GOVERNMENT POLYTECHNIC, KOLHAPUR

(An Autonomous Institute of Government of Maharashtra)

Curriculum Document

CURRICULUM: MPECS-2023

(Outcome Based Curriculum)

For

DIPLOMA IN ELECTRICAL ENGINEERING

Secretary **Chairman**

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

Government Polytechnic Kolhapur

Learning and Assessment Scheme for Post S.S.C Diploma Courses

Programme Name	**: Diploma in Electrical Engineering**		
Programme Code	**: EE**	**With Effect From Academic Year**	**: 2023-24**
Duration Of Programme	**: 6 Semester**	**Duration**	**: 15WEEKS**
Semester	**: First**	**Curriculum**	**: MPECS 2023**

Sr No	Course Title	Abbreviation	Course Type	Course Level	Course Code	Total IKS Hrs for Sem.	Learning Scheme					Credits	Assessment Scheme											
							Actual Contact Hrs./Week			Self Learning (Activity/ Assignment /Micro Project)	Notional Learning Hrs/Week		Paper Duration(hrs.)	Theory				Based on LL & TL				Based onSelf Learning		Total Marks
																		Practical						
							CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
														Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
1	ENGINEERING PHYSICS-A	HPHA	DSC	1	CCH101	4	4	-	2	2	8	4	1.5	30*#	70*#	100	40	25	10	25@	10	25	10	175
2	BASIC MATHEMATICS	HBMT	AEC	1	CCH105	4	4	2	-	2	8	4	3	30	70	100	40	-	-	-	-	25	10	125
3	ENGINEERING GRAPHICS&AUTO-CAD	HGRA	DSC	1	CCH107	2	2	-	2	-	4	2	-	-	-	-	-	50	20	50@	20	-	-	100
4	FUNDAMENTALS OF ICT	HICT	SEC	2	CCH202	1	1	-	2	1	4	2	_	-	-	-	-	25	10	25@	10	25	10	75
5	YOGA AND MEDITATION	HYAM	VEC	2	CCH203	1	-	-	1	1	2	1	_	-	-	-	-	25	10	-	-	25	10	50
6	FUNDAMENTALS OF ELECTRICAL ENGINEERING	HFEE	DSC	1	EEH101	2	4	-	2	2	8	4	3	30	70	100	40	50	20	25@	10	25	10	200
7	ELECTRICAL WORKSHOP PRACTICE	HWEE	SEC	1	EEH102	2	2	-	2	2	6	3	-	-	-	-	-	50	20	25@	10	25	10	100
Total						**16**	**17**	**2**	**11**	**10**	**40**	**20**		**90**	**210**	**300**		**225**		**150**		**150**		**825**

Abbreviations : CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, 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.

Course Category : Discipline Specific Course Core (DSC) : 2, Discipline Specific Elective (DSE) : 0, Value Education Course (VEC) : 1, Intern./Apprenti./Project./Community (INP) : 0, Ability EnhancementCourse (AEC) : 2, Skill Enhancement Course (SEC) : 2, Generic Elective (GE) : 0

Government Polytechnic Kolhapur (MPECS 2023)

PROFORMA -I

Formative Assessment of Practical's /Tutorial /Self LearningAssessment

														Total Mark sout of( )	Marks converte dAs per scheme ( )
PR/TU/Assignment No.		1	2	3	4	5	6	7	8	9	10	11	12		
Sr.No	Roll No.														
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															
16															
17															

Government Polytechnic Kolhapur
PROFORMA II
Used for Summative Assessment Practical /Oral Examination

SR.NO	ROLL NO	Knowledgee about the course	Preparedness for practical	Neat & complete Diagram/write up	Communication /Presentation	Performance in practical Exam.	Total out of 25	Converted Marks as per Learning scheme ()
		5M	5M	5M	5M	5M		
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								

COURSE NAME : ENGINEERING PHYSICS
COURSE CODE : CCH101
COURSE ABBREVIATION : HPHA

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	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
1.5	30*#	70*#	100	40	25	10	25@	10	25	10	175

(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)

CCH101-1 Estimate errors in measurement of physical quantities.

CCH101-2 Express importance of semiconductors and nanotechnology.

CCH101-3 Select proper material in engineering industry by analysis of its physical properties.

CCH101-4 Apply principles of electricity and magnetism to solve engineering problems.

CCH101-5 Apply principles of optics to solve engineering problems.

CCH101-6 Apply principles of fiber optics for related engineering applications.

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‖

COs	Programme Outcomes POs and PSOs								
	PO 1 Basic and Discipl i 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**
CCH101-1 Estimate errors in measurement of physical quantities.	3	1	-	1	1	1	1	-	-
CCH101-2 Express importance of semiconductors and nanotechnology	3	-	-	-	1	1	1	-	-
CCH101-3 Select proper material in engineering industry by analysis of its physical properties	3	1	-	1	1	1	1	-	-
CCH101-4 Apply principles of electricity and magnetism to solve engineering problems	3	1	-	1	1	1	1	-	-
CCH101-5 Apply principles of optics to solve engineering problems.	3	1	-	-	1	1	1	-	-
CCH101-6 Apply principles of fiber optics 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	CCH101-1
2	To measure the diameter of bob and thickness of plate by using Vernier Caliper	CCH101-1
3	To measure the diameter of bob and thickness of plate by using Micrometer screw gauge	CCH101-1
4	To determine forbidden energy band gap in semiconductors	CCH101-2

Sr. no	Laboratory experiences	CO
5	To determine the viscosity of liquid by Stokes method.	CCH101-3
6	To determine the buoyancy force on a solid immersed in a liquid	CCH101-3
7	To measure unknown resistance of wire by Ohm's law	CCH101-4
8	To verify series law of resistances	CCH101-4
9	To verify parallel law of resistances	CCH101-4
10	To draw magnetic lines of force for given magnet by using magnetic compass	CCH101-4
11	To verify Snell's law using glass slab	CCH101-5
12	To study variation of δ with i for a prism by pin method	CCH101-5
13	To study Total Internal Reflection using glass slab	CCH101-6
14	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: CCH101-1 Estimate errors in measurement in Physical quantities.			
1	**UNITS AND MEASUREMENT** 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 Simple Numerical problems**	**10**	**12**
CO: CCH101-2 Express the importance of Semiconductors and nanotechnology.			
2	**INTRODUCTION TO SEMICONDUCTORS AND NANOTECHNOLOGY** **2.1 SEMICONDUCTORS** 2.1.1 Conductors, insulators and semiconductors 2.1.2 Energy bands	**08** (06)	**08** (06)

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	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 **No numericals on above topic** **2.2 Nanotechnology** 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 **No numericals on above topic**	(02)	(02)
CO: CCH101-3 Select proper material in engineering industry by analysis of its physical properties.			
3	**PROPERTIES OF MATTER** **3.1 ELASTICITY** 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 η (No derivation) 3.1.5 Ultimate stress, breaking stress, Working stress, Factor of safety 3.1.6 Applications of elasticity **3.1.7 Simple Numerical problems** **3.2 VISCOSITY** 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	**12** (06) (06)	**14** (10) (04)

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	No numericals on above topic		

Section –II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO: CCH101-4 Apply principles of electricity and magnetism to solve engineering problems			
4	**ELECTRICITY AND MAGNETISM** **4.1 ELECTRICITY** 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 Simple Numerical problems** **4.2 MAGNETISM** 4.2.1 Magnetic field and magnetic field intensity and its units 4.2.2 Magnetic lines of force, magnetic flux **No numericals on above topic**	**10** (06) (04)	**12** (08) (04)
CO: CCH101-5 Apply principles of optics to solve engineering problems			
5	**OPTICS** **5.1 PROPERTIES OF LIGHT** 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 & Dispersive Power (in terms of angles of deviation only) **5.1.5 Simple Numerical problems** **5.2 LASER** 5.2.1 Introduction of LASER 5.2.2 Properties of laser 5.2.3 Spontaneous and stimulated emission	**14** (06) (04)	**18** (08) (06)

	5.2.4 Population inversion and optical pumping 5.2.5 Applications of LASER **No numericals on above topic** **5.3 X-RAYS** 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 **No numericals on above topic**	(04)	(04)
Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO: CCH101-6 Apply principles of fiber optics for related engineering applications			
6	**FIBER OPTICS** 6.1 Optical communication link 6.2 Principle of optical fiber (TIR) 6.3 Structure of optical fiber 6.4 Propagation of light in optical fiber 6.5 Advantages of optical fibers over conventional metal conductors 6.6 Applications of optical fibers **No numericals on above topic**	**06**	**06**

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

G : List of Micro projects/ 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	02

	magnets.	
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	Prepare a model to demonstrate total internal reflection. (For EE/ET/IT students)	02
	OR	
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	Draw and explain of optical fiber communication link. (For EE/ET/IT students).	02
	OR	
Sr.No	List of Activity (any one of the following under SLA)	Hrs Allotted
	Any course related activity assigned by the course teacher.	02

****One micro project/ assignment/ 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	CCH101-1
I / 2	Introduction to	2	2	4	08	CCH101-2

	Semiconductors and Nanotechnology					
I / 3	Properties of matter (Elasticity and Viscosity)	4	2	8	14	CCH101-3
II /4	Electricity and Magnetism	2	4	6	12	CCH101-4
II /5	Optics (Properties of light, Laser & X-rays)	6	6	6	18	CCH101-5
II / 6	Fiber Optics	2	2	2	06	CCH101-6
	Total Marks				70	

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
TOTAL		**25**

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
TOTAL		**25**

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
TOTAL		**25**

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
7) www.science.howstuffworks.com
8) www.iksindia.org

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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	
	LaboratoryLearning	-	
	SLH-SelfLearning	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	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-ClassRoomLearning,TL-TutorialLearning,LL-LaboratoryLearning,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.

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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.*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 asa 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/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 Disciplin especific knowledg e	**PO 2 Proble m Analysi s**	**PO 3 Design / Develo pment of solution s**	**PO 4 Engine ering Tools, Experi mentati on and Testing**	**PO 5 Enginee ring Practice s for society, sustaina bility and Environ ment**	**PO 6 Projec t Mana gemen t**	**PO 7 Life-long Learni ng**	**PSO1** Maintai n various types of electrica l equipm ents	**PSO2** Maintai n various section s of electric al power system s
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		

Competency and Cos	Programme Outcomes POs and PSOs								
	PO 1 Basic and Disciplin especific knowledg e	**PO 2 Proble m Analysi s**	**PO 3 Design / Develo pment of solution s**	**PO 4 Engine ering Tools, Experi mentati on and Testing**	**PO 5 Enginee ring Practice s for society, sustaina bility and Environ ment**	**PO 6 Projec t Mana gemen t**	**PO 7 Life-long Learni ng**	**PSO1** Maintai n various types of electrica l equipm ents	**PSO2** Maintai n various section s of electric al power system s
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

Sr. no	Tutorial experiences	CO
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	***1.1 LOGARITHMS*** 1.1.1 Concept and laws of logarithm 1.1.2 Simple examples based on laws of Logarithms ***1.2 MATRICES*** 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 ***1.3 PARTIAL FRACTIONS*** 1.3.1 Definition of rational, proper and improper fractions 1.3.2 Various cases of Partial fractions and Examples 1.4 Algebra of Indian Knowledge System: Solution of simultaneous equations using Vedic Mathematics	12	16

CO: CCH105-2 : To Use techniques and methods of statistics to compare multiple sets of data			
Unit 2 Statistics	***MEASURES OF DISPERSION*** 2.1 Range,Coefficient of Range of Discrete and grouped data 2.2 Mean deviation and Standared Deviation aboutmean for Discrete & 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	6	10
CO: CCH105-3 : Solve area specific engineering problems under given conditions of straight lines			
Unit 3 Coordinate Geometry	***THE STRAIGHT LINE*** 3.1 Slope, intercepts & 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	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	***TRIGONOMETRY*** 4.1 Fundamental Identities(Only state,No examples) 4.2 Conversion of degree into radian and vice versa of standard angles 4.3 Trigonometric ratios of Compound Angles(Without Proof) , Examples 4.4 Trigonometric ratios of Allied Angles (Without Proof) , Examples 4.5 Trigonometric ratios of Multiple and Submultiple Angles (Without Proof) , Examples 4.6 Factorization and De-Factorization Formulae (Without Proof) , Examples 4.7 Inverse Trigonometric ratios , Principle values and simple problems 4.8 Trigonometry in Indian Knowledge System : The evolution of sine function in India 4.9 Trigonometry in Indian Knowledge System : Indian Trigonometry-From ancient beginning to Nilakantha 4.10 Trigonometry in Indian Knowledge System : Ancient Indian Astronomy 4.11 Trigonometry in Indian Knowledge System: Pythagorean to triples in Sulabhsutras	14	14
CO: CCH105-5:- To solve the problems of maxima, minima, radius of curvature and geometrical applications.			
Unit 5 Differential	5.1 **Functions**: Concept of Functions and simple examples 5.2 **Limits**: Concept of Limits without examples **5.3 Derivatives:**		

Calculus	5.3.1 Derivative of sum, difference, product and quotient of two or more functions 5.3.2 Derivative of composite functions 5.3.3 Derivative of Inverse functions 5.3.4 Derivative of Implicit functions 5.3.5 Derivative of Parametric functions 5.3.6 Derivative of exponential and logarithmic functions 5.3.7 Calculus in Indian Knowledge system " Discovery of Calculus by Indian Astronomers (Indian Mathematics)	16	16
CO: CCH105-5:- To solve the problems of maxima, minima, radius of curvature and geometrical applications.			
Unit 6 Application of Derivatives	***APPLICATIONS OF DERIVATIVES*** 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 Micro project /Assignments under SLA

Sr.No	List of Assignment (under SLA)	Hrs Allotted
1	Collect the Data of Marks obtained by your class in midsemester 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 semicircularopening . 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 andoptics, 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:

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

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	Techical 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 10th 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
13	Sansar ke Mahan Ganitagya	Gunakar Muley	Raj kamal Prakashan ISBN-13. 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
b. www.scilab.org/-SCI Lab
c. 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

Course Name :ENGINEERING GRAPHICS & AUTO-CAD
Course Code :CCH107
Course Abbreviation: HGRA
Course Type :DSC

A. LEARNING SCHEME:

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

B. Assessment Scheme:

Theory				Based on LL & TL Practical				Based on Self Learning		Total Marks
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 Semester:02 Hrs.

C. **ABBREVIATIONS**: CL- ClassroomLearning, 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 asfail 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.

D. RATIONALE: -

The electrical technician / supervisor are called upon to draw or interpret drawings of electrical systems that include machines, control panels, power system components such as transmission and distribution systems etc. This course aims to provide hands on practice in freehand sketches; drawing using relevant tools and

computer based software. The course also provides practice to read and interpret electrical engineering drawings.

E. INDUSTRY / EMPLOYER EXPECTED OUTCOME

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

―Prepare engineering drawing using prevailing drawing instruments& Use CAD for creating and editing electrical engineering related drawings‖.

Course Outcomes:

CCH107-1. Draw symbolic representation of electrical components manually.

CCH107-2. Sketches, isometric and orthographic views of electrical machines and components.

CCH107-3- Use free hand drawing and sketches to draw simple electrical objects.

CCH107-4. Use CAD tools to draw simple electrical objects.

CCH107-5. Create electrical CAD drawings.

CCH107-6. Edit electrical drawings in CAD.

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** Maintain various types of electrical equipments	**PSO2** Maintain various sections of electrical power systems
Competency The aim of this course is to help the student to attain the following industry and field related competency; Use CAD for creating and editing electrical engineering related drawings	3	-	2	3	-	1	2	2	2
CCH107-1. Draw symbolic representation of electrical components manually.	3	1	3	3	-	2	3	3	3
CCH107-2. Sketches, isometric and orthographic views of electrical machines and components.	3	2	3	3	-	3	2	3	3
CCH107-3. Use free hand drawing and sketches to draw simple electrical objects.	3	3	3	3	-	3	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 Maintain various types of electrical equipments	PSO2 Maintain various sections of electrical power systems
CCH107-4. Use CAD tools to draw simple electrical objects	3	2	3	3	-	3	3	1	1
CCH107-5.Create electrical CAD drawings	3	2	3	3	-	2	3	3	3
CCH107-6 Edit electrical drawings in CAD	3	2	3	3	-	2	3	3	3

F. CONTENT

I) LAB AND PRACTICAL WORK:

Practical Exercises and related skills to be developed:

The following practical exercises shall be conducted as Term Work as detailed inpractical sessions of batches of about 22 students

Sr. No.	Practical Exercises	Course Outcomes
	Using manual drawing tools	
1.	Names & Letters	CCH107-01
2	Draw different electrical (including electronics) symbols using drawing Instruments as per IS: 1032 or new equivalent IS.	CCH107-01
3	Draw the orthographic Projection of Machine parts or electrical components.	CCH107-2
4	Draw the isometric Projection of Electrical Machine parts or electrical Components.	CCH107-02
5	Draw the freehand drawing of Machine parts and electrical Components	CCH107-03
6	Draw labeled layouts of two types of electrical earthing systems.	CCH107-03
	Using CAD software	
8.	Locate components of CAD classic screen by creating new drawing: a. CAD screen layout, drawing area, menu and toolbars, status bar Working with toolbar and commands, changing drawing limits, creating rectangle etc. saving drawing for first time	CCH107-04
9.	Draw a line diagram using absolute coordinate method. Use LIMITS, UNITS, LINE, ARC Commands:	CCH107-05

	a. Absolute coordinate method b. Drafting set-up: units, angle, area, coordinate system, limits, grid, object snap c. Creating two dimensional drawings using draw commands- line and arc.	
10.	Draw a line diagram using relative coordinate and relative polar coordinate method. Use LIMITS, UNITS, LINE, ARC, Commands: a. Relative coordinate and relative polar coordinate method b. Draft set-up: units, angle, area, coordinate system, limits, grid, object snap c. Create two dimensional drawings using draw commands-line and arc.	CCH107-05
11.	Draw a 2D figure using Draw and Modify commands. Use LINE, CIRCLE, OFFSET, TRIM, FILLET commands: a. Create two dimensional drawings using draw commands- line and circle b. Modify two dimensional drawings using modify commands- offset, trim, fillet	CCH107-05
12.	Draw a 2D figure using Draw and Modify commands. Use LINE, ARC, POLYGON, ELLIPSE, COPY, MIRROR, TRIM, ROTATE, CHAMFER commands: a. Create two dimensional drawings using draw commands- line, arc, polygon, and ellipse. b. Modify two dimensional drawings using modify commands- copy, Mirror, trim, rotate, chamfer	CCH107-05
13.	Draw isometric drawing of electrical machine. Use LIMITS, UNITS, ZOOM, GRID, SNAP, LINE, COPY, ISOPLANE, ELLIPSE, TRIM, ERASE, PROPERTIES, SAVE commands, a. Draft set-up: units, limits, zoom, grid, object snap, ortho mode b. Snap and grid- snap spacing, grid spacing, isometric snap type	CCH107-05
14.	Create a simple drawing using electrical CAD software for the given electrical circuit diagram	CCH107-06
15.	Create a simple drawing using electrical CAD software for the given Single line diagram of various simple wiring	CCH107-06

II) THEORY			
	SECTION - I		
Sr. No	**Topics**	**Teaching (Hours)**	**Theory Evaluation Marks**
***Course Outcome* CCH107-1** *Understand various fundamentals in engineering drawing*			
1.	**Introduction To Engineering Drawing** 1.1 Drawing Instruments and their uses 1.2 Standard sizes of drawing sheets as per ISO – ―A‖ series, Layout of Sheet(* IKS) 1.3 Letters and numbers (single stroke vertical), Convention of lines and their applications. 1.4 Dimensioning Technique as per SP-46 (Latest Edition), Elements of dimensioning, Types and applications of chain, parallel and Co-ordinate dimensioning	**03**	

Course Outcome **CCH107-*2*** *Draw the orthographic projections & Isometric projections of objects and machine components*			
2.	**Introduction of Orthographic Projections & Isometric Projections** 2.1 First and Third angle Projection Method 2.2 Conversion of Pictorial view into orthographic Views. (First angle Projection Method Only) 2.3 Orthographic projections of simple parts. 2.4 Introduction of isometric projections, isometric scale & natural scale. 2.5 Isometric view& Isometric projections of simple parts. 2.6 Isometric Projections of Electrical Machine parts or electrical components.	**09**	
Course Outcome **CCH107-3***Draw free hand sketches & single line diagram of simple electrical engineering components*			
3.	**Free hand sketches & single line diagram** 3.1 Need for free hand sketching with its importance. 3.2 Freehand sketches of electrical machine parts or electrical components. 3.3 Single line diagram of various simple wiring. 3.4 Basic of earthing (*IKS) 3.5 Draw labeled layouts of two types of electrical earthing systems.	**03**	

SECTION - II			
Sr. No	**Topics**	**Teaching (Hours)**	**Theory Evaluation Marks**
***Course Outcome* CCH107 -4** *Use CAD tools to draw simple electrical objects.*			
4.	4.1 Components of CAD classic screen, Identify components of CAD classic screen. 4.2 Menu bar and status bar. Identify components of CAD screen. 4.3 CAD tool bar. 4.4 Identify toolbar and commands(*IKS)	**03**	
***Course Outcome* CCH107-** *5 Create electrical CAD drawings*			
5.	5.1 Absolute Coordinate Method: Commands: LIMITS, UNITS, LINE and ARC. Interpret line diagram using absolute coordinate method. 5.2 Relative coordinate Method: Commands: LIMITS, UNITS, LINE and ARC. Interpret line diagram using relative coordinate and relative polar coordinate method. 5.3 Relative polar coordinate method: Commands: LIMITS, UNITS, LINE and ARC. Interpret 2D figures using Draw and Modify commands. Use commands in CAD. 5.4 D figures: Commands: LINE, CIRCLE, OFFSET, TRIM,FILLET, ARC, POLYGON, ELLIPSE, COPY, MIRROR, TRIM, ROTATE and CHAMFER,. 5.5 Isometric drawings: commands: LIMITS, UNITS, ZOOM, GID, SNAP, LINE, COPY, ISOPLANE, ELLIPSE, TRIM, ERASE,PROPERTIES and SAVE. 5.6 Interpret isometric drawing of electrical machine in CAD(*IKS)	**08**	
***Course Outcome* CCH107-6** *Edit electrical drawings in CAD.*			
6.	Applications of electrical CAD software to: Draw circuit diagrams and layouts. 6.1 Use of electrical CAD to draw the given electrical circuit diagram. 6.2 Use electrical CAD to draw layouts of two types of earthing systems	**04**	

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

G: LIST OF ASSIGNMENTS UNDER SLA

……..Not applicable ……

I:-ASSESSMENT CRITERIA

The assessment need to be done as per Proforma I & II

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
TOTAL		**25**

ii) Summative Assessment of Practical:

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

Sr.No	**Criteria**	**Marksallotted**
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
TOTAL		**25**

J. INSTRUCTIONAL METHODS:

6. Lectures cum Demonstrations,
7. Classroom practices.
8. Use of projector and soft material for demonstration

K. Teaching and Learning resources:

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

L. REFERENCE MATERIAL:

a. Reference Books:

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,	Engineering Drawing	Pearson, 2010

	B.C.Rana		
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

b. Web References:

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
iv) http://www.engineeringdrawing.org/
v) http://www.teachengineering.org/view_activity
vi) 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 NAME : FUNDAMENTALS OF ICT

COURSE CODE : CCH202

COURSE ABBREVIATION: HICT

A. TEACHING-LEARNING & ASSESSMENT SCHEME :

Scheme component	Hours / week	Credits
Theory	1	2
Practical	2	

Course Code	Course Title	Abbr	Course Category /s	Learning Scheme					Credits	Assessment Scheme												Total Marks
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based onSL		
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
CCH202	FUNDAMENTALSOF ICT	ICT	SEC	1	-	2	1	4	2		-	-	-	-	25	10	25 @	10	25	10	75

Total IKS Hrs for Sem. : 01 Hrs

Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learn Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - India 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 bedeclared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be dasfail 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.

B. 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 differentdiscipline can appraise the applications of these technologies in their respective domain.

C. COMPETENCY:

Apply Fundamental knowledge of computer system to work with simple applications.

Cognitive: i) State the basic parts of a computer system and relationships among component. ii) State characteristics and functions of CPU's, motherboard, RAM, Storage devices etc.

Psychomotor: i) Use computers for Internet services, Electronics Documentation, Data Analysis and Slide Presentation. ii) Appraise Application of ICT based Emerging Technologies.in different domain.

Affective: Attitude of i) Precision ii) Accuracy iii) Safety iv) Punctuality

D. COURSE OUTCOMES:

CCH202-1 - Use computer system and its peripherals for given purpose
CCH202-2 - Prepare Business document using Word Processing Tool
CCH202-3 - Analyze Data and represent it graphically using Spreadsheet
CCH202-4 - Prepare professional Slide Show presentations
CCH202-5 - Use different types of Web Browsers and Apps
CCH202-6 - Explain concept and applications of Emerging Technologies

E. COURSE OUTCOMES AND PROGRAMME OUTCOMES (CO-PO) MATRIX

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
CCH202-1	1	-	-	-	-	-	1		

CCH202-2	-	-	-	3	-	-	1		
CCH202-3	-	2	1	3	-	-	1		
CCH202-4	-	-	-	3	-	-	1		
CCH202-5	1	-	-	3	-	-	3		
CCH202-6	1	-	-	3	-	-	3		

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

F. LABORATORY WORK:

Laboratory experiments and related skills to be developed:

Sr. No.	Title of Experiment	Skills to be developed	Course outcome
1.	a) Work with Computer System, Input/output devices, and peripherals. b)Work with files and folders	1.1 Identify various Input/output devices, connections and peripherals of computer system 1.2 Work with Computer System, Input/output devices, and	CCH202-1
2.	Work with document files: a) Create, editand save document in Word Processing. b) Text, lines and paragraph levelformatting	2.1 Create and manage worddocument. 2.2 Apply formatting features on textat line, paragraph and page level.	CCH202-2
3.	Work with Images and Shapes in WordProcessing.	3.1 Insert and edit images, shapes in adocument file	CCH202-2
4.	Work with tables in Word Processing.	4.1 Insert table and apply various tableformatting features on it.	CCH202-2
5.	Working with layout and printing a)Document page layout, Themes, andprinting. b) Use of mail merge with options.	5.1 Apply page layout features in wordprocessing. 5.2 Print a document by applyingvarious print options 5.3 Use mail merge in word processing	CCH202-2
6.	Create, open and edit Worksheet.	6.1 Enter and format data in aworksheet. 6.2 Insert and delete cells, rows	CCH202-3

		andcolumns 6.3 Apply alignment feature on cell	
7.	Formulas and functions in Worksheet.	7.1 Create formula and ―If‖ conditionon cell data 7.2 Apply various functions and namedranges in worksheet.	CCH202-3
8	Sort, Filter and validate data inSpreadsheet.	8.1 Implement data Sorting, Filtering and Data validation features in a worksheet.	CCH202-3
9	Charts for Visual Presentation in Spreadsheet.	9.1 Create charts using various chartoptions in spreadsheet.	CCH202-3
10	Worksheet Printing.	10.1 Print the worksheet by applyingvarious print options for worksheet	CCH202-3
11	Make Slide Show Presentation.	11.1 Apply design themes to the givenpresentation 11.2 Insert pictures text/images/shapesin slide 11.3 Use pictures text/images/shapesediting options.	CCH202-4
12	Use Tables and Charts in Slide	12.1 Add tables and charts in theslides. 12.2 Run slide presentation in differentmodes 12.3 Print slide presentation as handouts/notes	CCH202-4
13	a) Insert Animation effects to Text and Slides. b) Insert Audio and Video files inpresentation	13.1 Apply animation effects to thetext and slides 13.2 Add/set audio and video files inthe presentation.	CCH202-4
14	a) Internet connection configuration b)Use Internet and Web Services.	14.1 Configure internet connection ona computer system 14.2 Use different web services oninternet	CCH202-5
15	Working with Browsers.	15.1 Configure different browsersettings 15.2 Use browsers for the givenpurpose	CCH202-5
16	Prepare Web Forms for Survey.	16.1 Create web forms for surveyusing different options.	CCH202-6
17	Prepare Web Forms for Quiz	17.1 Create web forms for Quiz	CCH202-6

		usingdifferent options	

G. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNINGSKILLS DEVELOPMENT (SELF LEARNING)

Self Learning

Following are some suggestive self-learning topics: 1) Use ChatGPT/any other AI tool to explore informatUse Calendar to Schedule and edit activities. 3) Use Translate app to translate the given content from one lang another. 4) Use cloud based storage drive to store and share your files.

