects:</b> <b>Any one project for group of three to five students.</b></p> <ol style="list-style-type: none"> <li>1. Visit any construction industry and list the quality control practices.</li> <li>2. The study of steps in quality control programme, objectives and quality characteristics.</li> <li>3. The study of quality circle, advantages and limitations of basic organization structure of any one construction organization</li> <li>4. To study various functions of quality control department and study job specifications regarding quality.</li> <li>5. To study the different features of ISO 9000</li> <li>6. To study various tools of TQM.</li> </ol>	<ol style="list-style-type: none"> <li>1. Information collection and presentation in the form of report.</li> <li>2. Motivation through field exposure.</li> <li>3. Developing self-learning ability.</li> </ol>	
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## H : Specification table for setting question paper for semester end theory examination

Topic No.	Name of topic	Distribution of marks (Cognitive level-wise)			Course Outcome	Total Marks
		Remember	Understand	Applica-tion		
1	Introduction	4	6	4	CEH412-1	14
2	Fundamentals of statistical concepts	2	4	4	CEH412-2	10
3	Organization structure and ISO	4	6	-	CEH412-3	10
4	Inspection and Sampling	8	4	4	CEH412-4	16
5	Quality assurance	4	4	2	CEH412-5	10
6	Total quality management	4	4	2	CEH412-6	10
<b>Total</b>		<b>26</b>	<b>28</b>	<b>16</b>		<b>70</b>

## I :-Assessment Criteria

### i) Formative Assessment of Practical :-

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Attendance/Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

Semester end exam question paper should be such that total marks of questions on each topic is one and half times the marks allotted above but the candidates are able to attempt questions of the above allotted marks only.

### ii) Summative Assessment of Practical:

At the time of Practical Examination assessed for 25 marks as per following criteria:

Sr. no	Criteria	Marks allotted
1	Knowledge about the course	05
2	Preparedness for practical /Oral	05
3	Neat & complete Diagram/write up	05
4	Observations/Handling of instrument/ Communication/Presentation	05
5	Oral Based on Lab work and completion of task	05
<b>TOTAL</b>		<b>25</b>

## J) Instructional Methods:

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration

## K) Teaching and Learning resources:

Chalk board, LCD presentations, Demonstrative kits, Demonstrative charts.

## L) Reference Books:

Sr.No.	Author	Title	Publisher
1	J .M .Juras&Frank M .GrynaJr	Quality planning and Analysis	
2	T .T .T .I .Madras	Quality control	T .T .T .I .Madras
3	S .Dalesa&Saurabh	ISO 9000 Quality systems.	
4	T.R.Banga, S.C.Sharma	Industrial organization	Khanna Publishers

## M) Learning Website & Software

Sr.No	Link / Portal	Description
1	<a href="https://www.youtube.com/watch?v=ypTiYyh7YT0">https://www.youtube.com/watch?v=ypTiYyh7YT0</a>	NPTEL Lectures on construction Quality control

**COURSE ID : HPSR**  
**COURSE NAME : PLUMBING SERVICES**  
**COURSE CODE : CEH410**  
**COURSE ABBREVIATION : HPSR**

**A. LEARNING SCHEME:**

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	04	2
	Tutorial Learning	00	
	Laboratory Learning	02	
	SLH-Self Learning	02	
	NLH-Notional Learning	07	

**B. ASSESSMENT SCHEME :-**

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Practical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
03	30	70	100	40	25	10	25@	10	25	10	175

**(Total IKS Hrs for Sem : 00 Hrs)**

**C:** Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1(one) credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.

\* Self learning includes micro project / assignment / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

### D. i) RATIONALE:-

A properly systematic course in Plumbing is rarely available in India. Plumbing though crucial but remained as neglected subject. As a result, there is a great demand to well trained Plumbing Professionals in the building industry.

Plumbing service is necessary for proper water supply & efficient drainage facility in a building. As building planning is becoming more complex with modern plumbing materials and systems are available in India, it is necessary to include the same in the Civil Engineering curriculum.

Plumbing services are important component of Civil Engineering. Internal plumbing contributes to around 15% of the construction cost. Indian Plumbing Association (IPA) has adopted, reviewed and revised the Uniform Plumbing Code of International association of Plumbing and Mechanical officials to suit Indian practices, customs and Laws. The code is published as Uniform Plumbing Code – 2008 India (UPC1). Need of proper use of Plumbing code must be code based education and training in Plumbing will have better job opportunities and improved income.

### ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

The formal education in Plumbing will improve the plumbing system design and installation standards, thereby ensuring health and safety of people, structure and environment.

### E. COURSE LEVEL LEARNING OUTCOMES (COS)

CO-1 Know the terminology in plumbing.

CO-2 Know the different types of plumbing fixtures and fittings.

CO-3 Know various types of traps, plumbing systems and venting system.

CO-4 Know the principles of sanitation and objects of sewage disposal, construction of sanitary drainage and storm water systems and select the proper plumbing materials.

CO-5 Understand system of water supply, gray water, reclaimed water.