Assignment

Prepare journal of practical performed in the laboratory.

Micro project

The micro project has to be industry application based, internet-based, workshop-based, laboratory-based o based as suggested by Teacher. 1) Perform a survey on various input and output devices available in market aits report. 2) Prepare Time Table, Prepare Notes on Technical Topics, Reports, Bio data with covering letter (S teacher shall assign a document to be prepared by each students) 3) Prepare slides with all Presentation feature as: classroom presentation, presentation about department, presentation of Technical Topics. (Subject teacher assign a presentation to be prepared by each student). 4) Student Mark sheet, Prepare Pay bills, tax statement, assessment record using spreadsheet. (Teacher shall assign a spreadsheet to be prepared by each student). 5) C Survey on different web browsers. 6) Generate resume for different job profile, survey report of any industry ChatGPT/any other AI tool.

H. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications
1	a) Computer System with all necessary Peripherals and Internet connectivity. b) Any Office Software c) Any Browser (Any General Purpose Computer available in the Institute)

I. CONTENT:

Sr. No.	Topics / Sub-topics	Lectures (Hours)
Course Outcome CCH202-1 - Use computer system and its peripherals for given purpose.		
1	**Unit - I Introduction to Computer System** 1.1 Basics of Computer System: Overview of Hardwareand Software: block diagram of Computer System, Input/ Output unit CPU, Control Unit, Arithmetic logic Unit (ALU), Memory Unit 1.2 Internal components: processor, motherboards, randomaccess memory (RAM), read-only memory (ROM), video cards, sound cards and internal hard disk drives)	2

Sr. No.	Topics / Sub-topics	Lectures (Hours)
	1.3 External Devices: 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 1.4 Application Software: 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 1.5 Network environments: network interface cards, hubs, switches, routers and modems, concept of LAN, MAN, WAN, WLAN, Wi-Fiand Bluetooth 1.6 Working with Operating Systems: 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.	
Course Outcome CCH202-2 - Prepare Business document using Word Processing Tool.		
2	**Word Processing** 2.1 Word Processing: 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. 2.2 Editing a Document: 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 2.3 Changing the Layout of a Document: Adjust page margins, Change page orientation, Create headers and footers, Set and change indentations, Insert and clear tabs 2.4 Inserting Elements to Word Documents: Insert and delete a page break, Insert page numbers, Insert the date and time, Insertspecial characters (symbols), Insert a picture from a file, Resizeand reposition a picture 2.5 Working with Tables: Insert a table, Convert a table to text, Navigate and select text in a table, Resize table cells, Align text in atable, Format a table, Insert and delete columns and rows, Borders and shading, Repeat table headings on subsequent page working with Columned Layouts and Section Breaks: a Columns, Section breaks, Creating columns, News letter style columns, Changing part of a document layout or formatting, Remove section break, Add columns to remainder of a document, Column widths, Adjust	3

Sr. No.	Topics / Sub-topics	Lectures (Hours)
Course Outcome CCH202-3: Design files of word processors, spreadsheets, presentation software, and database application.		
3	**Spreadsheets** 3.1 Working with Spreadsheets: Overview of workbook and worksheet, Create Worksheet Entering sample data, Save, Copy Worksheet, Delete Worksheet, Close and open Workbook. 3.2 Editing Worksheet: 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 3.3 Formatting Cells and sheet: 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 3.4 Working with Formula: 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. 3.5 Working with Charts: 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. Advanced Operations: Conditional Formatting, Data Filtering, Data Sorting, Using Ranges, Data Validation, Adding Graphics, Printing Worksheets, print area, margins, header, footer and other page setup options.	3
Course Outcome CCH202-4 - Prepare professional Slide Show presentations		
4	**Presentation Tool** 4.1 Creating a Presentation: 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. 4.2 Inserting Media elements: Adding and Modifying Graphical Objects to a Presentation - Insert Images into a Presentation, insertaudio clips, video/animation, Add Shapes, Add Visual Styles to Text in a Presentation, Edit Graphical Objects on a Slide, Format 4.3 Working with Tables: Insert a Table in a Slide, Format Tables, andImport Tables from Other Office Applications. Working with Charts: Insert Charts in a Slide, Modify Chart, Import Charts from Other Office Applications.	4

Sr. No.	Topics / Sub-topics	Lectures (Hours)
Course Outcome *CCH202-5 - Use different types of Web Browsers and Apps* *CCH202-6 - Explain concept and applications of Emerging Technologies*		
5	**Basics of Internet and Emerging Technologies** 5.1 World Wide Web: 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 search engines effectively for 5.2 Web Services: e-Mail, Chat, Video Conferencing, e-learning, e-shopping, e-Reservation, e-Groups, Social Networking 5.3 Emerging Technologies: IOT, AI and ML, Drone Technologies,3D Printing. Tools: Docs, Drive, forms, quiz, Translate and other Apps	3

J. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Lab performance, Assignment, Self-learning and Seminar/Presentation

Summative Assessment (Assessment of Learning)

- Lab. Performance, viva voce

K. PROGRESSIVE SKILLS TEST :

Criteria for Continuous Assessment of Practical work and Progressive skill Test:

Sr. no	Criteria	Marks allotted
1	Attendance at regular practical	05
2	Preparedness for practical	02
3	Neat & complete Diagram.	04
4	Observations & computer handling skill	02
5	Use of toolbar, menu bar and short cut keys.	04
6	Logical thinking and approach	04
7	Oral Based on Lab work and completion of task	04
	TOTAL	25

Assessment at semester end practical exam as per Pro-forma II.

Criteria for assessment at semester end practical exam:

Sr. no	Criteria	Marks allotted
1.	Technical ability	10
2.	Communication skill	5
3.	Logical approach	10
	TOTAL.	**25**

L. INSTRUCTIONAL STRATEGIES:

Instructional Methods:

1. Lectures cum Discussions
2. Regular Home Assignments.
3. Laboratory experiences and laboratory interactive sessions

Teaching and Learning resources:

1. Chalk board 2.Slides(PPT) 3. Self-learning Online Tutorials

M. REFERENCE MATERIAL:

a) Books / Codes

Sr.No	Author	Title	Publisher
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	Creative Space 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
6	Leete Gurdy, Finkelstein Ellen, Mary Leete	OpenOffice.org for Dummies	Wiley Publishing, New Delhi, 2003 ISBN : 978-0764542220

b) Suggested Websites and Portals

Sr.No	Link / Portal	Description
1	https://www.microsoft.com/en-in/learning/office-training.aspx	Office
2	http://www.tutorialsforopenoffice.org/	Open Office
3	https://s3-ap-southeast-1.amazonaws.com/r4ltue295xy0d/Special_Edition_Using_StarOffice_6_0.pdf	Open Office
4	https://ashishmodi.weebly.com/uploads/1/8/9/7/18970467/computer_fundamental.pdf	Computer Fundamental
5	http://www.tutorialsforopenoffice.org/	Open Office
6	https://www.tutorialspoint.com/computer_fundamentals/index.htm	Computer Fundamental
7	https://www.tutorialspoint.com/word/	Word Processing
8	https://www.javatpoint.com/ms-word-tutorial	Word Processing
9	https://support.microsoft.com/en-au/office/word-for-windows-training-7bcd85e6-2c3d-4c3c-a2a5-5ed8847	Word Processing
10	https://www.javatpoint.com/excel-tutorial	Spreadsheet
11	https://support.microsoft.com/en-au/office/excel-video-training-9bc05390-e94c-46af-a5b3-d7c22f6990bb	Spreadsheet
12	https://www.javatpoint.com/powerpoint-tutorial	Powerpoint Presentation
13	https://support.microsoft.com/en-au/office/powerpoint-for-windows-training-40e8c930-cb0b-40d8-82c4-b	Powerpoint Presentation
14	https://www.geeksforgeeks.org/ms-dos-operating-system/	Operating System
15	https://www.javatpoint.com/windows	Windows Operating System
16	https://www.javatpoint.com/what-is-linux	Linux Operating System

Sr.No	Link / Portal	Description
17	https://www.techtarget.com/iotagenda/definition/Internet-of-Things-IoT	IoT
18	https://www.geeksforgeeks.org/introduction-to-internet-of-things-iot-set-1/	IoT
19	https://www.javatpoint.com/machine-learning	AI & Machine Learning
20	https://www.skillrary.com/blogs/read/introduction-to-drone-technology	Drone Technology
21	https://www.cnet.com/tech/computing/what-is-3d-printing/	3D Printing
22	https://support.google.com/a/users/answer/9389764?hl=en	Apps

***

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

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	2	

B. ASSESSMENT SCHEME :-

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

(Total IKS Hrs for Semester: 01Hr)

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

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

Note :

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

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

C. 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 meditations 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 wellbeing of the student and aims to empower students to adopt and practice Yoga in daily life.

D. INDUSTRY/EMPLOYEREXPECTEDOUTCOME

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 Cos on completion of course based learning-

CCH203-1 Practice basic Yoga and Pranayam in daily life to maintain physical and mental fitness.
CCH203-2- Practice meditation regularly for improving concentration and better handling of stress and anxiety.
CCH203-3- Follow healthy diet and hygienic practices for maintaining good health.

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‖

Course Outcomes(COs)	ProgrammeOutcomes(POs)							ProgrammeSpecificOutcomes*(PSOs)		
	PO-1BasicandDisciplineSpecificKnowledge	PO-2 ProblemAnalysis	PO-3 Design/DevelopmentofSolutions	PO-4 EngineeringTools	PO-5 EngineeringPracticesforSociety,SustainabilityandEnvironment	PO-6Project Management	PO-7 LifeLongLearning	PSO-1	PSO-2	
CO1	-	-	-	-	3	-1		-	-	
CO2	-	-	-	-	3	-1		-	-	

CO3	-	-	-	-	3	-1	-	-	
Legends:-High:03,Medium:02,Low:01,NoMapping:- *PSOs are to be formulated at institute level									

F. CONTENT:

III) Practical exercises

Sr .No	Laboratory Experiment/PracticalTitles/TutorialTitles	Learning Of hrs.	Relevant COs
1	Introduction:- 1.1 Introduction to AshtangYog 1.2 Presentations on Introduction to Yoga and its History, Omkar chanting, prayer, Padmasan, Siddhasan &Vajrasan Lab Exp: 1. Perform warming up exercises to prepare the body from head to toe for Yoga - i)Nack Movement ii)Shoulder Movement iii) Trunk Movement iv)Knee Movement v) Ankle Movement	03	CCH203-1
2	Lab Exp: 2. After warm up, perform all the postures of Surya Namaskar one by one in a very slow pace, Lab Exp 3. Perform multiple Surya-Namaskar (Starting with three and gradually increasing it to twelve) in one go. (Experiment 2to 4 must be followed by shavasana for self relaxation.)	4	CCH203-1,CCH203-2
3	Lab Exp: 4 Perform Sarvangasna,Halasana,Kandharasana (setubandhasana) , Uttanpadasan, Pavanmuttasan. LabExp:5 Perform Bhujangasana,Naukasana,Mandukasana. LabExp:6 Perform Shalbhasan, Dhanurasan, Vakrasan, Goumukhasan, Paschimottasana, Ardhamasendrasan LabExp: 7 PerformVeerasan, Veer-Bhadrasana, Vrukshasana, Trikonasana. (Follow up experiment 5 to7 with shavasana for self relaxation)	4	CCH203-2
4	Lab Exp: 8 Perform Deepbrathing , Anulom Vilom Pranayam Kriya LabExp:9 Practice Kapalbhati Pranayam Kriya, Bhastrika LabExp:10 Practice Bhramary Pranayam and Sheetali Pranayam	2	CCH203-3
5	Lab Exp: 11 Perform sitting in Dhyan Mudra and meditating. Start with five minute and slowly increasing to higher durations. Introduction to Vippasanna , Anappan& Chakras. (Trainer will explain the benefits of Meditation before practice)	2	CCH203-3

III) Theory : (Not Applicable)

Section I NA

Section –II NA

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 practice done by the student with a photograph of selfi in yogic posture. Prepare Diet for and nutrition chart self

Assignment:

Prepare Diet for and nutrition chart for your self

- Self-Learning
  - Practice atleast thrice a week.
  - Read booksondifferentmethodstomaintainhealth,wellnessandtoenhancemood
  - Watch videos onYogaPractices.

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-yogic 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**

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

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA

I. Assessment Criteria

i) Formative Assessment of Practical:-
Every assignment shall be assessed for 25 marks as per the following criteria

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

ii) Summative Assessment of Practical: NA

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

Sr.no	Criteria	Marksallotted
NA	NA	NA
NA	NA	NA
NA	NA	NA
NA	NA	NA
NA	NA	NA
TOTAL		NA

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	SwamiVivekananda	Fingerprint Publishing (2023) Prakash BooksIndiaPvtLtd,NewDelhiISBN-13?:?978-9354407017
2	Yoga for Every Body: A beginner‘s guide to the practice of yoga	LuisaRay,AngusSutherland	VitalLifeBooks (2022) ISBN-13?:?978-1739737009

	postures, breathing Exercises and me		
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, ElizabethRobbins,MatthewMcKay,Eshelman MSW	ANewHarbingerSelf-HelpWorkbook(2019)
5	Science of Yoga: Understand the Anatomy and Physiology to Perfect Your Practice	AnnSwanson	ISBN-13?:?978-1465479358

M. Learning Website & Software

1 https://onlinecourses.swayam2.ac.in/aic19_ed28/preview- introduction to Yoga and Applications of Yoga

2 https://onlinecourses.swayam2.ac.in/aic23ge09/preview - Yoga for Creativity

3 https://onlinecourses.swayam2.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.swayam2.ac.in/ncel9sc04/preview-Food Nutrition for Healthy Living Course — Swayam

6.https://onlinecourses.swayam2.ac.in/aic2306/ preview- yoga for memory development

Course Name : FUNDAMENTALS OF ELECTRICAL ENGINEERING
Course Code : EEH101
Course Abbreviation : HFEE
Course Type :DSC

A. TEACHING-LEARNING :

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 Practical				BASED ONSLA		TOTAL
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR				
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
03	30	70	100	40	50	20	25@	10	25	10	200

Total IKS = 02 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

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

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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.

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

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

* 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 Diploma Course in Electrical Engineering mainly involves the study of Electrical machines, equipments and instruments. In order to understand the working principle, construction, operation and applications of the various Electrical machines, equipments and instruments; the basic concepts, rules and laws of Electric and Magnetic Circuits be understood by the students of Electrical Engineering Course.

This subject will help the students to study, understand and comprehend the fundamentals of various facts, the basic concepts, rules and laws of Electric and Magnetic Circuits. This subject is classified as Engineering Science subject.

ii. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Use basic principles of electrical engineering in electrical system.

Cognitive: Understand electrical charges, magnetism and electromagnetism.
Psychomotor: Use the basic electrical components in various applications.
Affective: Attitude of i) Punctuality ii) Accuracy iii) Safety iv) precision.

E. COURSE LEVEL LEARNING OUTCOMES

(COS) COURSE OUTCOMES:

EEH101-1: Apply the principles of electricity in different applications.

EEH101-2: Solve simple resistive networks in electrical engineering applications.

EEH101-3: Use by calculations relevant capacitors in electric circuits.

EEH101-4: Apply the principles of electromagnetism due to conductors and coils with currents

EEH101-5: Solve magnetic circuits used in electrical machine/device applications.

EEH101-6: Use the principles of electromagnetic induction in electrical engineering applications.

COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX

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

PO → / CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO2
	Basic and discipline specific knowledge	Problem Analysis	Design/Development of solutions	Engineering Tools,experimentation and testing	Engineering practices for society, sustainability and environment	Project Management	Lifelong Learning	Maintainance of equipment	Maintance of sections of electrical
COMPENTENCY-Apply Fundamental knowledge of electrical engineering and maintain computer network in healthy condition	3	1	1	2	1	-	1	-	-
EEH101-1	3	-	-	2	-	-	1	-	-
EEH101-2	3	1	-	2	-	-	1	-	-
EEH101-3	3	-	-	-	-	-	1	-	-
EEH101-4	3	-	-	-	-	-	1	-	-
EEH101-5	3	1	1	2	1	-	1	-	-
EEH101-6	3	1	-	2	1	-	1	-	-

F. CONTENT

I) Practical exercises

Laboratory experiments and related skills to be developed:

Sr. No.	Title of Experiment	Skills to be developed	Course outcome
1.	Introduction to electrical Laboratory	Identify different types of electricalsupply sources, equipment's. Interpret circuit diagram.	EEH101-1
2.	Use Ohm's Law to determine current in simple circuit.	. Connect the various components as perthe circuit diagrams by using wires. . Calculate the resistance from the	EEH101-1
3.	Observe the effect of temperature on resistance of copper	Calculate temperature coefficient ofmaterial.	EEH101-1
4.	To verify current division in parallel resistive circuit	. Connect the various components as perthe circuit diagrams by using wires. . Verify theoretical and practical reading.	EEH101-2
5.	To verify voltage division in series resistive circuit.	. Connect the various components as perthe circuit diagrams by using wires. . Verify theoretical and practical reading.	EEH101-2
6.	To verify Kirchhoff's current law(KCL)	Connect the various components as perthe circuit diagrams by using wires. . Verify theoretical and practical reading.	EEH101-2
7	To verify Kirchhoff's Voltage Law(KVL)	Connect the various components as perthe circuit diagrams by using wires. . Verify theoretical and practical reading.	EEH101-2
8	To plot the B H curve for a given magnetic material and determine the relative Permeability.	. Connect the various components as perthe circuit diagrams by using wires . Plot the B-H curve from the readings . Determine the relative Permeability ofthe material.	EEH101-5
9	a) Use Faraday first law of electromagnetic induction to analyze behavior of staticallyinduced emf ingiven circuit.	. Connect the apparatus as per the circuitdiagrams . . Observe the deflection of galvanometerwith respect to magnitude & direction. . Analyze the observations.	EEH101-6

10	b)Use Faraday first law of electromagnetic induction to analyse behavior of dynamically induced emf in a given circuit.	. Connect the apparatus as per the circuitdiagrams . . Observe the deflection of galvanometerwith respect to magnitude & direction. . Analyze the observations.	EEH101-6

II) THEORY

SECTION I

Sr. No.	Topics / Sub-topics	Lecture (Hours)	Theory Evaluation (Marks)
	EEH101-1 Apply the principles of electricity in different applications.		
1	**ELECTRICITY CONCEPT** **#Generation of Electricity in India (IKS Learning)** 1.1 Electric Charge 1.4 Electric Potential 1.5 Electric Current 1.6 Electromotive Force(EMF) 1.7 Resistance and resistivity. 1.7.1 Concept of Resistance & Resistivity 1.7.2 Effect of Temperature on Resistance, Temp coefficient ofResistance(simple numerical) 1.8 Classification of Electric current1.8.1Direct current with waveforms. 1.8.2 Alternating current with waveforms. 1.9 Electric Sources 1.9.1 Concept of Voltage Source: Ideal and Practical1.9.2Concept of Current Source: Ideal and Practical 1.9.3 Source Conversion. (simple numerical) 1.10 Effects of Electric Current 1.10.1 Heating effect 1.10.2 Magnetic effect 1.10.3 Chemical effect with its application. 1.11 Concept of electrical Work, Power and Energy. Their S.I. Unit(Simple Numerical)	**10**	**12**
	EEH101-2 Solve simple resistive networks in electrical engineering applications.		
2	**Resistive Networks:** 2.1 Ohm's Law, Concept of Voltage dropand Terminal Voltage. 2.2 Revision of resistance in series and parallel 2.3 Concept of voltage division and current division in simpleresistive circuit with its derivation(Numerical) 2.4 Star Delta conversion of resistive networks	**10**	**12**

	2.5 Calculations of Equivalent Resistance of simple Series, Parallel , Series Parallel Circuits and star-delta network (Simple Numerical) 2.6 Kirchhoff's Laws 2.6.1 Kirchhoff's Current Law 2.6.2 Kirchhoff's Voltage Law (Numericals based on only Two loop)		
EEH101-3 Use by calculations relevant capacitors in electric circuits.			
3	**Capacitors:** 3.1 Concept and Definition of Capacitance. 3.2 Electric Field 3.2.1 Electric Lines of force, Electric Flux 3.2.2 Electric Field Strength 3.2.3 Concept of electric flux density. 3.3 Construction & development of Capacitance in dielectrics. 3.4 Parallel Plate Capacitor. (Uniform Di-electric Medium) 3.5 Capacitors in Series & Parallel. 3.6 Calculations of Equivalent Capacitance of simple Series, Parallel and Series Parallel Combinations. (Simple Numerical) 3.7 Energy Stored in Capacitor. (No Derivation Only Simple Numerical) 3.8 Concept of Breakdown Voltage and Di-electric strength 3.9 Types of Capacitor & its application **#Manufacturing of capacitors in India in various Industries(IKS Learning)**	**08**	**10**
	Total	**28**	**34**

SECTION II

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
	EEH101-4 Apply the principles of electromagnetism due to conductors and coils with currents		
4	**ELECTROMAGNETISM** **#Earth and its relevance with Magnetic Field(IKS)** 4.1 Concept of Magnetic Field (definitions & relations of terms) 4.1.1 Magnetic Flux 4.1.2 Magnetic Flux Density 4.1.3 Magnetic field due to a Current carrying Conductor 4.1.4 Direction of Magnetic Field- Right hand rule, Cork Screw rule 4.1.5 Permeability 4.1.6 Relation between Magnetic flux Density and Field Intensity 4.2 Magnetic field due to current carrying Solenoid(Multi turn coil) 4.3 Concept of Toroid and its applications.	**6**	**10**
	EEH101-5: Solve magnetic circuits used in electrical machine/device applications.		
5	**MAGNETIC CIRCUIT** 5.1 Definitions Concerning Magnetic Circuit. Magneto-Motive-Force (MMF), Reluctance, Reluctivity, Permeance , Permeability. 5.2 Magnetic Circuit - Ohm's law of Magnetic Circuit 5.3 Comparison Between Electric and Magnetic circuit. 5.4 Parallel Magnetic Circuit. (Only Introduction No derivation and No Numerical) 5.5 Calculations of Amp.-Turns for simple Series Magnetic circuit(Simple Numerical) 5.6 Concept of Leakage Flux, Useful Flux & Fringing, Leakage coefficient. 5.7 Magnetization Curve (B - H Curve) 5.7.1 Magnetization Curve for Magnetic and Non-Magnetic material. 5.8 Magnetic Hysteresis, Hysteresis Loop. 5.8.1 Hysteresis Loops for Hard & Soft Magnetic Material. 5.8.2 Area of Hysteresis Loop, Hysteresis Loss.(No Derivation and No Numerical) 5.9 Eddy current Loss (No derivation only formula). 5.10 Types of Magnets and their applications. Permanent Magnet andElectromagnet. **#Bar Magnet and its application like Compass(IKS Learning)**	**14**	**12**

	EEH101-6 Use the principles of electromagnetic induction in electrical engineering applications.		
Sr. No.	**Topics / Sub-topics**	**Lectures (Hours)**	**Theory Evaluation(Marks)**
6	**ELECTROMAGNETIC INDUCTION.** 6.1 Relation Between Magnetism and Electricity. 6.2 Production of Induced E.M.F. and Current. 6.3 Faraday's Laws of Electromagnetic Induction. (No Numerical) 6.4 Statically Induced E.M.F. & Dynamically InducedE.M.F.(Simple Numerical) 6.5 Direction of Induced E.M.F. (induced Currents). 6.5.1 Fleming's Right Hand Rule 6.5.2 Lenz's Law 6.5.3 Self Induced E.M.F. 6.5.4 Mutually Induced E.M.F. 6.6 Self Inductance (definition & unit) 6.7 Coefficient of Self-induction (L) (Simple Numerical) 6.8 Mutual Inductance (definition & unit) 6.9 Coefficient of Mutual Inductance (M) (Simple Numerical) 6.10 Energy Stored in Magnetic Field (expressiononly)(No Derivation and No Numerical) 6.11 AC fundamentals Cycle,Time Period,Amplitude,Frequency,Phase	**12**	**14**
	Total	**32**	**36**

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

G. List of Assignments under SLA(Micro-project/activity)

1. Simple problems on Ohms law, Law of resistance, Power and energy.
2. Survey of different magnetic material.
3. Simple problems on magnetic circuits.
4. Simple problems on of induced E.M.F: Statically induced E.M.F., dynamically induced E.M.F.
5. Survey the electrical appliances which represents different types of load.(resistive, inductive and capacitive)
6. Compare types of transformer as per voltage level, construction, number of phases, applications.
7. Survey different types of Capacitors.

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	Electricity Concepts	6	4	2	12	EEH101-1
I / 2	Resistive Networks	4	4	4	12	EEH101-2
I / 3	Capacitors	2	4	4	10	EEH101-3
II / 4	Electromagnetism	6	2	2	10	EEH101-4
II / 5	Magnetic Circuits	6	2	4	12	EEH101-5
II / 6	Electromagnetic Induction	6	4	4	14	EEH101-6
Total		30	20	20	70	

I. ASSESSMENT CRITERIA

The assessment need to be done as per Proforma I & II

i) Formative Assessment of Practical and SLA:-

Every assignment/ 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	Attendance/Discipline and punctuality	05
TOTAL		**25**

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
TOTAL		**25**

J. INSTRUCTIONAL STRATEGIES:

I) Instructional Methods:

1. Lectures cum Discussions
2. Class room practices.
3. Use of projector for ppt

II) Teaching and Learning resources:

1. Chalkboard
2. Slides(PPT)
3. Self learning Online Tutorial
4. Virtual Lab

K. REFERENCE MATERIAL

I) Books / Codes

Sr. No.	Author	Title	Publisher
1.	B. L. Theraja A. K. Theraja	A Text Book of Electrical Technology Vol-I (Basic Electrical Engg)	S. Chand and Co.
2.	V.N. Mittle	Basic Electrical Engg.	Tata McGraw-Hill
3.	V.K. Mehta	Electrical Technology	S. Chand and Co.
4.	Edward Hughes	Electrical Technology	Pearson Education, New Delhi

II) Websites

i) **www.electrical4u.com**
ii) **www.vlab.co.in**
iii) **www.circuitglobe.com**

Course Name : Electrical Workshop practice.
Course Code : EEH-102.
Course Abbreviation : HWEE.
Course Type :SEC

A. LEARNING SCHEME:

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	02	3
	Tutorial Learning	...	
	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				100
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
	00	00	00	00	50	20	25@	10	25	10	

Total IKS Hrs for Sem.: 02 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

a. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
b. 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.
c. 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.
d. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.*15Weeks
e. 1(one) credit is equivalent to 30 Notional hrs.
f. *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: RATIONAL:

This course is important for candidates to learn practical approach to various electrical materials, electrical wiring accessories, tools, wiring circuits, protections of circuits with basic study of electrical concepts and correspondingly practically working. This encourages students to get hands on experiences of handling electrical apparatus which will be helpful for learning of next courses in consecutive semesters.

E. COURSE LEVEL LEARNING OUTCOMES(COS):

EEH102-1-Useparticular material for electrical circuit or application.
EEH 102-2-Select proper electrical wires & accessory in electrical wiring work.
EEH 102-3-Make connections in circuit of electrical meters.
EEH 102-4-Identify electrical machines & their spare parts.

Competency: Identify, select & use various electrical materials, wires, insulators, & Electrical accessories.

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**	**PSO1** Maintain various types of electrical equipments	**PSO2** Maintain various sections of electrical power systems
Competency: Able to identify, select & use various electrical materials wires insulators &equipments.	3	1	1	2	3	1	3	1	-
EEH 102 -1 Use particular material for electrical circuit or application.	3	1	1	1	1	-	3	1	-
EEH 102 -2 Select proper electrical wires & accessory in electrical wiring work.	3	1	1	1	1	-	3	1	-
EEH 102 -3 Make connections in circuit of electrical meters.	3	1	1	1	1	-	3	1	-
EEH 102 -4 Identify electrical machines & their spare parts.	3	1	1	1	1	-	3	1	-

F. CONTENT:

I. Practical exercises and related skills to be developed:

The following practical exercises shall be conducted in the *Laboratory for Electrical workshop practice* developed by the Institute in practical sessions of batches of students:

Sr No.	Title of Practical Exercise	Skills / Competencies to be developed	Course Outcome
01	**To draw various electrical symbols useful in electrical engineering field.	Able to identify meaning of symbol	**EEH 102 -1**
02	**Perform experiment on measurement of length, cross sectional area and resistance of copper conductor.	Able to measure electrical parameter values	**EEH 102 –1**
04	**Demonstrate various magnetic materials used in electrical equipment‘s& machines.	Able to identify & select electrical material	**EEH 102 -1**
05	**Demonstrate various insulating materials used in electrical equipment‘s & machines.	Identify , select & use electrical material	**EEH 102 -1**
06	Demonstrate different tools used in electrical wiring system.	Identify , select & use electrical wiring tools.	**EEH 102 -2**
07	**Demonstrate function of one way & two way switch in lamp control.	Make connections & Use electrical apparatus.	**EEH 102 -2**
08	**Connect MCB in simple single phase circuit.	Make connections & Use electrical apparatus.	**EEH 102 -2**
09	Connect ELCB in simple single phase circuit.	Make connections & Use electrical apparatus.	**EEH 102 -2**
10	**Testing of specific fuses for given load. (Up to 5 Amp)	Make connections & Use electrical apparatus.	**EEH 102 -2**
11	Demonstrate different DC and AC Ammeter, Voltmeter & Wattmeter & Energy meter.	Able to use electrical apparatus	**EEH 102 -3**
12	Demonstrate hands on operations of Clamp on meter, Digital multimeter.	Able to handle & use electrical equipment‘s	**EEH 102 -3**
13	**Demonstrate identification of components, constructional, circuit diagram & function of following equipment‘s: 1) Tube light, 2) Ceiling fan, 3) Electric Iron,4) Electric geyser, 5) Electrical Mixer. 6) Auto transformer or Dimmerstat.	Identify spare parts, equipment‘s & machines	**EEH 102 -4**

**** Compulsory 08assignments to be completed + Any 01from remaining = 09.**

II) THEORY: SECTION-I

Sr. No.	Topics / Sub-topics	Lectures (Hours)
EEH 102 -1-Useparticular material for electrical circuit or application.		
1	**Chapter 1: Electrical Materials.** 1.1 Conducting Materials-- 1.1.1 Types-Copper & Aluminium. 1.1.2 Specific resistance & Resistivity 1.1.3 Temperature coefficient to resistance for metals 1.2 Magnetic materials-- 1.2.1 Types of magnetic materials: Paramagnetic, Diamagnetic and Ferromagnetic materials, Applications of magnetic materials 1.3 Insulating Material-- 1.3.1 Classification of Insulating Material- Typical examples ofgaseous, liquid and solid insulating materials. 1.3.2 Class of Insulation 1.3.3 Applications of some important insulating materials viz.Mica,porcelain,cotton,silk,Bakelite,mineraloil/transformer oil and asbestos.	**08**
EEH 102 – 2-Select proper electrical wires & accessory in electrical wiring work.		
2.	**Chapter 2. Electrical Wiring Components.** 2.1 Electrical useful symbols for wiring. 2.2 Wiring Tools & equipments. 2.3 Wiring components: **2.3.1 Various electrical points, Switches, Sockets, Switch boards(*IKS)** 2.3.3 Applications & connections of Fuses, MCB, ELCB. 2.4 Simple wiring and single line diagrams. 2.4.1 One lamp control by one switch. 2.4.2 One lamp control by two way switch. 2.4.3 Godown wiring.	**07**
	Total	**15**

SECTION- II

Sr. No.	Topics / Sub-topics	Lectures (Hours)
EEH 102 -3- Make connections in circuit of electrical meters.		
3	**Chapter 3. Electrical Measuring Instruments.** 3.1 Identification of AC-DC meter, their symbols& selection of rating. 3.2 Connections of Ammeter, Voltmeter & Wattmeter, and Energy meter. 3.3 Handling of Clamp on meter, Digital multimeter.	**07**

Sr. No.	Topics / Sub-topics	Lectures (Hours)
EEH 102 -4- Identify electrical machines & their spare parts.		
04	**Chapter 4. Electrical equipment's.** 4.1 Electrical safety- **4.1.1 IE safety rules.(*IKS)** **4.1.2** Safety measures. **4.1.3** Necessity of earthing system. **(From following given equipment's.)** 4.2 Identify components & their connection diagram----- 4.3 Study Construction &their function --- 4.4 Study of open & short circuit faults & their causes. **Equipment's:** 1) Tube light 2) Ceiling fan, 3) Electric Iron, 4) Electric geyser, 5) Electrical Mixer, 6) Auto transformer or Dimmerstat.	**08**
	Total	**15**

(*No questions will be asked for IKS)

List of Assignments under SLA

1. Survey on different types of wires.
2. Comparative survey on different wires
3. Survey on different types of lamps
4. Survey on electrical wiring accessories
5. Survey on different instruments

H .Specification table for setting question paper for semester end theory examination

……Not Applicable……

II. Assessment criteria for practical assignments and oral examination

The assessment need to be done as per Proforma I & II

i) Continuous Assessment of Practical Assignments :

Every practical 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
TOTAL		**25**

ii) Progressive Skill Test :

One mid-term *Progressive Skill Test* of 25 marks

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

iii) Final marks of ORAL examination shall be awarded as per Assessment Pro-forma *I&II*

J. Instructional Methods:

I) 1.Lectures cum Demonstrations 2. Laboratory practicals. 3. Term write up.

K. Teaching and Learning resources:

I) 1.Chalk board. 2. Demonstrations by Visual/LCD presentations. 3. Practical work in laboratory.

L. Ref. Books / Journals / IS Codes

Sr. No.	Title	Author	Publisher
01	An Introduction toElectrical EngineeringMaterials	C. S. Indulkarand S.Thiruvengadam	S.Chand Publishing, 2008
02	K.B. Raina, S.K.Bhattacharya	Electrical Design, Estimating and costing	New Age Int (p)Ltd,New Delhi
03	Electrical Measuring Instruments	byD.B.Dhar.	Tata McGraw-Hill P. Co. Ltd
04	Basic Electrical Engineering	V. N. Mittle	Tata McGraw-Hill P. Co. Ltd

M. Software/learning websites:

i. www.ntpc.co.in,
ii. www.nhpcindia.com,
iii. www.nptel.ac.in,

iv. ISO, IS, BS standards, Data Sheets,
v. IE Rules HandbookS/International code: IS5909, 7733, 2174, 732, 4648

Websites:

i. http://www.bestestimatepro.com/bieap.gov.in/estimatingandcosting.pdf
ii. http://indiacatalog.com/web_directory/electrical/electrica
iii. www.howstuffworks.com
iv. www.electrical4u.com
v. www.meda.com

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Government Polytechnic Kolhapur

Learning and Assessment Scheme for Post S.S.C Diploma Courses

Programme Name	**: Diploma In Electrical Engineering**		
Programme Code	**: EE**	**With Effect From Academic Year**	**: 2023-24**
Duration Of Programme	**: 6 Semester**	**Duration**	**: 15 WEEKS**
Semester	**: Second**	**Scheme**	**: MPECS 2023**

Sr No	Course Title	Abbreviation	Course Type	Course Level	Course Code	Total IKS Hrs for Sem.	Learning Scheme					Credits	Assessment Scheme											
							Actual Contact Hrs./Week			Self Learning(Activity/ Assignment /Micro Project)	Notional Learning Hrs/Week		Paper Duration (hrs.)	Theory				Based on LL&TL				Based on Self Learning		Total Marks
																		Practical						
							CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
														Max	Max	Ma	Mi	Max	Min	Max	Min	Max	Min	
1	ENGINEERING CHEMISTRY	HCHA	DSC	1	CCH103	4	4	-	2	2	8	4	1.5	30 *#	70*#	100	40	25	10	25@	10	25	10	175
2	COMMUNICATION SKILL	HCMS	AEC	2	CCH201		4	-	2	2	8	4	3	30	70	100	40	25	10			25	10	150
3	SOCIAL AND LIFE SKILLS	HSLS	VEC	2	CCH204		-	-	-	2	2	1	-	-	-	-	-	-	-	-	-	50	20	50
4	APPLIED MATHEMATICS	HAMT	AEC	3	CCH301	2	4	2	-	-	6	3	3	30	70	100	40	-	-	-	-	-	-	100
5	BASIC ELECTRONICS	HBET	DSC	1	EEH103	1	2	-	2	-	4	2	1.5	15	35	50	20	50	20	25@	10			125
6	ELECTRICAL POWER GENERATION	HEPG	DSC	3	EEH301	2	3	-	2	1	6	3	3	30	70	100	40	25	10			25	10	150
7	BASIC MECHANICAL AND CIVIL ENGINEERING	HBMC	SEC	3	EEH302	2	2	-	4	-	6	3	-	-	-	-	-	50	20	50@	20	-	-	100
	Total					**11**	**19**	**2**	**12**	**7**	**40**	**20**		**135**	**315**	**450**		**175**		**100**		**125**		**850**

Abbreviations:CL-ClassroomLearning,TL-TutorialLearning,LL-LaboratoryLearning,FA-FormativeAssessment,. SA-SummativeAssessment,IKS-IndianKnowledgeSystem,SLA-SelfLearningAssessment

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.*15Weeks
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.

Course Category: Discipline Specific Course Core(DSC): 3,DisciplineSpecificElective (DSE):0,ValueEducation Course(VEC):1, Intern./Apprenti./Project./Community(INP):0,AbilityEnhancementCourse (AEC) : 1, Skill Enhancement Course (SEC) : 2, Generic Elective (GE) : 0

Government Polytechnic Kolhapur (MPECS 2023)

PROFORMA -I

Formative Assessment of Practical's /Tutorial /Self LearningAssessment

														Total Marks out of( )	Marks converted As per scheme ( )
PR/TU/Assignment No.		1	2	3	4	5	6	7	8	9	10	11	12		
Sr.No	Roll No.														
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															
16															
17															

Government Polytechnic Kolhapur

PROFORMA II

Used for Summative Assessment Practical /Oral Examination

SR.NO	ROLL NO	Knowledge aboutthe course	Preparedness for practical	Neat & complete Diagram/write up	Communication/Presentation	Performance in practical Exam.	Total out of 25	Converted Marks as per Learning scheme( )
		5M	5M	5M	5M	5M		
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								

COURSE NAME : ENGINEERING CHEMISTRY.
COURSE CODE : CCH 103
COURSE ABBREVIATION : HCHA

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	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
1.5	30 *#	70*#	100	40	25	10	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 - FormativeAssessment, 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 &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 Timetable.

* Self learning includes micro project / assignment / other activities. (Provide list of all assignmentshere 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 ofthe 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 theirfield. 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)

CCH103-1 Apply the basic knowledge of atom, molecules and compounds in Engineering Chemistry.

CCH103-2 Apply the concepts of Electrochemistry to interpret the reasons of corrosion with its remedies.

CCH103-3 Select the relevant catalyst, insulators, adhesives, composite materials, plastic and rubber for different applications in the field of engineering.

CCH103-4 Use of water in Domestic purpose, Industrial purpose and its relevant treatment to solve industrial problems.

CCH103-5 Explain the method of Extraction of Copper and select proper types of alloys, solders for various purposes.

CCH103-6 Apply the basic knowledge of Cells and Batteries in Industrial applications.

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**	**PSO2**
CCH103-1 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
CCH103 -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	-	-
CCH103 -3 CO-3 Select the relevant catalyst, 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	-	-
CCH103 – 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	-	-
CCH103-5 CO-5 Explain the method of Extraction of Copper and select proper types of alloys, solders for various purposes.	3.0	1.0	-	-	2.0	1.0	3.0	-	-
CCH103- 6 CO-6 Apply the basic knowledge of cells and Batteries in Industrial applications.	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	CCH103-1
2	Volumetric analysis of solution.	CCH103-1
3	Preparation of 1 N, 0.5 N & 0.1 N Solutions of different chemicals like NaOH, HCI, Oxalic acid, $FeSO_4$, etc.	CCH103-1
4	Titration of strong acid and strong bases (HCl X NaOH)	CCH103-1
5	Double titration of strong acid, strong base & weak acid (HCI X NaOH X $H_2C_2O_4.H_2O$)	CCH103-1
6	Titration of weak base, strong acid & strong base (Na_2CO_3 X H_2SO_4 X KOH)	CCH103-1
7	Estimation of chloride content in water by Mohr' s method	CCH103-4
8	Determination of amount of Ca and Mg ions present in given sample of water by E.D.T.A method	CCH103-4
9	Estimation of viscosity of oils/solutions by Ostwald's method	CCH103-1
10	Estimation of Ca in limestone.	CCH103-4
11	Titration of $KMnO_4$ & $FeSO_4$ (Redox titration)	CCH103-1
12	Estimation of % of Fe in given sample of steel.	CCH103-1
13	Determination of alkalinity of water.	CCH103-4
14	Determination of Electrochemical equivalent (ECE) by copper voltmeter.	CCH103-2
15	To estimate volumetrically the percentage of copper in a given sample of Brass.	CCH103- 5
16	To demonstrate the different types of Solders.	CCH103-5

II) Theory

Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation. Marks
CO - CCH103-1 Apply the basic knowledge of atom, molecules and compounds in Engineering Chemistry.			
1	**ATOMIC STRUCTURE AND CHEMICAL BONDING** 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	**07**	**08**

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation. Marks
	multiplicity, Pauli's exclusion principle. 1.6 Lewis and Langmuir's concept of stable electronic configuration. 1.7 Electrovalency and Co-valency. 1.8 Formation Of electrovalent compounds- NaCl, $CaCl_2$. 1.9 Formation of Covalent compounds- H_2O, CO_2.		
CO - CCH103-2 Apply the concepts of Electrochemistry to interpret the reasons of corrosion with its remedies.			
2	**ELECTROCHEMISTRY AND CORROSION.** 2.1 Definitions- Cathode, Anode, Conductor, Electrolyte, Electrode, Ionization, Electrolysis. 2.2 Arrhenius Theory of Ionization. 2.3 Degree of Ionization & Factors affecting degree of ionization. 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 CuSO4 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 - CCH103-3 Select the relevant catalyst, insulators, adhesives, composite materials, plastic and rubber for different applications in the field of engineering.			
3	**CHEMISTRY OF ENGINEERING MATERIALS AND CATALYSIS.** **3.1 INSULATORS** 3.1.1 Definition & Characteristics of insulator. 3.1.2 Preparation, properties & uses of Glass wool, Thermocole. **3.2 COMPOSITE MATERIALS** 3.2.1 Definition. 3.2.2 Classification, Properties & Application of	**13**	**16**

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation. Marks
	composite materials. **3.3 PLASTICS** 3.3.1 Definition of Polymer, Polymerization. 3.3.2 Types of polymerization – Addition & Condensation polymerization. 3.3.3 Classification of plastic - Thermosoftening & Thermosetting plastic. 3.3.4 Engineering properties & applications of plastic. **3.4 RUBBER** 3.4.1 Elastomer 3.4.2 Drawbacks of Natural rubber. 3.4.3 Vulcanization of rubber. 3.4.4 Engineering properties & uses of rubber. **3.5 ADHESIVES** 3.5.1 Definition of adhesives. 3.5.2 Characteristics of good adhesive. 3.5.3 Properties of adhesive. **3.6 CATALYSIS** 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.		

Section –II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO - CCH103-4 Use of water in Domestic purpose, Industrial purpose and its relevant treatment to solve industrial problems.			
4	**WATER** 4.1 Impurities in natural water. 4.2 Hard water & Soft water. 4.3 Hardness of water- Temporary & Permanent. 4.4 Reactions of hard water with soap.	**09**	**12**

	4.5 Disadvantages of hard water for domestic & Industrial purpose - Textile Industry, Sugar Industry, Paper Industry Dying Industry. 4.6 Sterilization of water - Chlorination –by Cl_2, bleaching powder, Chloramines with chemical reactions. 4.7 Ion Exchange method to remove total hardness of Water.		
CO - CCH103-5 Explain the method of Extraction of Copper and select proper types of alloys, solders for various purposes.			
5	**METALLIC CONDUCTORS AND SOLDERS** **5.1 METALLIC CONDUCTORS** 5. 1.1 Occurrence of metals 5.1.2 Distinction between mineral & ore 5.1.3 Definition of flux, Gangue & Slag 5.1.4 Steps involved in metallurgy-Flow chart. Concentration of ores— A) Physical Methods 1. Gravity Separation Method 2. Electromagnetic separation 3. Froth floatation method. B) Chemical Methods 1. Calcination 2. Roasting 5.1.6 Important ores of copper Metallurgy of copper-Extraction of copper from copper pyrites by concentration, roasting, smelting, Bessemerization, Electrorefining. 5.1.7 Physical properties & uses of copper. **5.2 SOLDERS** 5.2.1 Definition of alloy, classification of alloys & purposes of making alloy. 5.2.2 Composition, properties & applications of soft solder. A) Tinman's solder, B) Brazing alloy, C) Plumber's solder D) Rose metal E) Woods metal	**14**	**16**
CO - CCH103-6 Apply the basic knowledge of Cells and Batteries in Industrial applications.			
6	**CELL AND BATTERIES** 5.1 Definition of Electrochemical cell, Battery, Charge, Discharge, Closed Circuit Voltage, Electrochemical couple, Internal resistance, Open Circuit Voltage, Separator, E.M.F. 5.2 Classification of Batteries such as – Primary & Secondary Batteries 5.3 Construction, Working and Applications of a	**07**	**08**

	Primary Cell such as Dry Cell, Secondary Cell such as Lead Acid Storage Cell 5.4 Charging and Discharging of Lead Acid Storage Cell 5.5 Hydrogen-Oxygen fuel cell, its chemical reactions & advantages 5.6 Introduction of solar cell		

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

G: List of Assignments under SLA (25 marks)

**** 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 & Electro refining 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	Distinguish between Calcination & Roasting	02
16	Smelting process of copper with diagram	02
17	Bessemerization of Copper with diagram	02
18	Physical properties & uses of copper.	02
19	Definition & classification of alloys	02
20	Purposes of making of alloys	02
21	Composition, properties & applications of 1. Soft solder, 2. Tinman's solder, 3. Brazing alloy, 4. Plumber's solder, 5. Rose metal, 6. Wood's metal	02

22	Definitions of Electrochemical cell, Battery, Charge, Discharge, Closed circuit voltage, Open circuit voltage, Electrochemical couple, internal resistance, Separator, EMF.	02
23	Distinguish between Primary & Secondary batteries	02
24	Construction of Dry cell	02
25	Working & applications of Dry cell	02
26	Construction of Lead acid storage cell	02
27	Working & applications of Lead acid storage cell	02
28	Construction of H_2-O_2 fuel cell with Chemical reactions & advantages	02
29	Construction & working of solar cell	02

H: Specification table for setting question paper for semester endtheory 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	CCH103-1
I / 2	Electrochemistry & Corrosion	4	4	2	10	CCH103-2
I / 3	Chemistry of Engineering materials & catalysis	6	6	4	16	CCH103-3
II /4	Water	4	4	4	12	CCH103-4
II /5	Metallic conductors & solders	6	6	4	16	CCH103-5
II / 6	Cell & Batteries	4	2	2	8	CCH103-6
	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
TOTAL		**25**

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
TOTAL		**25**

J) Instructional Methods:

1. Lectures cum Demonstrations,
2. Classroom 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
b. www.kentchemistry.com
c. www.chemcollective.org
d. www.wqa.org
e. www.chemistryteaching.com
f. www.ancient-origins.net/hisotry-famous-people/indian-sage-acharya-kanad-001399

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	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
03	30	70	100	40	25	10	-	-	25	10	150

(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 assignmentshere 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 carryout 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 identifiedoutcome through various learning experiences:

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 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
Competency: 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, conversation, elocution and debate.	2	1	-	-	-	2	1		

CH201-4 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 ofabout 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

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 guidanceof 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

1. 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
TOTAL		**25**

2. 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	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
TOTAL		

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:

S.N.	Name of Book	Author	Publication
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 College Division

M. Learning Website & Software

a. www.nptel.com/iitm/
b. https://www.britishcouncil.in/english/learn-online
c. https://www.vocabulary.com
d. www.newagegolden.com
e. https://www.internationalphoneticassociation.org

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	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
00	00	00	00	00	00	00	-	-	50	20	50

(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, *# 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 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 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
Competency: Exhibit psychosocial competencies, workplace ethics, resilience, positive attitude, integrity and self-confidence.									
CCH204-1 Develop ability to adapt to new challenges.						1	2		
CCH204-2 Manage emotions effectively.						1	2		
CCH204-3 Follow workplace ethics and practices.						1	2		
CCH204-4 Manage time effectively.						2	2		
CCH204-5 Increased self-confidence to handle stress.						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 localproblems TLO 1.3 Design a methodology for fieldwork	**Unit - I MODULE I : Activities UnderUnnat Maharashtra Abhiyan (UMA)** 1.1 Introduction to Societal Needs and respective stakeholders : Regional societal issues that need engineering intervention 1.2 Multidisciplinary approach-linkages of academia, society and technology 1.3 Stakeholders‘ involvement 1.4 Introduction to Important secondary data sets	Implementation Methodology: Considering the nature of the course designed, following points shall be considered while implementing the course. i) Regroup in the batches of 5-6 students for conducting the fieldwork

	TLO 1.4 Select the attributes of engineering and socialsystem for measurement, quantification, and documentation TLO 1.5 Measure & quantify the quantities / systems parameters TLO 1.6 Write a report using information collected. Study the data collected from fieldwork and conclude the observations.	available such as census, district economic surveys, cropping pattern, rainfall data, road network data etc 1.5 Problem Outline and stakeholders : Importance of activity and connection with Mapping of system components and stakeholders (engineering / societal) 1.6 Key attributes of measurement 1.7 Various instruments used for data collection - survey templates, simple measuringequipments 1.8 Format for measurement of identified attributes/ survey form and piloting of the same 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 1.10 Analysis and Report writing Report writing containing- 1. Introduction of the topic 2. Data collected in various formats such as table, pie chart, bar graph etc Observations of field visits and datacollected.	from the bigger group. ii) Assign a few batches of the students for this course to all thefaculty members. 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. iv) The group of course teacherswill 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. v) The course will be implemented in eight sessionsand fieldwork. a) Session I - Introduction to development paradigm, fieldwork and case study as pedagogy b) Session II - VII - Society, stakeholders and value creation, measurements, rudimentary analysis and reporting c) Session VIII - Final closure session feedback and assessment d) Field work - 1. Pilot Visit - Pilot of surveyinstrument Survey Visit 1 - Data gathering / Information Collection 3. Survey Visit 2 - Datagathering

			Summary Visit - Closure afteranalysis
2	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	**Unit - II MODULE II : National Service Scheme (NSS)** 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;
3	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	**Unit - III MODULE-III : Universal Human Values** 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
4	TLO 4.1 Punctuality TLO 4.2 Cleanliness, Hygiene and Orderliness TLO 4.3	**Unit - IV MODULE-IV: Value Education (Unnati Foundation)** 4.1 Punctuality, Icebreaker and Simple Greeting, Understanding & Managing Emotions, Introducing Self, The power of a Positive Attitude, Talking about one's Family, Talking about one's Family, Making a Positive	i) Video Demonstrations ii) Flipped Classroom iii) Case Study iv) Role Play v) Collaborative learning vi) Chalk-Board

	Responsibility TLO 4.4 Gratitude andAppreciations TLO 4.5 Determination& Persistence TLO 4.6 Respect TLO 4.7 Team Spirit TLO 4.8 Caring & Sharing TLO 4.9 Honesty TLO 4.10 Forgive andForget	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 &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 & Asking for the price , Stress Management, Student Referral process ,Comprehending & Paraphrasing Information, A Plate of Rice and Dignity of Labour, Topicsfor Public Speaking, Placement Process , OCSEM-E-Newspaper, Critical Thinking to overcome challenges 4.5 Determination and Persistence, Guiding and Giving Directions, Language Etiquette & Mannerism, . Unnati Philosophy , b. Unnati Branding - Follow, Like & 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 & Word, a. Unnati Philosophy& b. Unnati Branding - Follow, Like & 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 & Adaptability, Student referral process, Writing a Resume, OCSEM-Public Speaking, Placement Process, Meditation/ Affirmation & OCSEM-Debate, Introduce Certif-ID, how to create Certif-ID Project , 4.9 Honesty, Email etiquette & Official Email communication, Alcohol & Substance use & abuse, Describing a known place , Leadership Skills, Describing an event, OSCEM-Picture Reading & Visual Comprehension	

		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)	
5	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 Importanceof Insurance TLO 5.8 Literacy About the Dos and Don'ts in finances	**Unit - V MODULE-V : Financial Literacy** 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 ofInstructions 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 heritageamong 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) programmesof educatingpeople 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 thecommunity;
(iii) creating awareness among women that there is no occupation or vocation which is not opento them provided theyacquire 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 ofpatients 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 forinstruction 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

The assessment need to be done as per Proforma I & II

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 Healthand 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 ControlBoard, Government of India)
h. http://www.mahapwd.com/# (A Website of Public WorksDepartment, 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 lectureby 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 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	-	
	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	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
03	**30**	**70**	**100**	**40**	**--**	**--**	**--**	**--**	**--**	**--**	**100**

(Total IKS Hrs for Sem.: 02 Hrs)

C: ABBREVIATIONS:-CL-ClassRoomLearning,TL-TutorialLearning,LL-LaboratoryLearning,SLH-SelfLearningHours,NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA -Self Learning Assessment

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

FA-TH represents average of two class tests of 30 marks each conducted during the semester.
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.
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.
Notional Learning hours for the semester are (CL+LL+TL+SL) hrs.*15Weeks
1(one) credit is equivalent to 30 Notional hrs.
*Self learning hours shall not be reflected in the Time Table.
*Self learning includes micro project /assignment/other activities. (The list of all assignmentsare 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

G. COURSE LEVEL LEARNING OUTCOMES (COS)

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

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** 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		
CCH301-1-CO-1 : To solve examples on integration using various techniques	3	1	-	-	1	-	1		
CCH301-2-CO-2 : To solve Differential equation of first order and first	3	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** Maintain various types of electrical equipments	**PSO2** Maintain various sections of electrical power systems
degree by various methods									
CCH301-3-CO-3 : To find approximate solution of algebraic equations and simultaneous equations by various methods.	2	3	1	1	-	-	1		
CCH301-4-CO-4:- To solve problems on Probability distributions	2	1	1	1	1	1	1		
CCH301-5-CO-5:- Solve examples on Laplace Transform	2	1	-	-	-	-	1		

H. CONTENT:

V) 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

Sr. no	Tutorial experiences	CO
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.			
Unit 1 Indefinite Integration	**Indefinite Integration** 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			
Unit 2 Definite Integration	**Definite Integration** 2.1 Definition, Examples 2.2 Properties of Definite Integration (without proof), Examples based on properties	8	8
CO: CCH301-3: To solve Differential equation of first order and first degree by various methods			
Unit 3 Differential equation	**Differential equation** 3.1 Definition of differential equation 3.2 Order & degree of Differential equations 3.3 Methods of solving Differential equations of first order & first degree of following types:	8	10

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	3.3.1 Variable separable form 3.3.2 Exact Differential equations 3.3.3 Linear Differential Equations		

Section –II

Sr. no.	**Topics/Subtopics**	Learning Hours	Classroom learning evaluation Marks
CO: CCH301-4 :- To find approximate solution of algebraic equations and simultaneous equations by various methods.			
Unit 4 **Numerical Methods**	**Numerical Methods** 4.1 Numerical solution of Algebraic Equations 4.1.1 Bisection Method 4.1.2 Regula- Falsi Method 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 Bakhshali iterative method for finding approximate square root.(IKS)	10	14
CO: CCH301-4:- To solve problems on Probability distributions			
Unit 5 **Probability Distribution**	**Probability Distribution** 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 **Laplace Transform**	**Laplace Transform** 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
	Total Marks				70	

H .Assessment Criteria

i) **Formative Assessment (Assessment for Learning)**
- **Tests**

ii) **Summative Assessment (Assessment of Learning)**
- **End term exam**

I. Instructional Methods:

7. Lectures cum Demonstrations
8. Classroom practices
9. Use of projector and soft material for demonstration
10. 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
16	Higher Engineering Mathematics	Grewal B.S.	Khanna publication New Delhi,2013 ISBN:8174091955
17	A textbook of Engineering Mathematics	Dutta.D.	New age publication New Delhi,2006 ISBN:978-81-224-1689-3
18	Advance Engineering Mathematics	Kreysizg,Ervin	Wiley publication New Delhi,2016 ISBN:978-81-265-5423-2
19	Advance Engineering Mathematics	Das H.K.	S Chand publication New Delhi,2008 ISBN:978-81-219-0345-5
20	Introductory Methods of Numerical Analysis	S.S.Sastry	PHI Learning Private Limited,New Delhi.ISBN:978-81-203-4592-8
21	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

22	Calculus & Its Applications	Marvin L.Bittinger	Addison-Wesley 10th Edition ISBN-13:978-0-321-69433-1
		David J.Ellenbogen Scott A. Surgent	
23	An Introduction to Statistical Learning withApplication in R	Gareth James,Hastie Robert & Tibshirani	Springer New York Heidelberg Dordrecht LondonISBN:978-1-4614-7138-7(eBook)

L. Learning Website & Software

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

COURSE NAME : BASIC ELECTRONICS
COURSE CODE : EEH 103
COURSE ABBREVIATION : HBET

A. LEARNING SCHEME:

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

B. ASSESSMENT SCHEME:-

PAPER DURATION INHRS	THEORY				BASED ON LL&TL				BASED ON SLA		Total
					Practical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR				
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
1.5	15	35	50	20	50	20	25@	10	-	-	125

(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 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.