**Competency, course outcomes and programme outcomes/programme specific outcomes**

**(cp-co-po/pso) matrix** [Note: Correlation levels : 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), “0” ]

Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 Plan and Design	PSO2 Construction and Maintenance	PSO3 Problem solving on field
CEH410- CO-1 Know the terminology in plumbing.	3	3	1	1	3	3	1	2	2	1

Competency and Cos	Programme Outcomes POs and PSOs									
	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analyses	PO 3 Design / Development of solutions	PO 4 Engineering Tools, Experimentation and Testing	PO 5 Engineering Practices for society, sustainability and Environment	PO 6 Project Management	PO 7 Life-long Learning	PSO1 Plan and Design	PSO2 Construction and Maintenance	PSO3 Problem solving on field
CEH410- CO-2 Know the different types of plumbing fixtures and fittings	2	3	3	2	3	2	1	2	2	3
CEH410 -CO -3 Know various types of traps and plumbing systems.	3	3	3	3	3	3	3	2	2	1
CEH410- CO-4 Know the principles of sanitation and objects of sewage disposal. Construction of sanitary drainage and storm water systems and select the proper plumbing materials	3	2	2	3	3	1	2	2	2	2
CEH410-CO-5 Understand system of water supply, gray water, reclaimed water and methods to conserve water and energy.	3	3	1	1	3	3	2	2	2	1

## F. CONTENT:-

I) **Practical exercises** – Practical exercises contain assignments, market survey reports, information brochure, leaf-lets and pamphlets on the following:

Sr. no	Laboratory experiences	CO
1	*To study different plumbing fixtures.	CO - 2
2	*To study different valves used in drainage and water supply.	CO – 1
3	*To study system of plumbing for building drainage	CO – 3
4	*Make a seminar presentation of 10 minutes using power point and make a report on any topic from contents by text book, professional magazines, technical papers published and websites.	CO – 1 TO 5
5	*Visit any plumbing site and submit a report on observation on plumbing system, architectural and structural provisions, pipe materials, work method, safety and recommendations based on the provisions of UPC-I.	CO – 4 and 5

**Note : Out of above suggestive LLOs -**

'\*' Marked Practicals (LLOs) Are mandatory.

Sr. no	<b>Laboratory experiences</b>	<b>CO</b>
Minimum 80% of above list of lab experiment are to be performed. Judicial mix of LLOs are to be performed to achieve desired outcomes.		

## II) Theory

### Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CEH410-CO-1 Know the terminology in plumbing.			
1	<p><b>Plumbing Terminology.</b>            Definition, use/Location, purpose and sketches of the following</p> <p>1.1: Plumbing fixture: - accessible /readily accessible, aerated fitting, bathroom group, carrier, flood level rim, floor sink, flush tanks, lavatories, toilet system, plumbing appliances, flushometer valve.</p> <p>1.2: Traps, indirect waste, vent blow off, development length, parts of vent system – stack vent, branch vent, continuous vent, individual vent, dirty arm, FOG (Fat, Oil and Grease) disposal system receptors and slip joint.</p> <p>1.3: Drainage- adapter fitting, AAV (Air Admittance Valve), air break, air gap, bell and spigot joint, branch, DFU (Drainage Fixture Unit Values), grease interceptor, roof drain, smoke test.</p> <p>1.4: Water supply: angle valve, anti- scald valve, check valve, gate valve, PRE (Pressure Relief Valve), back flow, bypass, cross connection, ferrule</p>	06	10
CEH410-CO-2 Know the different types of plumbing fixtures and fittings.			
2	<p><b>Plumbing fixtures and fixture fittings.</b>            Different types of plumbing fixtures, shapes/sizes, capacities, situation and used:</p> <p>2.1 Ablution fixtures –Wash basin, sinks (kitchen sinks cleaner sinks), bath tub, flushing cistern.</p> <p>2.2 Soil fixtures - water closets, urinal, mop sink, bidets, slop sinks plumbing fittings for Ablution fixtures and Soil fixtures.</p> <p>2.3 water conserving fixtures- Water cooler, cloth washer, hot and cold-water system, display fountain. Installation standard for plumbing fixtures, dimension in plan and elevation</p>	08	12

CEH410-CO-3 Know various types of traps, plumbing systems and venting system.