D. i) RATIONALE: -

Diploma engineers must deal with the various electronic components while maintaining various electronic equipment/systems. The use of basic electronics components and handling of various electronics systems will help them troubleshoot electronics equipment used in industry or in the consumer market etc. This course is developed to empower the students to apply their knowledge to solve broad electronic engineering application problems.

ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to attend following industry identified competency through various teaching learning experiences: • Maintain electronic equipment/systems comprising of discrete electronic components.

E. COURSE LEVEL LEARNING OUTCOMES (COs)

EEH 103 -1 Identify and use relevant diode in electronic circuits

EEH 103 -2 Examine and operate rectifier and filter.

EEH 103 -3 Identify and illustrate use bipolar junction transistor in electronic circuits.

EEH 103 -4 Convert the decimal number into other number system and use logic gates in electronics circuit.

Course outcomes and programme outcomes/ programme specific outcomes (CO- PO/PSO) matrix

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

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** Operate and Maintain	**PSO2** Supervision and Providing Solution
EEH 103 -1	3	2	-	3	-	-	--	2	--
EEH 103 - 2	3	2	-	2	--	--	--	3	1
EEH 103 - 3	3	-	-	2	-	--	--	3	1
EEH 103 - 4	3	1	-	2	--	--	--	3	--

F. CONTENT:

I) Practical exercises

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

Sr. No.	Laboratory experiences	CO
1.	Identification electronic equipment in basic electronics laboratory 1) Identify different electronic equipment. 2) Operate DMM, power supply, CRO, function generator. 3) Illustrate the use of breadboard	**EEH 103-1**
2.	Find the value of given resistor, capacitor and inductor using color codes 1) Calculate the value of resistor by color code. 2) Find the value of given capacitor and inductor	**EEH 103-1**
3.	Measure amplitude, time period and frequency of sine wave using CRO 1) Use of function generator to generate sine wave. 2) Measure the amplitude, time period and frequency of sine wave	**EEH 103-1**
4.	Test the performance of PN junction diode 1) Build the circuit as per circuit diagram 2) Record the measured readings in observation table 3) Draw the forward & reverse characteristics	**EEH 103-2**
5.	Test the performance of Zener diode 1) Build the circuit as per circuit diagram 2) Record the measured readings in observation table 3) Draw the forward & reverse characteristics	**EEH 103-2**
6.	Test Zener voltage regulator for given voltage (With varying input voltage) 1) Build the circuit as per circuit diagram 2) Record the readings in observation table	**EEH 103-2**
7.	Test Zener voltage regulator for given voltage With varying load 1) Build the circuit as per circuit diagram 2) Record the readings in observation table	**EEH 103-2**
8.	Test the half wave circuits on breadboard 1) Construct the circuit as per circuit diagram 2) Record the waveform displayed on the oscilloscope according to the setting of VOLT/DIV 3) Record readings measured in observation table	**EEH 103-2**
9.	Test the full wave center tapped circuit on breadboard 1) Construct the circuit as per circuit diagram 2) Record the waveform displayed on the oscilloscope according to the setting of VOLT/DIV 3) Record readings measured in observation table	**EEH 103-2**
10.	Test the full wave bridge circuit on breadboard 1) Construct the circuit as per circuit diagram 2) Record the waveform displayed on the oscilloscope according to the setting of VOLT/DIV 3) Record readings measured in observation table	**EEH 103-2**
11.	Test the operation of transistor as a switch 1) Construct the circuit as per circuit diagram 2) Record the reading in observation table.	**EEH 103-3**

Sr. No.	Laboratory experiences	CO
	3) Sketch the graph of input & output characteristics.	
12.	Plot input –output characteristic of common emitter amplifier 1) Construct the circuit as per circuit diagram 2) Record the reading in observation table. 3) Sketch the graph of input & output characteristics	**EEH 103-3**
13.	Test the performance of logic gate ICs of AND,OR,NOT. 1) Build the circuit as per circuit diagram 2) Verify the truth-table	**EEH 103-4**
14.	Test the performance of logic gate ICs of NAND,NOR. 1) Build the circuit as per circuit diagram 2) Verify the truth-table.	**EEH 103-4**
15.	Test the performance of logic gate ICs of XOR,XNOR. 1) Build the circuit as per circuit diagram. 2) Verify the truth-table.	**EEH 103-4**

II) Theory

Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	EEH103-1 Identify and use relevant diode in electronic circuits		
1	**1.1 Semiconductor Diode** 1.0 Conductor , Insulator, semiconductor 1.0.1 Band theory 1.0.2 Intrinsic semiconductor : Si, Ge 1.0.3Doping 1.0.4 Extrinsic semiconductor : P type , N type 1.1 P.N. junction diode – Ge & Si 1.1.1 Constructional features. 1.1.2 Operating principle. 1.1.3 Characteristics. 1.1.4 Applications. 1.1.5 Specifications. 1.2 Zener diode 1.2.1 Constructional features. 1.2.2 Operating principles. 1.2.3 Characteristics 1.2.4 Specifications. 1.2.5 Applications-Zener as a voltage regulator **1.2.6 Voltage regulators (*IKS)**	**8**	**12**

	EEH103-2 Examine and operate rectifier and filter.		
2	**Rectifiers and filters** 2.0 Block diagram of regulated power supply 2.1 Rectifiers: 2.1.1 Definition: Rectification, Rectifier 2.1.2 Need of rectification 2.1.3 Classification of rectifier 2.2 Half wave rectifier and full wave rectifier (Center-tapped and bridge) 2.2.1 Circuit diagram and waveforms 2.2.2 Operation 2.2.3 Parameters its definition and values for corresponding rectifier- (i) Average output voltage and current (ii) Ripple factor (iii) Rectifier efficiency (iv) Peak Inverse Voltage (v) Transformer Utilization Factor 2.2.4 Comparison of rectifier 2.3 Filter **2.3.1 Need of filter(*IKS)** **2.3.2** Types of filter- (i) Shunt capacitor filter (ii) Series inductor filter (iii) LC filter (iv) CLC filter 2.3.2 Operation of each filter w.r.t. full wave bridge Rectifier only 2.3.3 Comparison of filters	**12**	**10**
	EEH103-3 : Identify and illustrate use bipolar junction transistor in electronic circuits.		
3	**Bipolar Junction Transistor(BJT)** 3.0 BJT-.Types, symbols 3.1 Construction of BJT. 3.2 Operating principles of NPN & PNP Transistor 3.3 Transistor configurations & Modes of operation 3.4 Transistor input & output characteristic of CE & CB configuration. 3.5 Relation between α & β 3.6 Switching action of transistor 3.7 Applications of transistor.	**6**	**7**
	EEH103-4; Convert the decimal number into other number system and use logic gates in electronics circuit.		
4	**Number Systems and Logic gates** 4.1 Number System: binary, octal, decimal and hexadecimal 4.2 Conversion of given decimal number into binary, octal and hexadecimal (simple numerical with no fractions) **4.3 Boolean logic (*IKS)** 4.4 Digital logic gates symbol and truth table:	**4**	**6**

	AND,OR,NOT,NAND,NOR,XOR,XNOR		
	Sub-total:	**30**	**35**

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

H. Specification table for setting question paper for semester end theory assessment

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I	Semiconductor Diode	4	6	2	12	EEH103-1
II	Rectifiers and filters	2	8	-	10	EEH103-2
III	Bipolar Junction Transistor (BJT)	1	4	2	07	EEH103-3
IV	Number Systems and Logic gates	-	2	4	06	EEH103-4
Total Marks		07	20	08	35	

I .Assessment Criteria

The assessment need to be done as per Proforma I & II

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
TOTAL		**25**

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
TOTAL		**25**

J. Instructional Methods:

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

K. Teaching and Learning resources:

Chalk board, LCD presentations, Demonstrative kits, Demonstrative charts

L. Reference Books:

Sr. No	Name of Book	Author	Publication
1	V. K. Mehta	Principles of Electronics	S.Chand
2	B. L. Theraj	Basic Electronics	S.Chand
3	R.S.Sedha	A text book of Applied Electronics	S.Chand
4	G. K. Mithal	Applied Electronics	Khanna Publication
5	A. Motershed	Electronics Devices & Circuits	PHI Publication
6	Malvino	Electronics Principles	McGraw Hill

M. Learning Website & Software

i. www.nptel.iitm.ac.in
ii. www.learningaboutelectronics.com
iii. www.electronics-tutorials.com
iv. https://circuitdigest.com/electronic-circuits
v. https://www.tutorialspoint.com/basic_electronics/basic_electronics_transistors.htm
vi. https://www.youtube.com/watch?v=O_pqCNPs6xw
vii. https://www.youtube.com/watch?v=0nXEUkFBd8A

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COURSE NAME : ELECTRICAL POWER GENERATION
COURSE CODE : EEH 301
COURSE ABBREVIATION : HEPG

I. 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 Hrs /Week*	**06**	

Total IKS Hrs for Sem.: 02 Hrs.

J. 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				150
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
03	30	70	100	40	25	10	….	….	25	10	

K. 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.
(Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

D: RATIONALE:

This course deals in detail about generation of electric power using conventional and nonconventional power plants like Thermal (Coal), Hydro, Nuclear fuels, Solar, Wind, Geothermal, Tidal and Magneto-hydro dynamic. These types of power plants need highly skilled technicians who are capable of operating various control equipment to supply uninterrupted power. This course attempts to develop the basic skills required to take appropriate actions to maintain the various generating and auxiliary equipment of power plants.

Competency: Able to compare & explain different types of electric power generating plants.
Cognitive : Understand the operation of different types of electric power generating plants.
Psychomotor: Explain different types of electric power generating plants.
Affective: Attitude of i) Safety ii) Punctuality iii) Accuracy iv) Precision v) Aesthetic presentation.

E:COURSE LEVEL OUTCOMES:

EEH 301 -1: Suggest which electrical power generation is safe & environment friendly.
EEH 301 -2: Select the power generation plant based on economy.
EEH 301 -3: Infer components & operation of different power plants.
EEH 301 -4: Demonstrate wind and solar power plants.
EEH 301 -5: Illustrate & use Bio-mass, bio-gas & Ocean power plant.
EEH 301 -6: Explain geothermal power plant & fuel cell energy.

Competency, course outcomes and programme outcomes (cp-co-po) 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** Maintain various types of electrical equipments	**PSO2** Maintain various sections of electrical power systems
Able to compare & explain different types of electric power generating plants.	3	1	-	1	2	0	2	-	-
EEH 301 -1: Suggest which electrical power generation is safe & environment friendly.	3	1	-	0	2	0	2	-	-
EEH 301 -2: Select the power generation plant based on economy.	3	1	0	0	2	0	2	-	-
EEH 301 -3: Infer components & operation of different power plants.	3	0	0	1	2	0	2	-	-
EEH 301 -4: Demonstrate wind and solar power plants.	3	1	-	1	2	0	2	-	-
EEH 301 -5: Illustrate & use Bio-mass, bio-gas & Ocean power plant.	3	0	0	1	1	0	2	-	-
EEH 301 -6: Explain geothermal power plant & fuel cell energy.	3	0	0	1	1	0	2	-	-

F. CONTENT:

I) Practical Exercises:

The following practical exercises shall be conducted in the Laboratory for Electrical Power Generation developed by the Institute in practical sessions of batches of about 22 students:

Note-Use half imperial drawing sheets

Sr No.	Title of Practical Exercise	Skills / Competencies to be developed	C O
01	Draw labeled layout of Coal based thermal power plant.	To realize/ identify the various equipment's in thermal power plant.	EEH 301-2
02	Draw labeled layout of Hydroelectric power plant.	……As above……	EEH 301-2
03	Draw labeled layout of Nuclear power plant.	……As above……	EEH 301-3
04	Draw labeled basic diagrams & block diagrams of Wind power plant.	……As above……	EEH 301-4
05	Draw labeled basic diagrams & block diagrams of Solar power plant.	……As above……	EEH 301-4
06	Draw labeled basic diagrams & block diagrams of Ocean power plant.	……As above……	EEH 301-5
07	Draw labeled basic diagrams & block diagrams of Tidal power plant.	……As above……	EEH 301-5
08	Draw labeled basic diagrams & block diagrams of Geothermal.	……As above……	EEH 301-6
09	Draw labeled basic diagrams & block diagrams of Biogas.	……As above……	EEH 301-6

Two or three industrial Visits to Electrical power generation plant.

II) THEORY

SECTION-I

Sr. No	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
EEH 301 -1: Suggest which electrical power generation is safe & environment friendly.			
	Basics of power generation:		

1	1.1. Importance of electrical power in day-to-day life. 1.2 Various sources of energy 1.3 Environmental issues of electrical power generation. **1.4 India Scenario of Power Generation(IKS*)**	**03**	**06**
EEH 301 -2: Select the power generation plant based on economy.			
2	**Economics Aspects:** 2.1 Related terms: Connected Load, firm power, cold reserve, hot reserve, spinning reserve. Base load and peak load plants, load curve, load duration curve, integrated duration curve. 2.2 Cost of generation: Average demand, maximum demand, demand factor, plant capacity factor, plant use factor, Diversity factor, load factor and plant load factor. 2.3 Choice of size and number of generator units, combined power operation of power station. 2.4 Grid System:- State grid and National grid.	**06**	**08**
EEH 301 -3: Infer components & operation of different power plants.			
3	**Generating Stations:** **History of Power Generation (IKS*)** **3.1 Thermal Power Plant:** 3.1.1 Sources of Conventional Thermal Power Plant. 3.1.2 Block diagram. 3.1.3 Working and function of auxiliary component. 3.1.4 Advantages and Disadvantages. 3.1.5 Application. 3.1.6 Major TPS in Maharashtra state with their capacity. **3.2 Hydro Power Plant:** 3.2.1 Sources of Conventional Hydro Power Plant. 3.2.2 Classification & Layouts. 3.2.3 Working and function of auxiliary component. 3.2.4 Advantages and Disadvantages. 3.2.5 Application. 3.2.6 Major HPS in Maharashtra state with their capacity. **3.3 Nuclear Power Plant:** 3.3.1 Nuclear fuels, Chain reaction. 3.3.2 Block Diagram Conventional Power Plant. 3.3.3 Working and Functions of auxiliary component. 3.3.4 Advantages and Disadvantages. 3.3.5 Application. 3.3.6 Major NPS in Maharashtra state with their capacity.	**15** **(05)** **(04)** **(04)** 	**20** **(06)** **(06)** **(08)**
Total		**22**	**34**

SECTION-II

Sr.No	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
EEH 301 -4: Demonstrate wind and solar power plants.			
4	**4.1 Solar Power Plant (Electrical)** **4.2** Introduction of Solar power plant 4.2.1 Photovoltaic cell: Construction, Types. 4.2.2 Series and parallel connections: Cell, module, array. 4.2.3 Performance: Influencing factors-tilt angle, solar radiation, I-V, P-V characteristics. **4.2 Wind Power Plant** **Basic of Wind Energy (IKS*)** 4.2.1 Site Selection for wind plant. 4.2.2 Basic Components: Block diagram, 4.2.3 Functions of each part. 4.2.4 Classification of wind turbines: 1. Horizontal (Basic Diagram, construction and advantages) 2. Vertical Axis Turbine(Basic Diagram, construction and advantages)	**03** **06**	**16** **(08)** **(08)**
EEH 301 -5: Illustrate & use Bio-mass, bio-gas & Ocean power plant.			
5	**5.1 Bio-gas energy& Bio-mass Energy.** 5.1.1 Introduction of Bio-gas & its calorific value. 5.1.2 Block diagram of Bio-mass based power 5.1.3 Types of Bio Gas plant (KVIC & Pragati). **5.2 Energy from the oceans.** 5.2.1 Ocean energy: Principle of ocean thermal electric conversion. (Only principle & no types) 5.2.2 Tidal Power: Basic principle and operation of single basin tidal power plant, site requirements.	**05** **04**	**12** **(08)** **(04)**
EEH 301 -6: Explain geothermal power plant & fuel cell energy.			
6	**Energy from other Sources** **6.1 Geothermal Energy.** 6.1.1 Geothermal energy sources, working principle of Power generation. 6.1.2 Advantages, limitations & applications geothermal. **6.1.3 Sites of Geothermal energy in India (IKS*)**	**03** **02**	**08** **(04)** **(04)**

	6.2 Fuel cell. 6.2.1 Construction & working of Hydrogen Fuel cell. 6.2.2 Advantages, limitations & applications.]		
Total		**23**	**36**

***No questions will be asked for IKS subtopics.**

G: UNDER SLA LIST ASSIGNMENT / MICRO PROJECT:

Sr No.	Title of Exercise/Practices
1	Prepare list of major Conventional power plants (TPS, HPS & NPS) in Maharashtra state with their capacity
2	Prepare a load curve as per data given & show fitting of power generated & supplied to load by thermal, hydroelectric & Nuclear power plant or any other power plants in that load curve suggested by concerned faculty.
3	Study of environment scenario due to conventional power generation plants.
4	Study basic terms related to power generation system like firm power, hot & cold reserve capacity, Connected load, Maximum demand, Average demand, Plant capacity factor, Plant use factor Demand factor , Load curve, Base load & Peak load.
5	Prepare list of major Non conventional power plants in Maharashtra state with their capacity
6	Market survey of list of components of solar water heating scheme for home utility.
7	Prepare a visit report on the Hydro Power station
8	Prepare a visit report on Wind/Solar Power plant

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	Basics of power generation	04	02	00	EEH301-1	06
2	Economics aspects	02	02	04	EEH 301-2	08
3	Generating stations	04	08	08	EEH 301-3	20
4	Solar (electrical)&wind power plant	04	04	08	EEH 301-4	16
5	Bio-gas, Bio-mass & oceans energy.	04	04	04	EEH 301-5	12
6	Energy from other Sources.	02	02	04	EEH 301-6	08

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.

I: ASSESSMENT CRITERIA FOR PRACTICAL- ASSIGNMENTS AND ORAL EXAMINATION

The assessment need to be done as per Proforma I & II

iv) Formative Assessment of Practical Assignments :

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/Drawing/Assignment	05
3	Neat & complete diagram with proper labels.	05
4	Lab work handling of instrument, observations & calculations.	05
5	Lab work/Drawing work and Assignment completion in proper manner with topic wise knowledge.	05
	TOTAL	25

Self Learning Assessment of exercises given :

Every exercise 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/Drawing/Assignment	05
3	Neat & complete diagram with proper labels.	05
4	Lab work handling of instrument, observations, calculations.	05
5	Lab work/Drawing work and Assignment completion in proper manner and with topic wise knowledge.	05
	TOTAL	25

J: Instructional Methods:

1. Lectures cum Demonstrations.
2. Classroom practices.
3. Drawing sheet preparation.

Teaching and Learning resources:

1. Chalk board
2. LCD presentations.
3. Audio presentations.
4. Item/ Question Bank.

K: REF. BOOKS / JOURNALS / IS CODES

Sr. No.	Title	Author	Publisher
01.	Generation of electrical energy	Dr. Gupta BR	S.Chand & Co. New Delhi, 1983,
02.	A course in electrical power	Gupta JB	S. K Kataria and sons, 2014,
03.	A course in electrical power.	Soni, Gupta, Bhatnagar	Dhanpat rai and sons
04.	Principles of power system	Mehta VK and Rohit Mehta	S.Chand & Co. New Delhi, 1982,
05	Power plant engineering	Nag P K	Tata McGraw Hill, New Delhi

SOFTWARE/LEARNING WEBSITES

i. www.ntpc.co.in,
ii. www.nhpcindia.com,
iii. www.nptel.ac.in,
iv. www.mnre.org.in
v. www.powergridindia.com,
vi. www.howstuffworks.com
vii. www.electrical4u.com
viii. www.meda.com

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COURSE NAME : BASIC MECHANICAL AND CIVIL ENGINEERING
COURSE CODE : EEH302
COURSE ABBREVIATION : HBMC

A. LEARNING SCHEME:

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	**02**	**3**
	Tutorial Learning	**--**	
	Laboratory Learning	**04**	
	SLH-Self Learning	**--**	
	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	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	100
Nil	Nil	Nil	Nil	Nil	**50**	**20**	**50@**	**20**			

(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 LineExamination , @$ Internal Online Examination

1. FA-TH represents an average of two class tests of 30 marks each conducted during the semester.
2. If a 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 a 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 projects / assignments / other activities. (Provide list of all assignments here in tabular format At least 6 to 8 assignments to be given)

i) RATIONALE:-

Exposure to basic mechanical engineering subjects equips electrical engineering students with a well-rounded skill set. This interdisciplinary knowledge enhances their ability to design, analyze, and optimize electrical systems within the broader context of mechanical considerations, fostering a holistic approach to engineering. Understanding power plant engineering is valuable for electrical engineers working on power distribution and generation systems.Fluid mechanics is relevant in cooling systems for electrical devices and the design of transformers., Gears, Belt drives, Chain drives, Bearings, Coupling gives understanding of industrial material handling system.

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:

—Use the principles of mechanical and civil engineering in electrical engineering"

E. COURSE LEVEL LEARNING OUTCOMES (COS)

EEH302-1 Identify basic components of thermal power plants.

EEH302-2 Select suitable Industrial power transmission system

EEH-302-3 Identify basic components & their specifications in hydraulic equipment.

EEH302-4 Identify Different parts of Hydroelectric Power plant.

EEH302-5 Identify/Study Different component parts of the building

EEH302-6 Assist in infrastructure works.

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** Maintain various types of electrical equipments	**PSO2** Maintain various sections of electrical power systems
Use the principles of mechanical and civil engineering in electrical engineering"	3	2	2	2	2	2	2	-	-
EEH-302-1Identify basic components of thermal power plants	3	2	1	2	2	1	2	-	-
EEH-302-2 Select suitable Industrial power transmission system	3	3	2	2	1	2	1	-	-
EEH-302-3 Identify basic components & their specifications in hydraulic equipment.	3	2	2	2	2	1	2	-	-
EEH-302-4 Identify Different parts of Hydroelectric Power plant.	**3**	**2**	**2**	**0**	**1**	**1**	**1**	**-**	**-**
EEH-302-5 Identify/Study Different component parts of the building	**3**	**2**	**2**	**1**	**2**	**1**	**2**	**-**	**-**

EEH-302-6 Assist in infrastructure works.	**3**	**1**	**2**	**1**	**1**	**1**	**1**	**-**	**-**

F. CONTENT:

I) Practical exercises

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

Sr. no	**Basic Mechanical Engineering**	CO
1	*Identify steam boilers using models and charts	EEH302-1
2	*Identify steam turbines using models and charts	EEH302-1
3	Measure temperature of different equipment using temperature measuring devices	EEH302-1
4	Measure pressure of different equipment using pressure measuring devices	EEH302-1
5	Measure speed of different rotating elements using sped measuring devices	EEH302-1
6	*Identify drive system using models/ actual set up	EEH302-2
7	Calculate Velocity Ratio of given gear/belt drive of suitable mechanical system.	EEH302-2
8	*Demonstrate Working of Hydraulic Power plant using pelton wheel turbine set up.	EEH302-3
9	*Identify different components of Reciprocating Pump	EEH302-3

Sr. no	**Basic Civil Engineering**	CO
1	*Studyof Layout plan for Hydroelectric power plant.	EEH302-4
2	*Studythe different types of buildings.	EEH302-5
3	Reading of a working drawing for Different types of buildings.	EEH302-5
4	Introduction of different building component	EEH302-5
5	Different types of openings and ducts in the Residential buildings.	EEH302-5
6	*Studyof different construction activity sequence.	EEH302-5&6
7	Study Requirements of concealed wirings in the construction activities	EEH302-5
8	*Studyof foundation used in residential and industrial works.	EEH302-5 & 6
9	*Studyof different types of Concrete grades.	EEH302-5
10	Identify the structures for the electrification in the infrastructure development.	EEH302-6

II) Theory

Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO: EEH-302-1: Identify the different parts of a thermal power plant.			
1	Power plants equipment 1.1 Layout of Thermal Power Plant, Major thermal power plants in India(*IKS) 1.2 Introduction to steam boilers- Difference between water tube & fire tube boiler. Babcock Wilcox boilers, 1.3 Introduction to steam Turbines- Impulse and reaction turbine.	07	16

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	1.4 Introduction to portable generators: Basic components and working of four stroke petrol & diesel I.C engine 1.6 Mechanical parameters measurement 1.6.1Pressure measurement: Bourdon tube pressuregauge 1.6.2 Temperature measurement: Optical pyrometer, Thermocouple 1.6.3 Heat measurement: Calorimeter 1.6.4 Speed measurement of rotating elements: Tachometer, Stroboscope		
CO: EEH-302-2: Select suitable Industrial power transmission system			
2	Power Transmission systems ; 2.1 Gears: Spur, helical, bevel, and worm gears. 2.2 Belt drives: Flat belt, V-belt 2.3 Chain drives; Roller chains, Inverted Tooth Chains 2.4 Bearings; Ball Bearing, Roller Bearing. 2.5 Couplings Flexible Couplings, Rigid Couplings	04	08
CO: EEH-302-3: Identify basic components & their specifications in hydraulic equipment.			
3	Hydraulic pumps, turbines, and Air Compressor 3.1 Layout of Hydraulic Power Plant, 3.2 Major hydraulic power plants in India(*IKS) 3.3 Introduction to hydraulic turbines: construction and working of Pelton wheel, 3.4 Introduction to hydraulic pumps: construction and working of centrifugal pump, reciprocating pump 3.5 Air Compressor; construction and working of two stage reciprocating air compressor, centrifugal air compressor.	05	12

Section –II

Sr. no.	**Topics/Subtopics**	Learning (Hours)	Classroom learning evaluation Marks
CO: EEH302-4**. Identify Different parts of Hydroelectric Power plant.**			
4	1.1 Layout of Hydroelectric Power Plant 1.2 Major Hydroelectric power plants in India(*IKS) 1.3 Civil works structures and their uses	02	00
CO: EEH302-5 **Identify/Study Different component parts of the building**			
5	**Building Construction & drawing:-** 5.1 Types of building Component parts of the building. 5.2 Stone Masonry & Brick masonry and Plastering 5.3 Openings: doors and windows their types. 5.4 Introduction to building drawing. 5.5 Circulation: Horizontal and vertical (passages and staircases) 5.6 Types of structure load bearing, framed & industrial 5.7 Terms Related to Built up Area: plinth area, carpet area, built-up area and FSI. **Foundation and soil mechanics::** 5.8 Types of soils and bearing capacities.(*IKS) 5.9 Different Types of foundations. **Concrete technology:** 5.10 Ingredients of concrete 5.11 Different types of concrete grade and its application. 5.12 Concreting procedure & centering works.	08	00
CO: EEH302-6: **Assist in infrastructure works.**			
6	Introduction to various infrastructure Projects. 6.1 Need of Infrastructure 6.2 Role of Civil & Electrical engineer in development. 6.3 Different sectors in the infrastructure 6.4 Transportation Engineering. 6.4.1 Railway 6.4.2 Roads 6.4.3 Bridges 6.4.4 Tunnels 6.5 Water supply and Sanitary Engineering 6.5.1 Water treatment plant and supply network 6.5.2 Collection of waste water & sewage treatment plant 6.6 Irrigation engineering 6.6.1 Intake structure 6.6.2 Types of irrigation projects. Lift irrigation 6.7 Modern Infrastructure work 6.7.1 Modern public transport system like metro	06	00

	6.7.2 Renewable energy plants like solar energy wind energy(*IKS)		

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

G : List of Assignments under SLA

…….Not applicable…….

H. Specification table for setting question paper for semester end theoryexamination

Not applicable.

I .Assessment Criteria

The assessment need to be done as per Proforma I & II

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
TOTAL		**25**

ii) Summative Assessment of Practical:

Everycandidate 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
TOTAL		**25**

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:

S.N.	Name of Book	Author	Publication
1	A Textbook of Thermal Engineering,	R. S/ Khurmi	S. Chand, New Delhi, 2012 or latest
2	A Textbook of Basic Mechanical Engineering.	D.K.Gupta	Dhanpat rai Publication.
3	Basic Mechanical Engineering.	S. C. Sharma	Khanna Publication, New Delhi, 2012 or latest
4	Electrical Machine	Nagrath I.J. a Kothari, D.P.	Tata McGraw Hill, New Delhi, 2012 or latest
5	Electrical Machine-I	Gupta, J. B.	S. K. Kataria& Sons, New Delhi, 2012 or latest
6	Basic Civil Engineering	G.K.Hiraskar	Dhanpat rai Publication.
7	Basic Civil Engineering	S.S.Bhavikatti	New age international Publication.

M. Learning Website & Software

a. www.nptel.com/iitm/
b. www.howstuffworks.com/
c. www.vlab.com
d. www.sskphdmm.com
e. http://www.youtube.com/watch?v=RAc1RYilugI

Government Polytechnic Kolhapur

Learning and Assessment Scheme for Post S.S.C Diploma Courses

Programme Name	**: Diploma In Electrical Engineering**		
Programme Code	**: EE**	**With Effect From Academic Year**	**: 2024-25**
Duration Of Programme	**: 6 Semester**	**Duration**	**: 15 WEEKS**
Semester	**:Third**	**Scheme**	**: MPECS 2023**

Sr No	Course Title	Abbreviation	Course Type	Course Level	Course Code	Total IKS Hrs for Sem.	Learning Scheme					Credits	Assessment Scheme											
							Actual Contact Hrs./Week			Self Learning(Activity/ Assignment /Micro Project)	Notional Learning Hrs/Week		Paper Duration (hrs.)	Theory				Based on LL&TL				Based on Self Learning		Total Marks
																		Practical						
							CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
														Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
1	Essence of Indian Constitution	HEIC	VEC	2	CCH205		1	-		1	2	1	-	-	-	-	-				-	50	20	50
2	Electrical Circuits	HECT	DSC	3	EEH303	2	3		4	1	8	4	3	30	70	100	40	25	10	25#	10	25	10	175
3	Electrical Measurement & Instrumentation	HEMI	DSC	3	EEH304	2	3		4	1	8	4	3	30	70	100	40	25	10	25#	10	25	10	175
4	Transformer	HTRF	DSC	3	EEH305	2	3		4	1	8	4	3	30	70	100	40	25	10	25#	10	25	10	175
5	Transmission and Distribution of Electric Power	HTDP	DSC	3	EEH306	2	4		2	2	8	4	3	30	70	100	40					25	10	125
6	Applied Electronics	HAET	SEC	3	EEH307	1	3	-	2	1	6	3	3	30	70	100	40	25	10			25	10	150
	Total					**9**	**17**		**16**	**7**	**40**	**20**		**150**	**350**	**500**		**100**		**75**		**175**		**850**

Abbreviations:CL-ClassroomLearning,TL-TutorialLearning,LL-LaboratoryLearning,FA-FormativeAssessment,. SA-SummativeAssessment,IKS-IndianKnowledgeSystem,SLA-SelfLearningAssessment

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.*15Weeks
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.

Course Category: Discipline Specific Course Core(DSC): 3,DisciplineSpecificElective (DSE):0,ValueEducation Course(VEC):1, Intern./Apprenti./Project./Community(INP):0,AbilityEnhancementCourse (AEC) : 1, Skill Enhancement Course (SEC) : 2, Generic Elective (GE) : 0

COURSE NAME : ESSENCE OF INDIAN CONSTITUTION

COURSE CODE : CCH205

COURSE ABBREVIATION : HEIC

A. LEARNING SCHEME:

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	**1**	**1**
	Tutorial Learning	**-**	
	Laboratory Learning	**-**	
	SLH-Self Learning	**1**	
	NLH-Notional Learning	**2**	

B. ASSESSMENT SCHEME :-

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

(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.

- FA-TH represents average of two class tests of 30 marks each conducted during the semester.
- If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall bedeclared as"Detained" in that semester.
- If candidate is not securing minimum passing marks in SLA of any course then the candidate shall bedeclared as fail and will have to repeat and resubmit SLA work.
- Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
- 1(one) credit is equivalent to 30 Notional hrs.
- * 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 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, andsets 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 bythe Constitution in their personal and professional life.

E. COURSE LEVEL LEARNING OUTCOMES (COS)

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

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

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

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

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

F. CONTENT:-

I) Practical exercises

…….Not Applicable…….

II) Theory

SECTION-I		
Sr. No.	**Topics / Sub-topics**	**Lectures (Hours)**
1	**CCH 205. 1.** 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	**2**
2	**CCH 205. 2** .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 Teritories and their limitations.	**3**
3	**CCH 205. 3.** State Government. 3.1 Governor –Role and power. 3.2 Chief Minster and council of ministers. 3.3 State secretariat. 3.4 Administrative Regions of Maharashtra.	**3**
SECTION -II		
4	**CCH 205.4** Local Administration:-Their roles and responsibilities 4.1 District Administration. 4.2 Municipal Corporation. 4.3 Zilla Panchayat 4.4 Taluka (Tahasil) Administration .	**2**
5	**CCH 205. 5**. 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	**2**
6	**CCH 205. 6.** Introduction to Judiciary Provisions :- 1.1 Introduction 1.2 Different courts. 1.3 Government legal advisor-provisions. 1.4 Limitations of courts and co-ordination with Home department.	**3**

G. LIST OF ASSIGNMENTS UNDER SLA

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

i. Prepare elaborations where directive principle of State policy has prevailed over Fundamental rights with relevant Supreme Court Judgements.

ii. Organize a debate on 42nd, 97th and 103rd Constitutional Amendment Acts of Constitution of India.

Seminar

a) Differences in the ideals of Social democracy and Political democracy.
b) Democracy and Women's Political Participation in India.
c) Khap Panchayat – an unconstitutional institution infringing upon Constitutional ethos.
d) Situations where directive principles prevail over fundamental rights.

Group discussions on current print articles.

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

Activity

Arrange Mock Parliament debates.
Prepare collage/posters on current constitutional issues.
National (Art 352) & State Emergencies (Art 356) declared in India.
1. Seven fundamental rights.
2. Land Reforms and its effectiveness – Case study of West-Bengal and Kerala.

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

…….Not Applicable…….

I. ASSESSMENT METHODOLOGIES/TOOLS

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

Assignment, Self-learning and Terms work Seminar/Presentation

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

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. 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, 6thedition, 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

M. LEARNING WEBSITES & PORTALS

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

COURSE NAME : ELECTRICAL CIRCUITS
COURSE CODE : EEH303
COURSE ABBREVIATION : HECT

A. LEARNING SCHEME:

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	3	4
	Tutorial Learning	--	
	Laboratory Learning	4	
	SLH-Self Learning	1	
	NLH-Notional Learning	8	

B. ASSESSMENT SCHEME :-

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL Practical				BASED ON SLA		TOTAL
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR				
	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. : 02 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

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d. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
e. 1(one) credit is equivalent to 30 Notional hrs.
f. * 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. RATIONAL :- Electrical technicians working in the field have to deal with applications that require them to be well conversant with the concepts of electrical parameters such as resistance, inductance andcapacitors. Combination of these parameters in AC circuits gives rise to the different applications of electrical engineering. This course deals with these parameters and their behavior under different source conditions.

ii. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is that the student should solve different electric networks.

E.COURSE OUTCOMES:

EEH303 -1 Solve for ac circuit quantities of voltage, current and different factors.
EEH303-2. Solve ac series circuits and resonant circuit.
EEH303-3. Solve ac parallel circuits and resonant circuit.
EEH303-4 Apply electrical network theorems to solve dccircuits.
EEH303-5 Apply network theorems to solve ac circuits.
EEH303-6 Solve three phase star and delta circuits for voltage, current, power and power factors.

COMPETENCY,COURSE OUTCOMES AND PROGRAMME OUTCOMES /PROGRAMME SPECIFIC OUTCOMES (CP-CO-PO/PSO) MATRIX

[Note : Correlation levels : 1: Slight, 2: Moderate , 3: Substantial, "0": no correlati

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
Competency: Solve different electric application networks	2	2	-	-	1	_	1	0	1
EEH303-1: Solve for ac circuit quantities of voltage, current and different factors.	2	2	-	-	-	_	1	1	1
EEH303-2: Solve ac series circuits and resonant circuit.	2	1	2	-	1	_	1	1	1
EEH303-3: Solve ac parallel circuits and resonant circuit.	2	2	-	-	1	–	1	0	1
EEH303-4: Apply electrical network theorems to solve dc circuits	2	2	-	-		_	1	1	1
EEH303-5: Apply network theorems to solve ac circuits.	2	1	2	-	1	_	1	1	1
EEH303-6: Solve three phase star and delta circuits for voltage, current, power and power factors.	2	2	-	-	1	-_	1	0	1

F. CONTENT:

I. Suggested Practical's/ Exercise:-

Practical Exercises and related skills to be developed:

The following practical exercises shall be conducted as practical's and assess the student for attainment of the competency.

Sr No.	Title of Practical Exercise	Course Outcome
1	Verify behavior of pure resistive circuit	EEH303.1
2	Verify behavior of Pure Inductive Series Circuit.	EEH303.1
3	Verify behavior of Pure Capacitive Circuit	EEH303.1
4	Verify behavior of R-L Series circuit	EEH303.2
5	Verify behavior of R-C Series Circuit.	EEH303.2
6	Verify behavioure R-L-C Series Circuit	EEH303.2
7	Verify Current divisions in R-L-C Parallel Circuit	EEH303.3
8	Verify Voltage divisions in R-L-C Parallel Circuit	EEH303.3
9	Verify Superposition Theorem on D.C. Supply.	EEH303.4

10	Verify Thevenin's Theorem on D.C. Supply	EEH303.4
11	Verify Norton's Theorem on D.C. Supply	EEH303.4
12	Verify Maximum power Transfer Theorem on D.C. Supply	EEH303.4
13	Verify Superposition Theorem on A.C. Supply.	EEH303-5
14	Verify Thevenin's Theorem on A.C. Supply	EEH303-5
15	Verify Norton's Theorem on A.C. Supply	EEH303-5
16	Verify Maximum power Transfer Theorem on A.C. Supply	EEH303-5
17	Verify relationship between Line & phase values of voltage & current in Star connected three phase system.	EEH303-6
18	Verification of relationship between Line & phase values of voltage & current in Delta connected three phase system.	EEH303-6
19	To Study a residential bill of electricity and calculate it after understanding the similar bill.	EEH303- 6

II. THEORY

Sr. No.	Topics / Sub-topics	Lect. (Hrs)	Theory (Marks)
	Section -I		
	EEH303-1. Solve for ac circuit quantities of voltage, current and different factors.		
1.	**A.C. Fundamentals**. # Basic terms related to AC fundamentals(IKS) 1.1 Generation of Alternating Current and Voltageusing elementary alternator. 1.2 Important terms: waveform, Peak/maximum value, Average value, Effective/RMS value, Peak factor, Form Factor and its importance, Phase and phase difference. 1.3 Equations of Alternating Voltages and Currents. 1.4 Phasor representation of alternating quantities. simpleMathematical operations. 1.5 Addition and subtraction of sinusoidal alternating quantities. 1.6 Simple Numerical on above.	**09**	**12**
	EEH303-2 : Solve ac series circuits and resonant circuit.		
2.	**A.C. Series Circuits:** **#Basic of resistance, inductance, capacitance (IKS)** 2.1 Rectangular and polar forms of vectors with conversions from one form to other. 2.2 Response of A.C Supply to pure resistive circuit , pure inductive circuit and pure capacitive circuit. 2.3 Combinations of resistance, inductance and Capacitance in series. 2.4 R-L Series Circuits ,R-C Series Circuit and R-L-C	**08**	**12**

	Series Circuits.		
	EEH303-3 Solve ac parallel circuits and resonant circuit.		
3.	**A. C. Parallel Circuit** 3.1 Impedances in parallel. 3.2 Concept of admittance. 3.3 voltage and current relations in Parallel circuits. 3.4 Calculation of currents in different branches. 3.5 Phasor diagrams (Numerical problem upto threeparallel branches). 3.6 Resonance, resonant frequency, current, power factor, quality factor with numerical .	**07**	**10**

Section-2			
EEH303.4 Solve different Theorems on D.C.			
4	**DC Circuit** 4.1 Revision of basic concepts related with d.c. circuits. 4.2 Nodal Analysis up to two nodes. 4.3 Superposition Theorem Numerical up to two loops. 4.4 Thevenin's theorem Simple Numerical. 4.5 Norton's theorem and simple Numerical .. 4.6 Maximum Power Transfer theorem and its application. 4.7 Star/delta and delta /star Transformations ofResistances. Only Numerical]	**08**	**14**
	EEH303-5 Apply network theorems to solve ac circuits.		
5	**A C network solution - Ohm's** law(IKS) 5.1 Statements of the following laws and theorems on A.C. 5.1.1. Kirchhoff's laws. 5.1.2 Superposition Theorem 5.1.3 Thevenin's theorem. 5.1.4 Norton's theorem 5.1.5 Maximum Power Transfer Theorem. 5.2 Numerical solutions of two-loop ac circuits using the above theorems.	**07**	**12**
	EEH303.6 Polyphase circuits		
6	**Polyphase circuits** 6.1 Generation of emf(IKS) 6.2 Concept of poly phase circuits 6.3 Three phase circuits and advantages of producing three phase voltages and their equations. 6.4 Star and delta connections in alternator. 6.5 Relation between line and phase values of voltages and currents in three phase delta and star connectedsystems. 6.6 Powers in three-phase circuits and their equations. 6.7 Units of different powers in polyphase circuits. 6.8 Billing unit of electricity and sample calculations ofelectricity bill. (Sample simple calculation)	**06**	**10**

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

G : LIST OF ACTIVITIES UNDER SLA

Suggested micro-project on electrical network are as follows:

i. Micro project -Prepare model of star or Delta system using lamps, holders etc to verify relations.
ii. Micro project -Prepare model of simple R,L and C series or parallel circuits using lamps, holders, rheostats etc to verify relations between them.
iii. Survey Electrical network system available nearby offices, commercial places, industry etc.

H: SPECIFICATION TABLE FOR SETTING QUESTION PAPER FOR SEMESTER ENDTHEORY EXAMINATION

Section / Topic no.	Name of topic	Distribution of marks Cognitive base (level wise)			Total Marks	Course outcome
		Remember	Understand	Application		
I / 1	**A.C. Fundamentals**	4	4	4	12	EEH303-1
I / 2	**A.C. Series Circuits**	4	4	4	12	EEH303-2
I / 3	**A. C. Parallel Circuit**	4	4	2	10	EEH303-3
I / 4	**DC Circuit**	4	8	4	14	EEH303-4
II / 5	**A C network solutions**	4	4	4	12	EEH303-5
II / 6	**Polyphase circuits**	4	4	2	10	EEH303-6

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
TOTAL		**25**

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
TOTAL		**25**

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 MATERIAL :

a) Books / Journals / IS Codes

Sr. No.	Author	Title
1.	E.Hudges	Electrical Technology
2.	B.L.Theraja	Electrical Technology-vol.1
3.	V.N,Mittal	Basic Electrical engineering
4.	B.H.Deshmukh	Electrical Technology
5.	V.K.Mehata	Electrical Technology
6.	Nagrath	Basic Electrical engineering

b) Websites

1. www.nptel.iitm.ac.in
2. www.learningaboutelectrical circuits.com
3. www.futurlec.com
4. www.electricalcircuits .co.in

COURSE NAME : ELECTRICAL MEASUREMENT & INSTRUMENTATION
COURSE CODE : EEH304
COURSE ABBREVIATION : HEMI

A.TEACHING/LEARNING SCHEME:

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	3	4
	Tutorial Learning	--	
	Laboratory Learning	4	
	SLH-Self Learning	1	
	NLH-Notional Learning	8	

B.EVALUATION 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	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. : 02 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 OnlineExamination

a. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
b. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shallbe declared as"Detained" in that semester.
c. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall bedeclared as fail and will have to repeat and resubmit SLA work.
d. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
e. 1(one) credit is equivalent to 30 Notional hrs.
f. * 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 intabular format At least 6 to 8 assignments to be given)

D. a) RATIONALE:

The course deals with the principle, construction and application of various electrical measuring instruments used in circuits for measurement of various electrical quantities in the area of industry as well as in electrical power systems. The topics included are meant to prepare the technicians to carry out the responsibilities of electrical engineer in day-to-day work.

This course also deals with various methods for measurement of non-electrical quantities in process industries, power plants, substations etc. for measurement of pressure, temperature, displacement etc.

b) INDUSTRY / EMPLOYER EXPECTED OUTCOME

The main objective of this subject to know the students about electrical measuring unit & which instruments is useful for measurement of electrical quantities, how they construct, how they work & how they handle.

Carryout electrical and instrumentation-based measurements of different parameters

Cognitive: Understanding principles of measurements related to engineering fields

Psychomotor: Use relevant measuring techniques/ instruments for different electrical and some non-electrical quantities.

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

E. COURSE OUTCOMES:

EEH304.1: Understand the basics concepts of electrical measuring instrument
EEH304.2: Carryout measurement of Voltage & Current by using relevant instruments andmethods .
EEH304.3: Use different types of measuring instruments for measuring electric power & Energy.
EEH304.4: Use different types of electrical instruments for measuring various ranges of electrical parameters
EEH304.5: Use different transducer-based instruments for various measurements
EEH304.6: Use electronic instruments for electrical measurements and display.

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	**PSO1** Maintain various types of electrical equipments	**PSO2** Maintainvarious sections of electricalpower systems
Competency :Carry out instrumentation and electrical measurement	3	1	1	2	2	1	3	1	1
EEH304-1 : Check the working of electrical measuring instrument	2	1	2	3	2	1	2	1	-
EEH304-2 Use different types of measuring instruments formeasuring electric Voltage & Current.	3	-	1	2	2	1	1	1	1
EEH304-3 : Use different types of measuring instruments for measuring electric power & Energy	3	-	2	2	1	1	2	1	1
EEH304-4Use Use different types of electrical instruments for measuring various ranges of electrical parameters	3	1	2	1	1	1	2	1	1
EEH304.5:Use different transducer based instruments for various measurements.	3	1	2	2	1	1	2	1	1
EEH304-6:Use electronic instruments for electrical measurements and display	3	1	1	3	2	1	2	1	1

F. CONTENT:-

I. Practical exercises

The following practical exercises shall be conducted in the Laboratory **Electrical Measurement& Instrumentation** developed by the Institute in practical sessions batches of 20-22 students.

Laboratory experiments and related skills to be developed:

Sr. No	Title of Experiment	Course outcome
1.	Introduction to electrical measurement Lab	EEH304-1
2.	Study the different physical & Electrical measurements & Their Conversion.	EEH304-1
3.	Identify measuring instruments on the basis of symbols on dial, type, accuracy, class, position and scale	EEH304-1
4.	Measurement of Voltage & Current in single phase circuit by using voltmeter, ammeter & Multi-Mater	EEH304-2
5.	Identify the components of PMMC and PMMI instruments.	EEH304-2
6.	Troubleshoot PMMC and MI instruments.	EEH304-2
7	Measurement of current by using Clamp-On meter.	EEH304-2
8.	Use of CT. for Extension of range of Ammeter.	EEH304-2
9.	Use of PT. for Extension of range of Voltmeter.	EEH304-2
10.	Measurement of power in single phases circuit by using wattmeter.	EEH304-3
11.	Measurement of power in three phases Balanced Load by using two-wattmeter method	EEH304-3
12.	Measurement of power in three phases Un-Balanced Load by using two- wattmeter method.	EEH304-3
13.	Measurement of reactive power in three phases Laod by using two-wattmeter method.	EEH304-3
14.	Calibrate single phase energy meter by direct loading	EEH304-3
15.	Demonstrate of Single phase Electronic Energy meter.	EEH304-3
16.	Demonstrate the working of smart energy meter	EEH304-3
17.	Measurement of insulation resistance by Megger /Earth Tester	EEH304-4
18.	Use Voltmeter-Ammeter method for measurement of medium resistance.	EEH304-4
19.	Measurement of Medium resistance by Wheatstone Bridge method	EEH304-4
20.	Measurement of low resistance by Kelvin Double-bridge method.	EEH304-4
21.	Use of Rotating type Phase sequence indicator	EEH304-4
22.	Measurement of Temperature using Transducers.	EEH304-5
23.	Measurement of distance using LVDT.	EEH304-5
24.	Measure weights by using strain gauge	EEH304-5
25.	Measure pressure by using Bourdon tube pressure gauge	EEH304-5
26.	Measure voltage, current, Frequency, Amplitude using Cathode Ray Oscilloscope.	EEH304-6

II. Theory:-

Sr.No	Topic/Subtopic	Lect.in Hours	Theory Evaluation marks
EEH304-1: Basics of Electrical measuring instrument.			
Unit-1	**INTRODUCTION & FUNDAMENTALS OF MEASURING INSTRUMENTS** **Old Measurement Methods (IKS)** 1. Introduction to Electrical measuring system a. Def. of measurement b. Significance or Necessity of Measuring Instruments 2. Def. of Instruments a. Standards & units of measuring instruments b. Detail classification of Measuring Instruments. c. Essentials of Measuring Instruments 3. Characteristics of Measuring Instruments a. Static Characteristics b. Dynamic Characteristics 4. Error & Their Types 5. Necessity or Need of Calibration of Measuring Instruments	**04**	**08**
	with their procedure.		