3	<p><b>Traps, interceptors, indirect waste and vents.</b></p> <p>3.1 Traps- Definition, function, Requirement of good trap, trap arms, Development length, trap seals, venting to traps, trap primers, Classification of traps.</p> <p>3.2 System of plumbing for building drainage-Two pipe system, one pipe system, waste receptors, dish washers, drinking fountain.</p> <p>3.3 Vent- purpose of venting, trap seal protection, materials, vent connection, flood rim level, vent stacks, water curtain and hydraulic jump, cleanouts, venting of interceptors, vent sizing.</p>	08	12
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### Section –II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CEH410-CO-4 Know the principles of sanitation and objects of sewage disposal, construction of sanitary drainage and storm water systems and Select the proper plumbing materials.			
4	<p><b>Sanitary drainage and storm drain.</b></p> <p>4.1 Preamble on single and two pipe systems, different pipe materials and jointing methods, special joints, hangers, and supports, protection of pipes and structures, alternative materials, workmanship, prohibited fittings and practices, hydraulic jump, change in direction of flow, T and Y fittings, cleanouts, pipe grading, fixtures below inverted level, suds relief, building sewers, trenching, testing sumps and pumps, sizing of horizontal and vertical pipes.</p> <p>4.2 Storms drain required, prohibited connections, subsoil drains, sub drain, gutters/channels/scuppers, roof drains, strainers, leaders, conductors and connections, collect/capture storm water, discharging storm water, safety, traps required, prohibited installations.</p>	12	18
CEH410-CO-5 Understand system of water supply, gray water, reclaimed water.			
5	<p><b>Water Supply, Gray and Reclaimed Water.</b></p> <p>5.1 Preamble on municipal water, sources of water, potable and non-potable water, reclaimed water, water storage, hot and cold-water distribution system, back flow protection, air gap, cross connection control, pipe materials and jointing method, alternative materials, hangers, and supports, workmanship, prohibited fittings and practices, protection of pipes and structures, pressure control, unions, thermal expansion, types of valves, installation and testing,</p>	11	18

	disinfection, protection of underground pipes, color codes and arrow marking, introduction to WSFU (Water Supply Fixture Units). 5.2: Definition of gray water, approvals, specification, and drawing, safety, total gray water discharge, holding tanks, valves and piping, reclaimed water system, definition of reclaimed water, pipe identification, installation, safety signs, valves, cross connection, approved uses.		
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**\*\* No questions will be asked on IKS learning subtopics in any question papers.**

### **G : List of task under SLA**

1. Draw sketches of installation details of plumbing fixtures and fittings in plan , Elevation.
2. Collect plumbing drawings for multi storied building, Interpretation of plumbing system.
3. Draw toilet layouts, plans, elevations and sections of selected case. Give dimensions.
4. Prepare layout of internal and external (outside the toilet) DWV pipes and fittings of a selected case. Write pipe diameters.

(Note: “These are the just suggestive topics. Faculty must design Microproject/Activities/ Assignments based on Course Outcome requirements”.)

### **H : Specification table for setting question paper for semester end theory examination**

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	Plumbing Terminology	02	04	04	10	CO -1
I / 2	Plumbing fixtures and fixture fittings.	02	04	06	12	CO - 2
I / 3	Traps, interceptors, indirect waste and vents.	02	04	06	12	CO - 3
II / 4	Sanitary drainage and storm drain	06	06	06	18	CO - 4
II / 5	Water Supply, Gray and Reclaimed Water.	06	06	06	18	CO - 5
Total Marks					70	

### **I :-Assessment Criteria**

#### **i) Formative Assessment of Practical:-**

Every assignment shall be assessed for 25 marks as per following criteria:

Domain	Particulars	Marks out of 25
Cognitive	Understanding	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Attendance/Discipline and punctuality	05
<b>TOTAL</b>		<b>25</b>

**ii) Summative Assessment of Practical: Not Applicable for this course**

At the time of Practical Examination assessed for 25 marks as per following criteria:

Sr. no	Criteria	Marks allotted
1	Knowledge about the course	05
2	Preparedness for practical /Oral	05
3	Neat & complete Diagram/write up	05
4	Observations/Handling of instrument/ Communication/Presentation	05
5	Oral Based on Lab work and completion of task	05
<b>TOTAL</b>		<b>25</b>

**J) Instructional Methods:**

1. Lectures cum Demonstrations,
2. Class room practices.
3. Use of projector and soft material for demonstration
4. Site visits.

**K) Teaching and Learning resources:**

Chalk board, LCD presentations, Demonstrative kits, Demonstrative Documents.

**L) Reference Books:**

Sr. No.	Author	Title	Publisher
1.	S. M. Patil	Plumbing Engineering	Seema Publication , Mumbai.
2.	S. G. Deolalikar	Plumbing Design and Practice	Tata McGraw-Hill
3.	Lee Smith	Plumbing Technology Design and Practice	Delmar Publication
4.	James C. Church	Practical Plumbing Design Guide	Mgraw-Hill (T)
5.	Michal Casey, Duglas Hannes , Redwood Kardon	Plumbing and Illustrated Guide to the Plumbing codes.	

**M) Learning Website & Software**

- 1) [www.plumbing services.com](http://www.plumbing services.com).
- 2) [www.cookandlees.com](http://www.cookandlees.com)
- 3) [www.mepdesignservices.com](http://www.mepdesignservices.com)
- 4) [www.plumbing.1800anytyme.com](http://www.plumbing.1800anytyme.com)
- 5) [www.dyno.com/plumbing](http://www.dyno.com/plumbing)

**N) Codes of Practice: IS, BIS and international codes:**

1. 2008 Uniform plumbing code – India (UPC-I )
2. 20080Illustrated training manual (ITM).
3. Extracts from IAPMO India.