Sr.No	Topic/Subtopic	Lect. in Hours	Theory Evaluation marks
EEH304-2: Use different types of measuring instruments for measuring Voltage & Current			
Unit-2	**MEASUREMENT OF VOLTAGE & CURRENT** 1. Analog Instruments for Measurement of current & Voltage. a. Permanent magnet moving coil instrument (Working Principle, Diagram, Construction, Working, Advantages-Disadvantages & Application) b. Moving iron type instrument. (Attraction Type, Repulsion type) (Working Principle, Diagram, Construction, Working, Advantages-Disadvantages & Application) 2. Clamp-on Meter (in Detail) 3. Measurement of High Voltage & Current a. Current Transformer b. Potential Transformer 4. Range extension of Instruments a. Range Extension of Ammeter b. Range Extension of Voltmeter.	**08**	**12**

Sr.No	Topic/Subtopic	Lect. in Hours	Theory Evaluation marks
EEH304-3: Use different types of measuring instruments for measuring Power & Energy			
Unit-3	**MEASUREMENT OF POWER & ELECTRIC ENERGY** **A) Measurement of Power** a. Def. of Power with their unit & Types of Power b. Introduction to watt-meters c. Classification of watt-meters d. Electrodynamometer Wattmeter (Working Principle, Diagram, Construction, Working, Advantages-Disadvantages & Application) e. Measurement of active, reactive power and power factor in three phase circuits by using two wattmeter method. f. Errors in wattmeter & their compensation. g. Maximum demand indicator. **B) Measurement of Energy** a. Def. of Energy with their unit. b. Calibration of energy meter c. Digital/Electronic Energy meters (Both single and three phase) d. Prepaid Energy meter	**09**	**14**

Sr. No	Topic/Subtopic	Lect.in Hours	Theory Evaluation marks
EEH304-4: Use different types of measuring instruments for measuring of R-L-C			
	Measurement of other electrical Parameters. A. Measurement of Resistance a. Classification of resistance (Low, Medium and high) b. Voltmeter-ammeter method. c. Wheatstone bridge. d. Kelvin double bridge method. (No derivation)		

Unit-4	Measurement of higher resistance (Insulation resistance) by Megger & its application. B. Measurement of Inductance a. Anderson bridge (no derivation no phasor diagram) b. Maxwell bridge (no derivation no phasor diagram) C. Measurement of capacitance by Schering bridge .(Noderivation no phasor diagram) Measurement of Inductance, capacitance and resistance by using digital LCR meter D. Special Type of Measuring Instruments a. Electrodynamometer type Power factor meters. (Single phase & three phase) b. Weston type Frequency meter c. Rotating type phase sequence indicator d. Synchroscope; Working and its application.	**10**	**16**

Sr.No	Topic/Subtopic	Lect.in Hours	Theory Evaluation marks
EEH304-1: Use different transducer-based instruments for various Physical measurements			
Unit-5	**Measurement of Non electrical Quantities by using TRANSDUCERS** 5.1 Introduction and classification of transducer 5.2 Transducer selection factors 5.3 Concept of Piezoelectric and photoelectric transducer **5.4 Measurement of temperature.** 5.4.1 Resistance temperature detector. 5.4.2 Thermistors 5.5 Measurement of Displacement 5.5.1 L V D T – construction, Operation, applications. 5.6 Measurement of Pressure by Strain Gauges 5.6.1 Unbounded type strain gauge 5.6.2 Bounded type strain gauge 5.7 Bourdon tube	07	10

Sr.No	Topic/Subtopic	Lect.in Hours	Theory Evaluation marks
EEH304-6: Use electronic instruments for electrical measurements and display.(Signal Conditioning Instruments)			
Unit-6	6.1 Block diagram of AC and DC signal conditioning systems in instrumentation. 6.2 Digital Multi-meter. 6.3 Function Generators **6.4 Old Recording system (IKS)** 6.5 Recording Type Instruments 6.5.1 Strip chart recorder, 6.5.2 X-Y recorder 6.6 Basic Oscilloscope [CRO], Controls, Their types & Applications of CRO	07	10

** 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	Collect the information about units for measurement of physical quantities.	02
2	Make chart of the physical symbol & representation of electrical quantities.	02
3	Draw & Understand the constructional details of PMMC & PMMI Instruments.	03
4	Compare the measurement method of Energy(Induction Method, Electronic & Prepaid Method)	02
5	Detail study of diff ranges of resistance & their measurement method.	02
6	Problems solved based on two wattmeter method.	02
7	Study the different signal conditioning instruments.	02
	Total Hours	**15**

Or

The following suggested list given below for Micro project, concerned faculty can add similar microprojects

a. Dismantle any PMMC and MI instrument available in the laboratory and identify different parts i.e. coil, spring, magnet, former etc and again assemble the same
b. Dismantle different types of wattmeter available in the laboratory identify the pressure coil and current coil and again the assemble the same
c. collect data of power consumption of various equipment installed in departmental laboratories of polytechnic using digital energy meter.
d. Using CRO test all electronics and electrical circuits in laboratory
e. Use tri-vector meter for its practical utilization in L.T consumers

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	Basics of Electrical measuring instrument.	2	4	2	08	EEH304-1
I / 2	Measurement of Voltage & Current	4	4	4	12	EEH304-2
I / 3	Measurement of Power & Electric Energy	4	4	6	14	EEH304-3
II /4	Measurement of other Electrical Parameters.	4	8	4	16	EEH304-4
II /5	Measurement of Non Electrical Quantities By Using TRANSDUCERS	2	4	4	10	EEH304-5
II / 6	(Signal Conditioning Instruments)	2	4	4	10	EEH304-6
	Total Marks				70	

I.ASSESSMENT CRITERIA

i) Continuous Assessment of Practical Assignments:

Every practical assignment shall be assessed for 25 marks as per criteria given in *Laboratory Manual*

Domain	**Particulars**	**Marks out of 25**
Cognitive	Preparation for practical	05
Psychomotor	Operating skills	05
	Observation and Recording	05
	Interpret Result and Conclusion	05
Affective	Safety Measures/ Discipline	05
TOTAL		**25**

J. Instructional Methods:

4. Lectures cum Demonstrations,
5. Class room practices.
6. Use of projector and soft material for demonstration

K. Teaching and Learning resources:

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

L. .REFERENCE MATERIAL:

Books

1. Electrical Measuring Instruments - by D.B. Dhar.
2. Electrical Technology vol. I - by B.L. Theraja.
3. Measuring Instruments - by Satyanarayan.
4. Electrical & Electronics Measurements & Instrumentation - A. K. Sawhney.
5. Electronic Measurements & Instrumentation - Cooper and Helfrick.

COURSE NAME : TRANSFORMER
COURSE CODE : EEH305
COURSE ABBREVIATION : HTRF

A. LEARNING SCHEME:

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	3	4
	Tutorial Learning	-	
	Laboratory Learning	4	
	SLH-Self Learning	1	
	NLH-Notional Learning	8	

B. ASSESSMENT SCHEME :-

PAPER DURATION IN HRS	THEORY				BASED ON LL & TL Practical				BASED ON SLA		TOTAL
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR				
	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. : 02 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 OnlineExamination

a. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
b. If candidate is not securing minimum passing marks in FA-PR of any course then thecandidate shall be declared as "Detained" in that semester.
c. 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.
d. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
e. 1(one) credit is equivalent to 30 Notional hrs.
f. * 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 intabular format At least 6 to 8 assignments to be given)

D. i) RATIONALE:-

Electrical engineering students must be knowledgeable about transformers, especially their features. The course addresses the principles, characteristics, and uses of transformers. An individual with a diploma is required to operate in a variety of companies, including manufacturing, power generation stations, state electricity boards, etc. The student operates and maintains electrical transformers as part of his job. As a result, student ought to be familiar with the transformer's operation, features, and construction. This course covers the functioning of transformers, their performance characteristics, parallel operations, applications, etc. The various tests performed on transformers to analyze their various parameters are also covered in this subject.

Since technicians are expected to work with various electrical / electronic systems involving transformer, it is highly essential to provide them necessary knowledge about construction, operation & testing of transformer with mathematical background. This course aims at strategic development of students so that they can comprehend, operate, use, and test transformers in accordance with requirements.

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:

"Use single phase and three phase transformer in electrical power system."

E. COURSE LEVEL LEARNING OUTCOMES (COS)

EEH305-1 Recognize the single phase transformer.

EEH305-2 Suggest special purpose transformer for given application.

EEH305-3 Analyze the performance of ideal and practical transformer at different conditions.

EEH305-4 Determine the performance parameters of single phase transformer.

EEH305-5 Operate single phase transformers in parallel and carry out load sharing calculations.

EEH305-6 Identify three phase transformers and operate it in parallel.

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) and "-" for 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** Maintain various types of electrical equipment	**PSO2** Maintain various sections of electrical power systems
EEH305-1	3	2	1	2	2	1	2	2	1
EEH305-2	3	1	-	1	-	-	1	-	-
EEH305-3	3	1	1	1	1	-	2	2	2
EEH305-4	3	1	1	2	2	1	2	2	1
EEH305-5	3	2	2	2	2	1	2	2	1
EEH305-6	3	1	2	2	1	1	1	2	1

F. CONTENT:-

I) Practical exercises:

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

Sr. No.	Laboratory Experiences	CO
1	Identify the different parts of single phase transformer.	EEH305-1
2	Identify the different parts of Three phase transformer.	EEH305-1
3	Determine transformation ratio of single phase transformer.	EEH305-1
4	Identify the different parts of single phase autotransformer (Dimmerstat).	EEH305-2
5	Observe the performance of a given single-phase autotransformer.	EEH305-2
6	Identify the different parts of single phase isolation transformer.	EEH305-2
7	Identify the different parts of current transformer.	EEH305-2
8	Observe the performance of a given Current transformer	EEH305-2
9	Identify the different parts of potential transformer.	EEH305-2

10	Observe the performance of a given Potential transformer	EEH305-2
11	Identify the different parts of single phase welding transformer.	EEH305-2
12	Observe the performance of a given welding transformer	EEH305-2
13	Study design & constructional features of pulse transformer.	EEH305-2
14	Perform Open circuit (OC) test on a given transformer.	EEH305-4
15	Perform Short circuit (SC) test on a given transformer.	EEH305-4
16	Back to Back test on single phase transformer.	EEH305-4
17	Perform polarity test on a single phase transformer.	EEH305-4
18	Determine equivalent circuit parameters of single phase transformer by O. C. & S. C Test.	EEH305-4
19	Determine the efficiency & regulation of given transformer by O. C. & S. C Test.	EEH305-4
20	Determine the efficiency & regulation of given transformer by direct load test.	EEH305-4
21	Perform polarity test on a single phase transformer whose polarity markings are masked.	EEH305-4
22	Perform parallel operation of two single phase transformers to determine the load current sharing.	EEH305-5
23	Perform parallel operation of two single phase transformers to determine the apparent and real power load sharing.	EEH305-5
24	Three-phase transformer connections as per vector group.	EEH305-6
25	Scott-Connection of three phase transformer.	EEH305-6
26	Open-delta Connection of three phase transformer.	EEH305-6
27	Observe Distribution & Power transformers. (based on visit to transformer manufacturing industry)	EEH305-6

II) Theory

Section I

Sr. No.	Topics/Subtopics	Learning (Hours)	Classroom learning Evaluation Marks
CO: EEH305-1: Recognize the single phase transformer.			
1	**Single Phase Transformer** 1.1 Introduction (IKS) 1.2 Principle operation 1.3 Type of transformer according to different aspects 1.4 Construction: Parts and function 1.5 EMF equation of single phase transformer 1.6 Transformation ratio 1.7 Why transformer is rated in KVA 1.8 Losses in a transformer 1.9 Problems on 1.5, 1.6 & 1.8	7	14
CO: EEH305-2: Suggest special purpose transformer for given application.			
2	**Special Purpose transformer** 2.1 Transformer: Need of special purpose transformers 2.2 Single phase auto transformer- 2.2.1 Autotransformer as step down transformer 2.2.2 Autotransformer as step up transformer 2.2.3 Advantages and disadvantages of Autotransformer Application	8	12

	2.2.4 Copper saving in Autotransformer 2.2.5 Comparison between two winding and Autotransformer 2.3 Isolation Transformer- Basic Diagram, function and application 2.4 Instrument transformer: 2.4.1 Current transformer- Basic Diagram, working, application 2.4.2 Potential transformer-Basic Diagram, working, application 2.4.3 Welding transformer- Basic Diagram, function and application 2.4.4 Pulse Transformer Basic Diagram, function and application		
CO: EEH305-3: Analyze the performance of ideal and practical transformer at different condition.			
3	**Phasor Diagram of ideal and practical transformer (No numerical on any subtopic)** 3.1 Concept of ideal transformer 3.2 Ideal transformer – Phasor diagram 3.3 Phasor diagram of ideal transformer – 3.3.1 No load condition 3.3.2 On load condition 3.4 Phasor diagram of Practical transformer- 3.4.1 Phasor diagram on No load 3.4.2 Phasor diagram on load (resistive, capacitive andinductive load) 3.4.3 Phasor diagram of transformer on load with resistance and leakage reactance.	7	8
Total		**22**	**34**

Section –II

Sr. No.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO: EEH305-4: Determine the performance parameters of single phase transformers			
4	**Performance & Operation of Transformer.** 4.1 Equivalent circuit- referred to primary and referred to secondary. 4.2 Transformer Tests 4.2.1 Open – circuit or No load Test 4.2.2 Short – circuit or Impedance Test 4.2.3 Back-to-back test 4.2.4 Polarity test 4.3 Efficiency & Regulation of transformer 4.4 Condition for maximum efficiency 4.4 Determination of efficiency & regulation of transformer by direct loading method. 4.5 All-day-efficiency of a transformer (Numerical based on 4.2.1,4.2.2, 4.3 and 4.5)	7	12
CO: EEH305-5: Operate single phase transformers in parallel & carry out load sharing calculations			

5	**Parallel operation of transformers** 5.1 Need of parallel operation 5.2 Conditions to be satisfied for parallel operation. 5.3 Load- sharing calculations 5.4 Numerical on 5.3	5	8
CO: EEH305-6: Use three phase transformer and operate it in parallel.			
6	**Three phase Transformers** 6.1 Three phase transformer: Need 6.3 Power Transformer and Distribution transformer- types, applications, ratings etc. 6.2 Transformer Connections: star-star connection, delta-delta connection, star-delta connection, delta-star connection, Scott connection, Open-delta connection. 6.3 Basic of vector groups (identify vector group only) 6.4 Harmonics: Definition, third harmonic component concept and its effects in transformer connections. 6.5 K factor of transformer – Overheating due to non-linear load and harmonics 6.6 Conditions to be satisfied for parallel operation of 3-ϕ transformers. 6.7 Application of three phase transformers.	12	16
Total		**23**	**36**

** 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	Survey of single phase transformer with its rating. Material, cost, types etc.	02
2	Problems on emf equation, transformation ratio of single phase transformer.	01
3	Problems on open-circuit test, short-circuit test, efficiency and regulation of transformer.	02
4	Collect photographs with details of various power/ distribution transformer and identify the parts (Specification, application, cost, features, manufacturers)	02
5	Collect detailed information of Special Purpose transformer (Specification, application, cost, features, manufacturers)	02
6	Visit to nearby substations to observe the power and distribution transformer and collect minimum 4 transformer information- specification, connection diagram, manufacturer, cost etc.	02
7	Load sharing calculation of transformer.	02
8	Industrial Visits to transformer repair workshop or manufacturing plant.	02
	Total Hours	**15**

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	Single phase transformer	4	8	2	14	EEH305-1
I / 2	Special Purpose transformer	2	8	2	12	EEH305-2

I / 3	Performance of ideal and practical transformer	2	4	2	08	EEH305-3
II / 4	Performance & Operation of Transformer	4	4	4	12	EEH305-4
II / 5	Parallel operation of transformers	-	4	4	08	EEH305-5
II / 6	Three phase Transformer	4	8	4	16	EEH305-6
	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
TOTAL		**25**

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
TOTAL		**25**

J. INSTRUCTIONAL METHODS:

a. Lectures cum Demonstrations,
b. Class room practices.
c. 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.	Name of Book	Author	Publication
1	Electrical Technology Vol-II	Theraja B. L.	S. Chand, New Delhi, 2012 or latest
2	Electrical Machines	Deshpande M. V.	PHI Learning,, New Delhi, 2012 or latest
3	Electrical Technology	Uppal, S. L.	Khanna Publication, New Delhi, 2012 or latest
4	Electrical Machine	Nagrath I. J. Kothari, D. P.	Tata McGraw Hill, New Delhi, 2012 or latest

5	Electrical Machine-I	Gupta, J. B.	S. K. Kataria & Sons, New Delhi, 2012 or latest

M. LEARNING WEBSITE & SOFTWARE

i) www.nptel.com/iitm/
ii) www.howstuffworks.com/
iii) www.virtual lab.com
iv) www.sskphdmm.com
v) http://www.youtube.com/watch?v=RAc1RYilug

COURSE NAME : TRANSMISSION & DISTRIBUTION OF ELECTRIC POWER.
COURSE CODE : EEH306
COURSE ABBREVIATION : HTDP

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	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN			
03	30	70	100	40	-	-	-	-	25	10	125

(Total IKS Hrs for Sem. : 02 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 ExaminationNote :

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:

Transmission and distribution of power is a dynamically changing field of electrical engineering which deals with efficiently, economically and environment friendly transmission and distribution of electrical power from source to utility. This course will enable students to develop knowledge and skill-sets to identify and operate components in transmission and distribution system.

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:

Apply the knowledge of electrical engineering to identify and operate components in transmission and distribution system.

E. COURSE LEVEL LEARNING OUTCOMES (COS)

EEH306-1 Identify the components in transmission and distribution system
EEH306-2 Calculate the constants of transmission line
EEH306-3 Calculate the performance of transmission lines.
EEH306-4 Select a suitable type of distribution system for a given application.
EEH306-5 Identify the major components in substation.
EEH306-6 Calculate the electricity bill for a given tariff & consumption.

COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX

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

PO →	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO2
CO	**Basic and Discipline specific knowledge**	**Problem Analysis**	**Design / Development of solutions**	**Engineering Tools, Experimentation and Testing**	**Engineering Practices for society, sustainability and Environment**	**Project Management**	**Life long Learning**	**Maintain various types of electrical equipments**	**Maintain various sections of electrical power systems**
EEH306-1	2	1	1	-	1	-	1	1	2
EEH306-2	3	3	1	-	-	-	-	-	-
EEH306-3	2	2	2	-	2	-	1	-	2
EEH306-4	2	2	1	-	1	-	-	2	2
EEH306-5	1	-	-	3	3	2	2	2	3
EEH306-6	2	2	2	-	2	-	1	-	2

F. CONTENT:

I) Practical Exercises

The minimum 80 percent of following practical exercises shall be conducted in the laboratory by the Institute in sessions of batches of about 20- 22 students:

Sr. no	Practical Exercises	Course outcome
1	Study and Drawing of Various Types of Insulators Used in Electrical Systems.	EEH306-1
2	Study and Drawing of Single Line Diagram of Electric Power Supply System.	EEH306-1
3	Calculation of String Efficiency and Study of Methods to Improve String Efficiency in Suspension Insulators.	EEH306-1
4	Calculation of Sag in Overhead Transmission Lines Under Different Loading and Weather Conditions	EEH306-2
5	Calculation of Voltage Regulation and Transmission Efficiency of a Short Transmission Line.	EEH306-3
6	Derivation and Study of ABCD Parameters of a Transmission Line.	EEH306-3
7	Study and Drawing of Radial and Ring Main Distribution Systems.	EEH306-4
8	Calculation of Voltage Drop and Efficiency of an AC Distributor Supplying Power to Two Consumers.	EEH306-4
9	Visit to 11KV/400V distribution Substation and write a report.	EEH 306-5
10	Calculation of Energy Bill for a Given Consumer Based on Tariff Structure.	EEH 306-6
11	Solving Numerical Problems on Power Factor Improvement Using Capacitor Banks.	EEH 306-6

Note:- Practical's will be evaluated but marks of practical evaluation should not be considered for the formative assessment of the course. Only SLA marks are considered.

II) Theory:

Section-I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
EEH306-1 Identify the components in transmission and distribution system			

1	**MECHANICAL ASPECTS OF TRANSMISSION LINES** 1.1 Electric Supply system: 1.1.1 Typical A.C. power supply scheme 1.1.2 Advantages of High Voltage Transmission 1.1.2 Comparison of H.V.A.C. and H.V.D.C. 1.2 Main components of transmission lines: i. Components of Transmission line(IKS) ii. Types of commonly used conductors: advantages & applications iii. Types of line supports: basic information iv. Insulators for overhead line: types of material, desirable properties & causes of insulation failure v. Types of insulator: a) pin type, b) suspension type, c) strain type,d) shackle type. (applications, advantages and comparison) vi. Deciding factors for size of conductor and capacity of insulator to be used: voltage level, voltage drop, thermal loading and short circuit capacity. 1.3 String efficiency: derivation and numerical upto 3 insulator disks only. Methods of improving string efficiency (no numerical). 1.4 Sag in overhead line: i. Calculation of sag when supports are at equal levels ii. Effect of wind on sag iii. Effect of sag on conductor and supporting 1.5 Corona: (no numerical) i. Formation of corona and its definition ii. Factors affecting corona iii. Important terms (definition & formula): Critical disruptive voltage, visual critical voltage, power loss. iv. Advantages & disadvantages v. Methods of reducing corona effect	12	14
EEH306-2 Calculate the constants of transmission line			
2	**ELECTRICAL ASPECTS OF OVERHEAD LINES** 2.1 Constants of transmission lines: (No derivation) (Simple numerical) 2.1.1 Calculation of R: 1phase 2 wire & 3 phase 3 wire system 2.1.2 Calculation of L: 1phase 2 wire & 3phase 3 wire symmetrical system, concept of internal flux linkages, external flux linkages, GMR & GMD. 2.1.3 Calculation of C: 1phase 2 wire & 3 phase 3 wire symmetrical system, Electric potential at a charged single conductor. 2.2 Transposition of conductors and its necessity. 2.3 Skin effect, Proximity effect, Ferranti effects in transmission systems: Concept and its effect.	07	08
EEH306-3 Calculate the performance of transmission lines.			

3	**PERFORMANCE OF TRANSMISSION LINES** 3.1 Classification of overhead lines based on voltage and length. 3.2 Concept of voltage regulation and efficiency of transmission line. 3.3 Performance of short transmission line: 3.3.1 Modeling of short transmission line (concept, circuit diagram & phasor diagram) 3.3.2 Calculation of voltage regulation and transmission efficiency (Simple numerical) 3.3.3 Effect of load power factor on regulation & efficiency 3.4 Performance of medium transmission line: i) End condenser method (No numerical) 3.4.1 Modeling (concept, circuit diagram & phasor diagram) 3.4.2 Relation between (V_S, I_S) and (V_R, I_R) ii) Nominal T method (No numerical) 3.4.3 Modeling (concept, circuit diagram & phasor diagram) 3.4.4 Relation between (V_S, I_S) and (V_R, I_R) iii) Nominal π method (No numerical) 3.4.5 Modeling (concept, circuit diagram & phasor diagram) 3.4.6 Relation between (V_S, I_S) and (V_R, I_R) 3.5 Introduction to Long transmission lines. 3.6 ABCD parameters of transmission line (no numerical): i) Basic concept of ABCD ii) Derivation of ABCD for short line model and end condenser line model	11	12

Section II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
EEH306-4 Select a suitable type of distribution system for a given application			
4	Distribution System & Underground Cables 4.1 Design considerations in distribution System: 4.1.1 Voltage drop, thermal loading and short circuit capacity. 4.1.2 Concept of feeder, distributors and service mains 4.2 Classification of distribution: Nature of current; Type ofconstruction, scheme of connection 4.3 Types of distribution: 4.2.1 Primary type: block diagram, concept 4.2.2 Secondary type: block diagram, concept 4.2.1 Radial type: block diagram, concept 4.2.2 Ring main type: block diagram, concept 4.4 Comparison overhead and underground transmission line. 4.5 Simple numerical on calculation of voltage drop and efficiency ofAC distributor feeding maximum two consumers. 4.6 Underground Cables: 4.6.1 Construction	1 1	14

	4.6.2 Properties of insulating materials 4.6.3 Types of insulating material (application, advantages): impregnated paper, PVC, XLPE 4.6.4 Types of cable according to number of cores used		
EEH306-5 Identify the major components in substation			
5	Substations & Neutral grounding 5.1 Selection of site for substation 5.2 Classification of substation according to service requirement: Transformer substation, switching substation, power factor correction substations, frequency changer substations, converting substations. 5.3 Classification of substitution according to constructional features: Indoor substitutions, outdoor substitutions, pole mounted substations. 5.4 Comparison between outdoor and indoor substations. 5.5 Single line diagram of 66/11kV and 11kV/400V substation. 5.6 Comparison between AIS and GIS. 5.7 Importance of grounding in power system: Importance of equipment grounding, importance of system grounding. 5.8 Advantages of neutral grounding.	11	12
EEH306-6 Calculate the electricity bill for a given tariff & consumption			
6	Tariff & Power factor improvement 6.1 Desirable characteristics of tariff & objectives of tariff 6.2 Types of tariffs (Simple numerical on energy billing) 6.3 Causes and drawbacks of low power factors. 6.4 Power factor improvement equipment: i) static capacitors ii) synchronous condenser 6.5 Calculations of Power Factor correction. (Numerical)	08	10

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

G. LIST OF MICRO-PROJECTS UNDER SLA

The following suggested list given below for Micro project, concerned faculty can add similar micro projects. Only one micro project is planned to be undertaken by a student that will be assigned at the beginning of the semester.

Micro project:-

a. Prepare a model Showing the layout and components of A special and distribution system

b. Prepare a model showing the different types of poles and lattice type of towers.

c. Prepare model showing the different components of 66kv/11kv or 33 kv/11kv.

d. Prepare a model showing the different components of 11 kv/ 415v Pole mounted substation.

e. Collect samples of different types of ACSR (having different trade names) conductors available in the market / local supplier/ mahavitaran.

f. Collect sample pieces of newest polymer insulator available in the market and write a detailed comparative report considering their specifications with traditional porcelain insulator.

g. Make a report on different types of tariff with local electric power supplier by collecting electric bills of different types of consumers.

h. Search and make a report on detail specifications, cost, rating, etc and supplier information about synchronous condenser from internet.

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

Section / Topic no.	Name of topic	Distribution of marks Cognitive base (level wise)			Total Marks	Course outcome
		Remember	Understand	Application		
I / 1	Mechanical aspects of transmission line	04	04	06	14	EEH306-1
I / 2	Electrical aspect Of Overhead Lines	00	04	04	8	EEH306-2
I / 3	Performance Of Transmission Lines	02	04	06	12	EEH306-3
I / 4	Distribution System & Underground Cables	04	06	04	14	EEH306-4
II / 5	Substations & Neutral grounding	04	04	04	12	EEH306-5
II / 6	Tariff & Power factor improvement	04	02	04	10	EEH306-6

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 / analytical Skills	05
	Drawing / drafting skills	05
Affective	Discipline and punctuality	05
TOTAL		**25**

J. INSTRUCTIONAL METHODS:

1. Lectures and discussions.
2. Laboratory experiences and laboratory interactive sessions.
3. Time bound assignments

K. TEACHING AND LEARNING RESOURCES:

1. Chalk board
2. LCD presentations.
3. Demonstrative charts.

L. REFERENCE MATERIAL:

Sr.No	Title Of Book	Author	Publication
01	Principles of power system	V.K.mehta	S Chand and Co.New Delhi,ISBN: 9788121924962
02	A course in Electrical power	Soni, Gupta Bhatnagar	Dhanpat Rai and sons New Delhi ISBN: 9488177000207
03	A Course In Electrical Power	Gupta J.B	S.K katria and New Delhi.SBIN:9788788458523
04	A Textbook of Electrical Technology Vol. III	Theraja B.L, Theraja A.K.	S Chand and Co.New Delhi,ISBN: 9788121924900
05	A Course in Electrical Power	Uppal S.L.	S.K. Khanna Publisher, New Delhi ISBN: 9788174092380
06	Electrical Power Transmission and Distribution	Sivanagaraju S, Satyanarayana S.	Pearson ISBN: 831707911 988131707913
07	Electrical Power System : A First Course	Ned Mohan	Wiley India Pvt. Ltd. New Delhi,ISBN:9788126541959
08	Power System Analysis and Design	Gupta B.R.	S Chand and Co.New Delhi,ISBN: 9788121922388
10	Electrical Power Distribution System	Kamraju V	Tata Mc. Graw Hill, New Delhi,ISBN: 9780070151413

M . LEARNINGWEBSITES

a. https://energy.gov/sites/prod/files/2013/07/f2/Transmission_Woodall_0.pdf
b. https://en.wikipedia.org/wiki/Electic_Power_transmission
c. https://www.electrical4u.com/performance-of-transmission
d. https://www.slideshare.net/sumitKumar58/ppt-of-ehv-ac-transmission
e. https://www.sildeshare.net/sagnikroychowdhury/hvdcpresentation-13232932
f. https://www.slideshare.net/sammergupta8/hvdc-vs-hvac
g. https://www.nctech.edu.lk/Download/Technology%20Zone/Disrtibution%20System%20-%2General..pdf
h. https://www.slideshare.net/surajprasad12/distribution-system-44252619
i. https://www.slideshare.net/pbknprabhakaran/power-transmission-distribution
j. https://www.slideshare.net/gsgindia/construction-ehv-transmission-line
k. www.nptelvideos.in/electricalpower

COURSE NAME : APPLIED ELECTRONICS

COURSE CODE : EEH307

COURSE ABBREVIATION : HAET

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 Practical				BASED ON SLA		Total
03	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN			
	30	70	100	40	25	10			25	10	150

IKS Hours=01

C.ABREVIATION:-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.* 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:

Electronic circuits are most widely used in industries, power systems, communication systems etc. Discrete components are widely used in electronics systems which a diploma engineer may need to maintain. The skills of operating/working on various types of electronic circuits and their applications are needed for every electrical engineer. This course is developed in such a way that, students will be able to apply the knowledge to solve broad electronic engineering application problems in electrical engineering field.

i) INDUSTRY / EMPLOYER EXPECTED OUTCOME:

The aim of this course is to attend following industry identified competency through various teaching learning experiences:

E. COURSE LEVEL LEARNING OUTCOMES (COs)

EEH307-1: Examine and use various types of amplifiers.
EEH307-2: Use different sinusoidal oscillators and multi-vibrators in electronic circuits.
EEH307-3: Illustrate the use of different regulated power supplies.
EEH307-4: Use op-amp in linear electronic circuits.
EEH307-5: Examine and Use various configuration of op-amp for different industrial applications.
EEH307-6: Verify the truth table of digital logic gates.

Course outcomes and programme outcomes/ programme specific outcomes(CO-PO/PSO) matrix

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

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** Operate and Maintain	**PSO2** Supervision and Providing Solution
EEH307-1 Examine and use various types of amplifiers	2	-	-	2	2	2	2	2	2
EEH307-2 Use different sinusoidal oscillators and multi-vibrators in electronic circuits	3	2	-	1	1	1	3	1	1
EEH307-3 Illustrate the use of different regulated power supplies.	3	2	-	2	2	1	2	2	2
EEH307-4 Use op-amp in linear electronic circuits.	3	-	-	1	-	-	3	1	1
EEH307-5 Examine and Use various configuration of op-amp for different industrial applications.	3	2	-	2	2	-	2	2	1

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** Operate and Maintain	**PSO2** Supervision and Providing Solution
EEH307-6 Verify the truth table of digital logic gates.	3	1	-	2	1	1	3	2	2

F. CONTENT:

I) Practical exercises

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

(Any 10)

Sr. No.	Laboratory experiences	CO
1.	Find the specification of given transistor using datasheet.	EEH307-1
2.	Test the working of the BJT as an amplifier in single stage CE mode	EEH307-1
3.	Build the RC phase shift oscillator using BJT and measure the frequency	EEH307-2
4.	Build the Hartley oscillator using BJT and measure the frequency	EEH307-2
5.	Test the performance of Astable multivibrator using IC555	EEH307-2
6.	Test the performance of Monostable multivibrator using IC555	EEH307-2
7.	Test the performance of Regulator IC's: IC's 78XX, 79XX.	EEH307-3
8.	Measure output voltage swing of Op-amp IC741	EEH307-4
9.	Measure Input offset voltage and output offset voltage of Op-amp IC741	EEH307-4
10.	Test the performance of Inverting Amplifier using op-amp IC741	EEH307-5
11.	Test the performance of Non Inv. Amplifier using op-amp IC741	EEH307-5
12.	Test the performance of Adder using op-amp IC741	EEH307-5
13.	Test the performance of Subtractor using op-amp IC741	EEH307-5
14.	Verify the truth table of Basic Logic Gates: NOT, OR, AND Gates	EEH307-6
15.	Verify the truth table of Universal Logic Gates: NOR, NAND Gates	EEH307-6
16.	Verify the truth table of Special Gates: X-OR, X-NOR Gates	EEH307-6

II) Theory

Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	EEH307-1. Examine and use various types of amplifiers		
1	**Amplifiers** 1.1 Load line- DC Load Line	**8**	**12**

	1.2 Q Point 1.3 Transistor Biasing Methods-Listing only 1.4 Types of amplifiers: Single stage and multistage Amplifiers 1.5 **Single stage CE amplifier**. 1.5.1 Circuit Diagram 1.5.2 Working (Function of each component) 1.5.3 Input Output Waveform 1.5.4 Frequency response and bandwidth 1.5.5 Applications 1.6. Types of coupling in multistage amplifiers 1.7 Circuit diagram ,working and applications of Multistage RC Coupled CE amplifier and direct/ transformer coupled amplifier.		
	EEH 307-2.Use different sinusoidal oscillators and multivibrators in electronic circuits.		
2	**Oscillators and multivibrators** Basic of Oscillator(IKS) 2.1 Need of oscillators 2.2 Barkhausen Criteria 2.3 Classification of oscillator **2.4 Transistor circuit ,working, frequency Formula of following oscillators:-** 2.4.1 RC-phase shift oscillator 2.4.2 Colpitts oscillator 2.4.3 Hartley oscillator 2.4.4 Crystal Oscillator 2.5 **IC 555**: Features, pin out, block diagram and specification. 2.6 IC 723 voltage regulator **2.7 Operations of following with circuit diagram and relevantformula, associated waveforms** 2.7.1 555 as monostable multivibrator 2.7.2 555 as astable multivibrator	**8**	**12**
	EEH307-3 Illustrate the use of different regulated power supplies		
3	**Regulated Power Supply** 3.1 Block diagram of Regulated powers supply. 3.2 Load and Line Regulation 3.3 Types of IC voltage regulator-Fixed and Variable voltage regulator **3.4 IC 78xx & IC 79xx series of voltage regulators** 3.4.1 Features 3.4.2 Pin diagram 3.4.3 Practical example with IC such as7805,7812	**6**	**10**
	Sub-total	**22**	**34**

Section –II

	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	EEH307-4: Use op-amp in linear electronic circuits		
4	**Basics Of Operational Amplifier** Need of Operational amplifier(IKS) 4.1 Block diagram of OP-Amp: 4.1.1 Input Stage 4.1.2 Intermediate Stage 4.1.3 Level Shifting Stage 4.1.4 Output Stage 4.1 Op-Amp IC-741 pin diagram and function. 4.2 Equivalent Circuit, Circuit Symbols And Terminals 4.3 Ideal OP-AMP and transfer curve 4.4 Electrical parameters of 741: Input offset voltage, Input offset current, Input bias current, Input capacitance, Input voltage range, CMRR, Large signal voltage gain, Output voltage swing, Output resistance, Power consumption, Slew rate	**8**	**12**
	EEH307-5: Examine and Use various configuration of op-amp for different industrial applications		
5	**Op-Amp Configuration and Feedback Amplifiers** 5.1 Open Loop and closed loop configuration of op-amp comparison **Circuit Diagram, operation, Equations and derivation for output for following:-** 5.2 Open loop configuration – Inverting ,Non-inverting 5.3 Close loop configuration – Inverting, non-inverting, 5.4 Voltage follower, Inverter (Sign changer) 5.5 Inverting and non-inverting configuration of Adders (summing amplifier, scaling Amplifier, averaging amplifier) 5.6 Substractor 5.7 Basic Integrator 5.8 Basic Differentiator	**8**	**12**
	EEH307-6:Use Boolean arithmetic, laws and data converters as per need of industrial application		
6	**Binary arithmetic and digital logic gates:** 6.1 Decimal, Binary, Hexadecimal number system 6.2 Conversion: Decimal to Binary, Binary to Decimal, Decimal to Hexadecimal, Hexadecimal to	**7**	**12**

	Decimal, Binary to Hexadecimal and Hexadecimal to Binary. 6.3 Boolean Laws and A/D converter. 6.4 **Binary arithmetic:** Binary addition and subtraction, with simple numerical 6.5 Subtraction using 1's compliment and 2's compliment method with simple numerical 6.6 Basic Logic Gates: NOT, OR, AND (symbol and truth table) 6.7 Universal Logic Gates: NOR, NAND (symbol and truth table) 6.8 Special Gates: X-OR, X-NOR Gates (symbol and truth table)		
		23	**36**

G.LIST OF MICRO-PROJECTS UNDER SLA

a) Construct doorbell using transistor

b) Using transistor construct clap switch

c) Construct small signal amplifier using transistor.

d) Water level indicator

e) IC based Simple Regulated Variable Power Supply

f) Flashing Lamps using 555 Timer

g) Build sound sensor circuit IC 741 and microphone

h) Build Clamp switch using IC741

i) Build shadow sensor circuit using IC741

j) Develop tone generator using IC555

k) Develop PWM LED Dimmer/Brightness control using IC555

l) Small Hobby project using Digital IC

G. SPECIFICATION TABLE FOR SETTING QUESTION PAPER FOR SEMESTER END THEORY ASSESSMENT

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	Amplifiers	4	4	4	12	EEH307-1
I / 2	Oscillators and multi-vibrators	4	4	4	12	EEH307-2
I / 3	Regulated Power Supply	4	2	4	10	EEH307-3
II /4	Basics Of Operational Amplifier	4	4	4	12	EEH307-4
II /5	Op-Amp Configuration and Feedback Amplifiers	4	4	4	12	EEH307-5

II / 6	Binary arithmetic and Digital Logic Gates	4	4	4	12	EEH307-6
Total Marks		24	22	24	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	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Discipline and punctuality	05
TOTAL		**25**

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
TOTAL		**25**

I. INSTRUCTIONAL METHODS:

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

J. TEACHING AND LEARNING RESOURCES:

Chalk board, LCD presentations, Demonstrative kits, Demonstrative charts

K. REFERENCE BOOKS:

Sr. No.	**Name of Book**	**Author**	**Publication**
1.	Principles of Electronics	V. K. Mehta	S.Chand

2.	Basic Electronics	B. L. Theraja	S.Chand
3.	A text book of Applied Electronics	R.S.Sedha	S.Chand
4.	Linear Integrated Circuits	Ramakant Gaikwad	Prentice Hall, 2000
5.	Digital Principles and Applications:	Malvino and Leach	McGraw Hill
6.	Applied Electronics	G. K. Mithal	Khanna Publication
7.	Electronics Devices & Circuits	A. Motershed	PHI Publication
8.	Electronics Principles	Malvino	McGraw Hill
9.	Modern Digital Circuits	R P Jain	McGraw Hill

L. TEXT BOOKS

Sr. No	Name of Book	Author	Publication
1	Principles of Electronics	V. K. Mehta	S.Chand
2	Basic Electronics	B. L. Theraja	S.Chand
3	A text book of Applied Electronics	R.S.Sedha	S.Chand
4	Linear Integrated Circuits	Ramakant Gaikwad	Prentice Hall, 2000
5	Digital Principles and Applications:	Malvino and Leach	McGraw Hill
6	Applied Electronics	G. K. Mithal	Khanna Publication
	Electronics Devices & Circuits	A. Motershed	PHI Publication

M. LEARNING WEBSITE & SOFTWARE

i) www.nptel.iitm.ac.in
ii) www.datasheetcafe.com
iii) www.learningaboutelectronics.com
iv) www.radio-electronics.com
v) www.bis.org.in
vi) www.electrical4u.com
vii) www.cadsoft.io
viii) www.electronics-tutorials.com

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Government Polytechnic Kolhapur

Learning and Assessment Scheme for Post S.S.C Diploma Courses

Programme Name	**: Diploma In Electrical Engineering**		
Programme Code	**: EE**	**With Effect From Academic Year**	**: 2025-26**
Duration Of Programme	**: 6 Semesterr**	**Duration**	**: 15 WEEKS**
Semester	**: Forth**	**Scheme**	**: MPECS 2023**

Sr No	Course Title	Abbreviation	Course Type	Course Level	Course Code	Total IKS Hrs for Sem.	Learning Scheme					Credits	Assessment Scheme											
							Actual Contact Hrs./Week			Self Learning(Activity/ Assignment /Micro Project)	Notional Learning Hrs/Week		Paper Duration (hrs.)	Theory				Based on LL&TL Practical				Based on Self Learning		Total Marks
							CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
														Max	Max	Ma	Mi	Max	Min	Max	Min	Max	Min	
1	Environmental Edu. & Sustainability	HEES	VEC	2	CCH206	2	2			2	4	2	1.5	30*#	70*#	100	40					25	10	125
2	Electrical Estimation and Contracting	HEEC	DSC	3	EEH308	2	4		4		8	4	3	30	70	100	40	25	10					125
3	Power Electronics	HPET	SEC	3	EEH309	1	4		2		6	3	3	30	70	100	40	25	10	25#	10			150
4	Energy Conservation & Audit	HECA	DSC	3	EEH310	2	4		2	2	8	4	3	30	70	100	40	25	10	25#	10	25	10	175
5	Rotating Machine-1(DC & IM)	HRM- 1	DSC	3	EEH311	2	4		4		8	4	3	30	70	100	40	25	10	25#	10			150
6	Utilization of Electrical Energy	HUEE	DSC	3	EEH312	2	4		2		6	3	3	30	70	100	40	25	10	25#	10			150
Total						11	22		14	4	40	20		180	420	600		125		100		50		875

Abbreviations:CL-ClassroomLearning,TL-TutorialLearning,LL-LaboratoryLearning,FA-FormativeAssessment,. SA-SummativeAssessment,IKS-IndianKnowledgeSystem,SLA-SelfLearningAssessment

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.*15Weeks
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.

Course Category: Discipline Specific Course Core(DSC): 3,DisciplineSpecificElective (DSE):0,ValueEducation Course(VEC):1, Intern./Apprenti./Project./Community(INP):0,AbilityEnhancementCourse (AEC) : 1, Skill Enhancement Course (SEC) : 2, Generic Elective (GE) : 0

COURSE TITLE : ENVIRONMENTAL EDUCATION AND SUSTAINABILITY

COURSE CODE :CCH206

COURSE ABBREVIATION :HEES

A.LEARNING SCHEME:

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

A. ASSESSMENT SCHEME:-

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

IKS Hours=02

A. ABREVIATION:-

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.

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

b. 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.

c. 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.

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

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

f. * 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)

B. 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

C. 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.

Course outcomes and programme outcomes/ programme specific outcomes(CO- PO/PSO) matrix

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

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										

D. CONTENT

I. PRACTICAL EXCERSISES:-

…….Not Applicable…….

II. THEORY 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	**CCH206.1** 1.1 Explain the need of studying environment and its components. 1.2 Investigate the impact of population growth and industrialization on the relevant environmental issues and suggest remedial solutions 1.3 Explain the Concept of 5 R w.r.t. the given situation 1.4 elaborate the relevance of Sustainable Development Goals in managing the climate change 1.5 Explain the concept of zero carbon-footprint with carbon credit	**Unit - I Environment and climate change** 1.1 Environment and its components, Types of Environments, Need of environmental studies 1.2 Environmental Issues- Climate change, Global warming, Acid rain, Ozone layer depletion, nuclear accidents. Effect of population growth and industrialization 1.3 Concept of 5R, Individuals' participation in i) 5R policy, ii) segregation of waste, and iii) creating manure from domestic waste 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 1.5 Zero Carbon footprint for sustainable development, (IKS-Enviornment conservation in vedic and pre-vedic India)	Lecture Using Chalk-Board Presentations
2	**CCH206.2** 2.1 Justify the importance of natural resources in sustainable development 2.2 Explain the need of optimum use of natural resources to maintain the sustainability 2.3 Differentiate between renewable and non-renewable sources of energy 2.4 Suggest the relevant type of energy source as a green solution to environmental issues	**Unit - II Sustainability and Renewable Resources** 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) 2.2 Impact of overexploitation of natural resources on the environment, optimum use of natural resources 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 2.4 Green Solutions in the form of New Energy Sources such as Hydrogen energy, Ocean energy & Tidal energy	Lecture Using Chalk-Board Presentations
3	**CCH206.3** 3.1 Explain the characteristics and functions of ecosystem 3.2 Relate the importance of biodiversity and its loss in the environmental sustainability 3.3 Describe biodiversity assessment initiatives in India 3.4 Conduct the SWOT analysis of the biodiversity hot spot in India 3.5 Explain the need of conservation of biodiversity in the given situation	**Unit - III Ecosystem and Biodiversity** 3.1 Ecosystem - Definition, Aspects of ecosystem, Division of ecosystem, General characteristics of ecosystem, Functions of ecosystem 3.2 Biodiversity - Definitions, Levels, Value, and loss of biodiversity 3.3 Biodiversity Assessment Initiatives in India 3.4 SWOT analysis of biodiversity hot spot in India 3.5 Conservations of biodiversity - objects, and laws for conservation of biodiversity	Lecture Using Chalk-Board Presentations Video Demonstration

4	**CCH206.4** 4.1 Classify the pollution based on the given criteria 4.2 Justify the need of preserving soil as a resource along with the preservation techniques 4.3 Maintain the quality of water in the given location using relevant preventive measures 4.4 State the significance of controlling the air pollution to maintain its ambient quality norms 4.5 Compare the noise level from different zones of city with justification 4.6 Describe the roles and responsibilities of central and state pollution control board	**Unit - IV Environmental Pollution** 4.1 Definition of pollution, types- Natural & Artificial (Man- made) 4.2 Soil / Land Pollution – Need of preservation of soil resource, Causes and effects on environment and lives, preventive measures, Soil conservation 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 4.4 Air pollution - Causes, effects, prevention, CPCB norms of ambient air quality in residential area 4.5 Noise pollution - Sources, effects, prevention, noise levels at various zones of the city 4.6 Pollution Control Boards at Central and State Government level: Norms, Roles and Responsibilities	Lecture Using Chalk-Board Presentations
5	**CCH206.5** 5.1 Explain Constitutional provisions related to environmental protection 5.2 Explain importance of public participation (PPP) in enacting the relevant laws 5.3 Use the relevant green technologies to provide sustainable solutions of an environmental problem 5.4 Explain the role of information technology in environment protection	Unit – V- Environmental legislation and sustainable practices 5.1 Article (48-A) and (51-A (g)) of Indian Constitution regarding environment, Environmental protection and prevention acts 5.2 Public awareness about environment. Need of public awareness and individuals' participation. Role of NGOs 5.3 Green technologies like solar desalination, green architecture, vertical farming and hydroponics, electric vehicles, plant-based packaging 5.4 Role of information technology in environment protection and human health	Lecture Using Chalk-Board Presentations Video Demonstrations

E. 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 . 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 /Micro project/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 relavance 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 judicial 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.

F. 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
Grand Total				**30**	**20**	**24**	**26**	**70**

G. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Nil	All

H. 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)/Micro project/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 micro projects , assignments and similar activities using proforma 1 marks of SLA can be calculated.

I. 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 Enviornmental science	APH Publishing New Delhi (ISBN 978-8176485906)

J. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://sdgs.un.org/goals	United Nation's website mentioning Sustainability goals
2	http://www.greenbeltmovement.org/news-and-events/blog	Green Belt Movement Blogs on various climatic changes and other issues
3	http://www.greenbeltmovement.org/what-we-do/tree-planting-fo r-watersheds	Green Belt Movement's work on tree plantation, soil conservation and watershed management techniques
4	https://www.youtube.com/@ierekcompany/videos	International Experts For Research Enrichment and Knowledge Exchange – IEREK's platform to exchange the knowledge in fields such as architecture, urban planning, sustainability
5	www.mahayouthnet.in	UNICEF Intiative for youth leadership for climate action
6	https://eepmoefcc.nic.in/index1.aspx?lsid=297&lev=2&lid=1180&langid=1	GOI Website for public awareness on enviornmetal issues
7	https://egyankosh.ac.in/handle/123456789/61136	IGNOU's Intiative for online study material on Enviornmental studies
8	https://egyankosh.ac.in/handle/123456789/50898	IGNOU's Intiative for online study material on sustainability
9	https://sustainabledevelopment.un.org/content/documents/11803Official-List-of-Proposed-SDG-Indicators.pdf	Final list of proposed Sustainable Development Goal indicators
10	https://sustainabledevelopment.un.org/memberstates/india	India's Strategies to progress across the SDGs.
11	https://www.un.org/en/development/desa/financial-crisis/sustainable-development.html	Challenges to Sustainable Development
12	https://nptel.ac.in/courses/109105190	NPTEL course on sustainable development
13	https://onlinecourses.swayam2.ac.in/cec19_bt03/preview	Swayam Course on Enviornmetal studies (Natural Resources, Biodiversity and other topics)
14	https://onlinecourses.nptel.ac.in/noc23_hs155/preview	NPTEL course on enviornmental studies which encomopasses SDGs, Pollution, Cliamate issues, Energy, Policies and legal framework
15	https://www.cbd.int/development/meetings/egmbped/SWOT-analysis-en.pdf	SWOT analysis of Biodiversity
16	https://www.sanskrit.nic.in/SVimarsha/V2/c17.pdf	Central sanskrkit university publication on Vedic and pre vedic enviornmetal conservation

Note : Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students

COURSE NAME : ELECTRICAL ESTIMATION & CONTRACTING.
COURSE CODE : EEH 308.
COURSE ABBREVIATION : HEEC.

A. LEARNING SCHEME:

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	04	4
	Tutorial Learning	--	
	Laboratory Learning	04	
	SLH-Self Learning	--	
	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(Oral)				
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
03	**30**	**70**	**100**	**40**	**25**	**10**			**…**	**…**	**125**

(Total IKS Hrs for Sem**. : 2** 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 On line 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.*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:-

Diploma Electrical Engineers need to be well conversant in the field of maintaining Electrical supply systems in Domestic, Commercial & Industrial units. This field is an ever changing one with new advancements coming up. This course will enable them to carry out
the different activities such as contracting, & executing the works needed for the same.
This course will empower the students with the necessary principles of planning, Follow electrical by laws, supply system and method of installations.

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. Able to do design, read & draw electrical layout, related calculations and selection of material used to execute aesthetical electrical installation work with the necessary principles of planning, electrical safety & important bylaws.

D.COURSE LEVEL LEARNING OUTCOMES (CO'S):

Course outcomes:

EEH 308 -1 Apply the rules of IE-1962 & NEC-2011 electrical safety.
EEH 308-2 Prepare electrical Installation schemes, design & Estimate for Residential Building.
EEH 308-3 Prepare electrical Installation scheme, design & Estimate for Commercial Building.
EEH 308-4 Prepare electrical Installation scheme, design & Estimate for small scale industry.
EEH 308-5 Carry out testing of electrical wiring Installation.
EEH 308-6 Prepare valid contract & tender documents for execution of electrical Installation works.

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"

Program outcomes → / Competency Course Outcomes ↓	PO 1 Basic & Discipline knowledge	PO 2 Problem analysis	PO 3 Design development of solution	PO 4 Engineering Tools, Experimentation & testing	PO 5 The engineering practices for society, Sustainability & Environment	PO 6 Project management	PO 7 Life long learning	PSO1 Maintain various types of Electrical equipment	PSO2 Maintain various sections of Electrical power systems
Able to Design, Install & Maintain Electrification Systems used in Domestic, Commercial & Industrial units.	3	…	3	2	3	2	3	3	1
EEH 308 -1 Apply the rules of IE-1962 & NEC-2011 electrical safety.	3	…	…	…	3	1	3	2	1
EEH 308-2 Prepare electrical Installation schemes design, Estimate for Residential Building.	3	…	2	2	3	1	3	2	1

EEH 308-3 Prepare electrical Installation system Estimate for Commercial Building.	3	…	…	1	3	…	1	2	1
EEH 308-4 Prepare electrical Installation system Estimate for small scale industry.	3	…	2	2	3	1	3	2	1
EEH 308-5 Carry out testing of electrical wiring Installation.	3	…	…	2	3	1	3	2	0
EEH 308-6 Prepare valid contract & tender documents for execution of Electrical Installation works.	3	…	…	1	3	…	1	2	1

E. CONTENT:-

I. Practical exercises

The following practical exercises shall be conducted in the *Laboratory for Electrical estimation and costing 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
01	Study of Electrical symbols, Tools & accessories used in wiring,	1. To remember Electrical symbols, Tools & accessories used in wiring.	EEH 308-1
02	Study and follow of IE rules, NEC codes of practices in wiring installation.	1. To follow IE rule in wiring installation. 2. Applying Safety rule. 3. Clearances in installation. 4. Earthing necessity	
03	Basic wiring circuits single line diagram, wiring diagram in details.	1. Practice of preparing single line diagram, wiring diagram.	
04	a) Study & enlist Purpose & Essential elements of Estimation & Costing, b) Qualities of good Estimator.	1. Able to follow essential elements for 'Estimation & Costing'. 2. Able to achieve qualities for good Estimator.	
05	a) Selection of rating of fuse, DP main switch, MCB, ELCB, RCCB, Wiring of Meter board, distributions board. b) Selection of types wires, cables & accessories.	1. Able to decide rating of wire, Meter, MCB, ELCB, RCCB, 2. Able to select rating for Meter, cut out, MCB's in distributions board. 3. Able to select rating cables & accessories etc.	EEH 308-2
06	EXAMPLE: a) Design electrical wiring Installation scheme for a given constructional plan of 1BHK flat/	1. Practice of solving example independently by each student. 2. To read the constructional plan of a Flat/Bungalow/house.	

	bungalow /House. b) Prepare estimation and costing report. **c)** Draw wiring diagram and single line diagram	3. Marking of positions of main boards and sub main boards and all points in layout. 4. Practice to calculate the length of wire Casing capping & accessories with simple assumptions. 5. Preparing material schedule & preparing of cost estimation & report. 6. To draw the wiring & single line diagram using AUTOCAD	
07	IE rules & guidelines for commercial wiring installation selection of rating of main switch, MCB, ELCB, RCCB, distributions board and type's wires, cables & accessories.	1. To decide f rating of wire, Meter, MCB, ELCB, RCCB, 2. To select rating for Meter, cut out, MCB's in distributions board. 3. To select rating cables & accessories etc.	
08	Mounting and positioning of Main switchboards, distribution boards, main switches, bus bar chamber, Sub main distribution board.	1. Able to decide mounting scheme. 2. Able to fix mounting clearances.	
09	a) Design electrical Installation scheme for a school of 2 story, contains 20 class room, Principles room, Office, Store room, Guest room, Teachers room, Lady teachers room of size 20'*20'each one, Gents, Ladies Washroom of size 30'*20', with corridor & Veranda. b) Prepare estimation and costing report. c) Draw wiring diagram and single line diagram.	1. Practice of solving example independently by each student. 2. Able to read the constructional plan of a Flat/Bungalow/house. 3. Marking of positions of main boards and sub boards and all points in layout. 4. Practice to calculate the length of wire Casing capping & accessories with simple assumptions. 5. Preparing material schedule & preparing of cost estimation & report. 6. To draw the wiring & single line diagram using AUTOCAD	EEH 308-3
10	To study types of motor & load current calculations. as per type of SSI unit [1 phase & 3 phase]. Their accessory and its ratings.	1. Knowing various types of electric motor, their accessory used in industry. 2. Load current calculations practice. 3. Fixing the rating of relay & their relay's trip current setting.	
11	Design and selection of rating switchboards, distribution boards, main switches, bus bar chambers, cables, Earting systems and plate/pipe, wire.	1. Students are able to decide scheme of installation. 2. Able to select accessory, material and decide required specification.	EEH 308-4
12	Mounting and positioning of accessory, Laying of cables in cable trench, Cable clamping on wall cable tray.	2. Students are able to decide mounting scheme. 2. Knowing mounting clearances. 3. various procedures of cable laying, & on wall fitting, Student will be knowing Trenches, cable trays & their sizes,	

13	a) Design consideration of Electrical Installation in small scale Industry, Agriculture pump set, Saw mill, Flour mill, Machine workshop of Lathes & other machines. b) Prepare estimation and costing report. c) Draw wiring diagram and single line diagram	1. To decide & mark the positions of main switch boards and sub boards and all motors, operating control panels. 2. To fix the line of laying of cable. 3. Calculating the length of cable. 4. Costing of Earthing & measurement of earth wire. 5. To prepare schedule of material & cost estimation. 6. To Draw of single line diagram using AUTOCAD	
14	Consideration of various types Protections systems, Earthing system for commercial & small scale industry.	1. To select protection schemes using MCB, ELCB, RCCB, Overload relay protection, Earth fault protection, Fire alarm system 2. Types of Earthing and their material. 3. Earthing practices in substations.	
15	To study testing procedures, handling testing equipments, and preparation of reports for wiring installation work.	1. To follow testing procedures. 2. Able to select apparatus of testing of wiring. 3. Practice of test report writing.	EEH 308-5
16	Prepare a test report after testing an electrical installation system.	Testing procedures for installation as per IS	
17	Prepare a tender notice& sample bill for electrical works.	1. Prepare work specifications, 2. Completion reports. 3. Relevant documents for type of billing.	EEH 308-06

II] Theory:

Section I

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
EEH308-1 Apply the rules of Electrical estimation.			
1	**Elements Of Estimating** General rules(IKS) 1.1 IE Rules: IE rules related to electrical wiring installation 1.2 Essential Elements &Purpose of Estimation & Costing. 1.3 Qualities of good Estimation.	08	08
EEH308-2 Prepare Electrical Installation system Estimate for Residential Building			
2	**Residential Building Electrification** 3.1 Old building Electrification (IKS) 3.2 Rating, Clearances, Quality of material & Safety practices. 3.3 Electrical load & load current calculations. 3.4 Principles of circuit design in lighting and power circuits. 3.5 Electrical rating selection: Cutout, Energy meter, Main switches, Wires & Accessories, Earthing provisions. 3.6 Preparing wiring &single line diagram. 3.7 Sequence of procedure for material schedule & cost estimate. 3.8 Examples on wiring & cost estimation for 1RK & 1BHK flat.	12	12
EEH308-3 Prepare Electrical Installation system Estimate for Commercial Building			
3	**Electrification of commercial Installation** 3.1 General idea of layout of commercial building e.g. School, Library hall, Bank, Office, Auditorium, Shopping mall, Cinema theatre. 3.2 Design considerations & guidelines for electrical Installation system in commercial building. 3.2.1 Nature of supply, Electrical load & load current calculations, 3.2.2 Mounting and positioning of Mains switch board – Cut out, Energy meter, Main & Sub-main, MCB Distribution board, ELCB/RCCB Protections, Earthing provision. 3.2.3 Cable laying, Lighting & Power circuits, Sample wiring their single line diagram 3.3 Sequence of procedure for material schedule & cost estimate. 3.4 Examples on wiring & cost estimation for any two types of commercial building [Refer above list].	10	14
		30	34

Section II

Sr. No.	Topics / Sub-topics	Lectures (Hours)	Theory Evaluation (Marks)
EEH308-4Prepare Electrical Installation system Estimate for small scale industry			
4	**Electrification of small scale industry unit** [Max Load 50kw] 4.1 Types of motors for industry, Motor load current calculations. [1 phase & 3 phase] 4.2 Design consideration guidelines of Electrical Installation in small Industry e.g. Agriculture pump set, Saw mill, flour mill, Machine workshop of Lathes & other machines. 4.2.1 Calculation & selection of rating of service main, Wire/Cable sizes, Bus bar chamber, TPN-MCCB, ELCB. Fuse, Starter, Relay ratings &protection setting, 4.2.2 Mounting and positioning of switchboards, distribution boards, main switches, bus bar chambers, Control panel, Cable trench, Clamping, Cable tray. Protections, Earthing, 4.2.3 Deciding the cable route, length of wire / cable, conduit, Earthing provision, Connection of earth wire to machines. 4.6 Motor wiring/cable layout diagram. Single line diagram. 4.7 Sequence of procedure for material schedule &costing. 4.8 Examples on electrification & cost estimation for any two types of industry units. [Refer above list].	15	18
EEH308-5 Carry out testing of Electrical wiring Installation			
5	**Testing of Electrical installation.** 5.1 General practice of testing(IKS) 5.2 Testing necessity and basic procedure. 5.3 Testing equipment's for electrical installation. 5.4 Testing of wiring Installation for verification of Earthing, insulation resistance and continuity as per IS & NEC.	06	08
EEH308-6 Prepare valid contract & tender documents for execution of electrical installation works.			
6	**Contracting, Tendering** 6.1. Types of contracts, contractors. 6.2 Valid Contracts, Contract documents. 6.3 Tender and tender notices. 6.4 Procedure for submission and opening tenders. 6.5 Comparative statements, criteria for selecting contractors, General conditions in order form. 6.6 Principles of Execution of works 6.7 Administrative approval, Technical sanctions. 6.8 Billing of executed work. 6.9 Tendering process(IKS) 6.10 E-tendering: Need, Procedure, Advantage & Disadvantage.	09	10
	Total	30	36

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

E. LIST OF ASSIGNMENTS UNDER SLA

…….Not Applicable……

F. 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	Elements Of Estimating	04	04	….	EEH308-1	08
2	Residential Building Electrification	04	04	04	EEH308-2	12
3	Electrification of commercial Installation	04	04	06	EEH308-3	14
4	Electrification of small scale industry unit	04	06	08	EEH308-4	18
5	Testing of Installation	02	02	04	EEH308-5	08
6	Contracting, Tendering	06	04	….	EEH308-6	10

G. 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
TOTAL		**25**

ii) Summative Assessment of Practical/Oral :

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

Sr. no	**Criteria**	**Marks allotted**
1	Knowledge about the course practical	05
2	Punctuality for practical /Oral	05
3	Neat& complete Diagram/Write up-Hand writing	05
4	Observations/Handling of instrument/ Communication/Presentation	05
5	Oral Based on Lab work and completion of task	05
TOTAL		**25**

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 BOOK

Sr. No.	Author	Title	Publisher
1.	K.B. Raina S.K. Bhattacharya	Electrical Design; Estimating and costing	New Age International (p) Limited, New Delhi
2.	Surjit Singh	Electrical Estimating and costing	Dhanpat Rai and company, New Delhi
3	B.D.Arora	Electrical wiring, Estimating and costing	R.B. Publication, New Delhi
3.	N. Alagappan S. Ekambaram	Electrical Estimating and costing	Tata McGraw Hill Publication, New Delhi
4.	S.L. Uappal	Electrical wiring Estimating and costing	Khanna Publication

M.LEARNING WEBSITE & SOFTWARE

1. IE Rules, NEC2011 eBook, PPT, pdf's, Handbook.
2. Websites:
   i. http://www.bestestimatepro.com/
   ii. bieap.gov.in/estimatingandcosting.pdf
   iii. http://indiacatalog.com/web_directory/electrical/electrical.html
   iv. http://www.nptel.ac.in
   v. http://www.howstuffworks.com
   vi. http://www.electricaltechnology.org

***

Course Name : Power Electronics
Course Code : EEH309
Course Abbreviation : HPET

A. LEARNING SCHEME:

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	04	3
	Tutorial Learning		
	Laboratory Learning	02	
	SLH-Self Learning	-	
	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	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
03	**30**	**70**	**100**	**40**	**25**	**10**	**25#**	**10**	**-**	**-**	**150**

(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 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.

D. i) RATIONALE:

Power electronics finds extensive applications in domestic, commercial, industrial front and electric utilities particularly in terms of efficient conversion, control and conditioning of electric power from its available input into the desired electrical output form. This course will enable the

diploma students to develop the knowledge and skill sets of operating and testing different power electronic devices and their applications

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:

Test the performance of power electronic devices and circuits.

E. COURSE LEVEL LEARNING OUTCOMES (COS)

COURSE OUTCOMES:

EEH309-1 Test the functionality of a given power electronic device.
EEH309-2 Test the switching performance of a thyristor.
EEH309-3 Test the performance of given inverter.
EEH309-4 Test the performance of given controlled rectifier.
EEH309-5 Test the performance of given chopper.
EEH309-6 Use suitable power electronic circuit for given application.

COURSE OUTCOMES AND PROGRAMME OUTCOMES (CP-CO-PO) MATRIX

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

PO →	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2
CO	**Basic and Discipline specific knowledge**	**Problem Analysis**	**Design / Development of solutions**	**Engineering Tools, Experimentation and Testing**	**Engineering Practices for society, sustainability and Environment**	**Project Management**	**Life long Learning**	**Maintain various types of electrical equipments**	**Maintain various sections of electrical power systems**
EEH309-1	2	1	-	1	-	-	2	1	2
EEH309-2	2	1	-	1	-	-	1	1	2
EEH309-3	2	2	1	2	-	-	1	1	3
EEH309-4	2	2	1	2	-	-	1	1	3
EEH309-5	2	2	1	2	-	-	1	1	3
EEH309-6	1	2	-	-	1	1	1	1	1

F. CONTENT:
I) Practical Exercises

The minimum 80 percent of following practical exercises shall be conducted in the *laboratory for Power Electronics developed* by the Institute in practical sessions of batches of about 20- 22 students:

Sr. no	Practical exercises	Course outcome
1	Identify given power electronic device	EEH309-1
2	Test the performance of SCR.	EEH309-1
3	Test the proper functioning of the IGBT.	EEH309-1
4	Test the effect of variation of resistance in R triggering circuit on the firing angle of SCR.	EEH309-2
5	Test the effect of variation of resistance and capacitance in RC triggering circuit on the firing angle of SCR.	EEH309-2
6	Perform the operation of Class F commutation circuit.	EEH309-2
7	Measure output voltage of single phase half wave controlled rectifier by using CRO/DSO.	EEH309-4
8	Measure output voltage of single phase full wave controlled rectifier by using CRO/DSO.	EEH309-4
9	Measure output voltage of single phase full wave bridge inverter by using CRO/DSO.	EEH309-3
10	Measure the output voltage of step up chopper by varying duty cycle.	EEH309-5
11	Measure the output voltage of step down chopper by varying duty cycle.	EEH309-5
12	Perform speed control of fan using TRIAC.	EEH309-6

II) Theory:

Section-I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
EEH309-1 Test the functionality of a given power electronic device.			
1	**Power Electronic Devices** 1.1 Power electronic system: general block diagram, need, advantages and disadvantages. 1.2 Switching in power electronic circuit: Need and its importance; Ideal switch and practical switch: concept, general characteristics, conduction losses, switching losses. 1.3 SCR: Construction, working principle, Static V-I characteristics, switching characteristics, and applications. 1.4 IGBT: Construction, working principle, Static V-I characteristics, switching characteristics, and applications. 1.5 Power MOSFET: Construction, working principle, Static V-I characteristics, and applications. 1.6 TRIAC: Construction, working principle, Static V-I Characteristics, and applications. Ancient terminology in power electronics (IKS)	10	12
EEH309-2 Test the switching performance of a thyristor.			
2	**Protection and Firing Circuit of Thyristor** 2.1 di/dt protection: need, snubber circuit 2.2 dv/dt protection: need, snubber circuit 2.3 Overvoltage protection: need, internal & external overvoltage, voltage clamping device 2.4 Overcurrent protection: need, electronic crowbar circuit 2.5 Thermal Protection of SCR: Need, thermal resistance, and heat sink specification 2.6 Firing circuit: Features and general layout of firing scheme 2.7 SCR turn-on methods: forward voltage triggering, gate triggering, dv/dt triggering, temperature triggering, and light triggering 2.8 SCR Firing circuit: resistance firing circuit (no derivation), RC firing circuit (no derivation), pulse transformer based triggering 2.9 SCR commutation techniques: load commutation (Class A), line commutation (Class F)	14	16
EEH309-3 Test the performance of given inverter.			
3	**Inverter** 3.1 Inverters: concept of voltage source inverter and current source inverter. 3.2 Single phase half bridge inverter with R, RL load: Circuit diagram, working, input-output waveforms. 3.3 Single phase full bridge inverter with R, RL load: Circuit diagram, working, input-output waveforms. 3.4 Pulse width modulation: importance/need, types; Sinusoidal pulse width modulation: concept, working principle and waveforms.	06	06

Section II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	EEH309-4 Test the performance of given controlled rectifier.		
4	**Controlled Rectifier** 4.1 Basic terminologies: conduction angle, firing angle, output voltage, output current, voltage across switch, source current, source voltage 4.2 Single phase half controlled rectifier with R, RL load: Circuit diagram, working, input-output waveforms, derivation for average output voltage, equations for output currents, voltages & power, and effect of freewheeling diode, simple numerical for calculation of output power for constant current load. 4.3 Single phase full controlled bridge rectifier with R, RL load: Circuit diagram, working, input-output waveforms, derivation for average output voltage, equations for output currents, voltages & power, simple numerical for calculation of output power for constant current load. 4.4 Three phase full controlled bridge rectifier: working principle with R load, input-output waveforms, equations for average output voltage, output currents, voltages & power.	15	18
	EEH309-5 Test the performance of given chopper.		
5	**DC-DC Converters** 5.1 Basic terminologies: duty ratio, turn on period, turn off period, chopping period, 5.2 Control strategies of chopper: Constant frequency system, variable frequency system. 5.3 Step up chopper: circuit diagram, working, waveforms and output voltage equation – simple numerical for calculation of output voltage. 5.4 Step down chopper: circuit diagram, working, waveforms and output voltage equation – simple numerical for calculation of output voltage. 5.5 Buck-Boost chopper: circuit diagram, working, waveforms and output voltage equation – simple numerical for calculation of output voltage.	08	10
	EEH309-6 Use suitable power electronic circuit for given application.		
6	**Applications of Power Electronics** 6.1 Charge Controller: Concept, types, applications in Photovoltaic (PV) system with block diagram. 6.2 Speed control of ceiling fan using TRIAC: Working, Block Diagram, advantages. 6.3 AC to AC converter using DC link: Concept, applications in Wind Power Generation. 6.4 HVDC converter station: Concept,	07	08

	Circuit Diagram		

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

D. LIST OF SELF LEARNING ACTIVITY:

……Not Applicable……..

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

Section / Topic no.	Name of topic	Distribution of marks Cognitive base (level wise)			Total Marks	Course outcome
		Remember	Understand	Application		
I / 1	Power Electronic Devices	02	06	04	12	EEH309-1
I / 2	Protection and Firing Circuit of Thyristor	04	08	04	16	EEH309-2
I / 3	Inverters	02	04	00	06	EEH309-3
II / 4	Controlled Rectifiers	02	12	04	18	EEH309-4
II / 5	DC-DC Converters	02	04	04	10	EEH309-5
II / 6	Applications of Power Electronics	02	04	02	08	EEH309-6

a) **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 / analytical Skills	05
	Drawing / drafting skills	05
Affective	Discipline and punctuality	05
TOTAL		**25**

ii) **Summative Assessment of Practical/oral :**

At the time of Practical/oral 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
TOTAL		**25**

J.INSTRUCTIONAL METHODS:

a) Lectures and discussions.
b) Laboratory experiences and laboratory interactive sessions.
c) Time bound assignments

K.TEACHING AND LEARNING RESOURCES:

a) Chalk board
b) LCD presentations.
c) Demonstrative charts.

L.REFERENCE MATERIAL:

Sr.No	Title Of Book	Author	Publication
01	Power Electronics Handbook	Muhammad H. Rashid	Butterworth-Heinemann Inc, ISBN:9780128114070
02	Power Electronics	P S. Bimbhra	KHANNA PUBLISHERS, ISBN: 978-8174092793
03	Power Electronics: Devices, Circuits,and Applications	Muhammad H. Rashid	Pearson Education, ISBN:978-8120345317
04	Power Electronics	M D Singh, K B Khanchnadani	Mc. Gram Hill, ISBN:9780070583894

M.LEARNINGWEBSITES

a. https://nptel.ac.in/courses/108102145
b. https://nptel.ac.in/courses/108105066
c. https://nptel.ac.in/courses/108101038
d. https://ocw.mit.edu/courses/6-334-power-electronics- spring-2
e. 007/
f. https://youtube.com/playlist? list=PLSnw1KE0TFkVu05Ws0Ax143gZ YmxPMCoY&si=FWLw-jfnLxC_l-4j
g. https://www.youtube.com/playlist? list=PL4emuJKx0B8aREwkC5BE
h. Ow2OZ48puPyOG
i. https://3dcircuits.engineering.dartmouth.edu/powani.html

COURSE NAME : ENERGY CONSERVATION & AUDIT
COURSE CODE : EEH310
COURSE ABBREVIATION : HECA

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	THEORY				BASED ON LL&TL Practical/Oral				BASED ON SLA		TOTAL
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR(Oral)				
	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.: 02Hrs)

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

a. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
b. If candidate is not securing minimum passing marking FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
c. 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.
d. Notional Learning hours for the semester are(CL+LL+TL+SL)hrs.*15Weeks
e. 1(one) creditisequivalentto30Notionalhrs.
f. *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 pressure on the natural resources of energy such as water, coal, gas, wood and other fuels has lead to the increasing costs of energy around the world. Efficient and judicious use of the available energy would lead to the easing of such pressures and drastic decrease in the operating costs of the organizations and industries. Thus it is necessary to save and conserve energy to the maximum possible extent. The process of energy audit will help to identify the various possible avenues in which savings of energy can be effectively affected. This course makes the diploma holder well conversant in the techniques of energy conservation in the fields of engineering. It also introduces him to the energy audit procedures

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. Use environment friendly energy conservation techniques and assist in energy audits.

E. COURSE LEVEL LEARNING OUTCOMES (COS)

Course Outcomes:

EEH310.1 Identify and specify the basics of energy conservation.

EEH310.2 Implement energy conservation techniques in electrical machines devices /equipment.

EEH310.3 Implement energy conservation techniques in electrical power distribution system.

EEH310.4 Implement energy conservation techniques in electrical lighting systems.

EEH310.5 Use and Energy conservation through Cogeneration and Tariff.

EEH310.6 Carry out simple energy audits.

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** Maintain various types of electrical equipments	**PSO2** Maintain various sections of electrical power systems
Competency:. Use environment friendly energy conservation techniques and assist in energy audits.	1	-	3	1	1	2	1		
EEH310 -1 Identify and specify the basics of energy conservation	2	1	2	2	1	1	2	1	1
EEH310- 2 Implement energy conservation techniques in electrical machines devices /equipment	1	3	2	2	3	1	1	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** Maintain various types of electrical equipments	**PSO2** Maintain various sections of electrical power systems
EEH310-3: :.Implement energy conservation techniques in electrical power distribution system	-	3	2	2	1	-	1	3	1
EEH310-4Implement energy conservation techniques in electrical lighting systems	-	2	3	1	1	-	1	3	2
EEH310-5 Use and Energy conservation through Cogeneration and Tariff	1	2	2	1	2	-	1	2	2
EEH310 -6: Carry out simple energy audits	1	3	2	-	2	2	2	2	2

F. CONTENT:-

I)Practical exercises

The following practical exercises shall be conducted in the Energy conservation & Audit by the Institute in practical sessions of batches of about 20- 22 students:

Sr. no	Laboratory experiences	CO
1	To analyses Energy conservation building code 2007	EEH310-1
2	Identify star labelled electrical apparatus and compare the data for various star ratings	EEH310-1
3	Collect the information of various energy conservation equipment.(soft starter, Automatic star delta convertor, Variable Frequency Drives(VFD) Automatic power factor controller (APFC),Intelligent power factor controller (IPFC) ,Active harmonic filter(AHF)	EEH310-2
4	Collect the information of various energy conservation equipment (Maximum Demand Controller, kVAR Controller, Automatic Power factor Controller)	EEH310-3
5	Determine the reduction in power consumption by replacement of lamp in a classroom/ laboratory	EEH310-4
6	Determine the reduction in power consumption by replacement of Fans and regulators in a classroom/ laboratory	EEH310-4
7	Compare power consumption of tube light with electric choke, electronic ballast and also with LED lamps by direct measurements	EEH310-4
8	i) Visit a plant of cogeneration e.g. sugar industries , spinning mills , Heat processing unit ii) Prepare report on the cogeneration containing energy flow diagrams , economics and tariffs structure	EEH310-5

Sr. no	Laboratory experiences	CO
9	Collect electricity bill of an industrial consumer and suggest suitable tariff for energy conservation and its impact on energy bill.	EEH310-5
10	Collect electricity bill of a commercial consumer and suggest suitable tariff for conservation and reduction of its energy bill.	EEH310-5
11	Collect electricity bill of a residential consumer and suggest suitable means for conservation and reduction of the energy bill.	EEH310-5
12	Prepare a sample energy audit questionnaire for the given industrial facility	EEH310-6
13	Prepare an energy audit report for your classroom/office/seminar hall	EEH310-6
14	Find out energy conservation by applying different energy conservation techniques for existing distribution system in your campus	EEH310-6

I) Theory

Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	EEH310-1 Identify and specify the basics of energy conservation		
1	**Energy conservation basics:** 1.1 Classification of Energy: Primary and secondary energy, Commercial and non-commercial energy, Renewable and Non-renewable energy 1.2 Energy demand and supply, National scenario 1.3 Energy conservation and Energy audit; concepts and difference 1.4 Indian Electricity Act 2001; relevant clauses of energy conservation 1.5 Salient features of Electricity Act 2003 1.6 BEE and its Roles, 1.7 MEDA and its Roles 1.8 Star Labeling: Need and its benefits. 1.9 Review of various energy sources (IKS learing)	06	06
EEH310-2 Implement energy conservation techniques in electrical machines and devices/ equipment's			
2	**Energy Conservation in Electrical Machines** 2.1 Need for energy conservation in induction motor and transformer. 2.2 Energy conservation techniques in induction motor by i) Improving Power quality, ii) Motor survey, iii) Matching motor with loading, iv) Minimizing the idle and redundant running of motor, v) Operating in star mode. vi) Rewinding of motor, vii) Replacement by energy efficient motor,	14	16

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	viii)Periodic maintenance 2.3 Energy conservation techniques in Transformer. i) Loading sharing, ii)Parallel operation, iii) Isolating techniques, iv) Replacement by energy efficient transformers. v) Periodic maintenance 2.4 Energy Conservation Equipment: i) Soft starters, ii) Automatic star delta convertor, iii) Variable Frequency Drives(VFD) iv) Automatic power factor controller (APFC), v) Intelligent power factor controller (IPFC) vi) Active harmonic filter(AHF) 2.5 Energy efficient motor: significant features, advantages, applications and limitations 2.6 Energy Efficient Transformer: a) Amorphous core transformers, b) Epoxy resin cast transformers/ Dry type of transformer c) Specialty of cores and windings of such transformers. 2.7 Improving mechanical power transmission efficiency by VFD(IKS Learning) 2.8 specialty of cores and windings of such transformers (IKS Learning).		
EEH310-3: Implement energy conservation techniques in electrical power distribution system			
3	**Energy conservation in electrical distribution system** 3.1 Aggregated Technical and commercial given losses (ATC) in power system, Distribution losses at global, national and state level, 3.2 Commercial and technical losses, causes, remedies and measures to minimize. 3.3 Energy conservation techniques a. Controlling I^2R line losses. b. Optimizing distribution voltage. c. Balancing phase currents. d. Compensating reactive power flow. e. Using energy efficient transformers. 3.4 Energy conservation equipment: a) Maximum Demand Controller, b) kVAR Controller, Old method of energy conservation(IKS Learning)	10	12
		Total	34

Section –II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
EEH310-4 Implement energy conservation techniques in electrical lighting systems			
4	**Energy conservation in lighting system:** 4.1 Assessing existing lighting systems, adopts and replace with efficient light sources, light control gears, Motion detectors, etc. 4.2 Installation of separate transformer/ servo stabilizer for lighting, 4.3 Regular survey and adequate maintenance programs, 4.4 Energy Conservation techniques in fans , Electric regulator Electronic regulators etc	08	12
EEH310-5 Use and Energy conservation through Cogeneration and Tariff			
5	**Energy conservation through Co-generation and Tariff,** 5.1 concept of cogeneration and Tariff, significance for energy conservation , Co-generation 5.2 Types of cogeneration on basis of sequence of energy use (Topping cycle, Bottoming cycle) 5.3 Types of cogeneration basis of technology (Steam turbine cogeneration, Gas turbine cogeneration, Reciprocating engine cogeneration). 5.4 Factors governing the selection of cogeneration system. 5.5 Advantages of cogeneration 5.6 Tariff: Types of tariff structure: Special tariffs; Time-off-day tariff, Peak-off-day tariff, Power factor tariff, Maximum Demand tariff, Load factor tariff.(No numerical) 5.7 Application of tariff system to reduce energy bill	12	16
EEH310-6: Carry out simple energy audits			
6	**Energy audit :** 6.1 Energy audit (definition as per Energy Conservation act), Specific energy consumption. 6.2 Energy audit instruments and their use. 6.3 Questionnaire for energy audit projects, ABC analysis. 6.4 Energy flow diagram (Sankey diagram) 6.5 Simple payback period (Numericals) Energy Audit procedure (walk through audit and detailed audit). 6.6 Energy Audit report format.	10	08

	6.7 Advantages of energy audit		

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

G: LIST OF ASSIGNMENTS UNDER SLA

Sr.No	List of micro projects/Assignments (under SLA)	Hrs Allotted
1	Energy efficient lamps: Prepare comparative charts with ratings, cost and manufacturer details	02
2	Energy conservation campaign: Prepare charts/slogans to create energy conservation awareness while using fans and tube lights in polytechnic.	02
3	Market survey of available IOT devices and technology.	02
4	Energy conservation policies: Prepare report on energy conservation policies of Govt. Maharashtra 2017.	02
5	Energy Manager and Energy Auditor: Identify from available resources their roles and responsibilities.	02
6	Collect and record electrical audit reports from nearby industries and commercial units/offices	02
7	Visit the nearby installation to collect information, rating, cost, supplier and maintenance of Automatic Power Factor controller (APFC).	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	Energy conservation basics	02	04	-	06	EEH310-1
I / 2	Energy Conservation in Electrical Machines	04	08	04	16	EEH310-2
I / 3	Energy conservation in electrical installation system	04	04	04	12	EEH310-3
II /4	Energy conservation in lighting system	04	04	04	12	EEH310-4
II /5	Energy conservation in distribution systems	02	08	04	16	EEH310-5
II / 6	Energy audit	02	04	04	08	EEH310-6
					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
TOTAL		**25**

ii) Summative Assessment of Practical/oral :

At the time of Practical/oral 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
TOTAL		**25**

J. INSTRUCTIONAL METHODS:

a. Lectures cum Demonstrations,
b. Classroom practices.
c. 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	Energy management	Murphy W.R.	Butterworth-Heinemann Publications
2	Art of Reading Electricity bill	Talware Yogendra	DnyatavyaPrakashan
3	Energy Management	Singh,Sanjeev,Rathire,Unmesh	S.K.Kataria and sons , New Delhi ISBN-13: 9789350141014
4	Efficient Use and Management of electricity in industry	Desai, B.G ,Rana, J.S, S.A. Dinesh V Paraman,R	Devki Energy Consultancy Pvt.Ltd.
5	Energy	Chakrabarti , Amlan	e-books Kindle Editions

	Engineering And Management		
6	Guide books no.1 to 4 for National certification Examination for Energy managers and Energy Auditors	Bureau of Energy Efficiency (BEE)	Bureau of Energy Efficiency (A Statuory body under Ministry of Power Government Of India) (Fourth Editions 2015)
7	Energy Management Handbook	Turner W.C.	Fairmount Press,2012 ISBN: 978- 019560659
8	Principle Of Power System	Mehta V.K	S. Chand & Co. New Delhi,2016 ISBN: 978812190594
9	Industrial Energy Conservation	D.A.Ray.	Pergaman Press

M. LEARNING WEBSITE & SOFTWARE

1. Website of bureau of energy and efficiency :www.bee.india.nic.in
2. Website of Akshay Urja News Bulletin: www,mnesnicin
3. Notes on energy management on: www.energy management training.com
4. www.greenbusinss.com
5. www.worldenergy.org
6. Maharashtra Energy Development Agency (MEDA):wwwmahaurja.com

Course Name : Rotating Machine-1 (DC& IM).
Course Code : EEH311
Course Abbreviation : HRM-1

A. LEARNING SCHEME:

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	4	4
	Tutorial Learning	-	
	Laboratory Learning	4	
	SLH-Self Learning	-	
	NLH-Notional Learning	8	

B. ASSESSMENT SCHEME :-

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL Practical				BASED ON SLA		TOTAL
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR				
	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. : 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

a. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
b. 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.
c. 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.
d. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
e. 1(one) credit is equivalent to 30 Notional hrs.
f. * 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 knowledge of DC and AC machines including their characteristics is necessary for students of Electrical Engineering. The subject deals with the concepts, characteristics & applications of DC and AC machine.

A diploma holder has to work in various fields such as manufacturing industries, State Electricity boards, Power Generation Stations, etc. His work involves operation control and maintenance of electrical machines. He should therefore know the working principle, constructional features, and performance of DC machines AC machine.

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:

Use DC and AC machines for given application

E. COURSE LEVEL LEARNING OUTCOMES (COS)

EEH311-1 Identify the different parts along with materials in the d.c. machines
EEH311-2 Determine practically the performance characteristics of d.c. machines
EEH311-3 Select the relevant three phase induction motor**.**
EEH311-4 Determine the performance parameters using circle diagram
EEH311-5 Connect & use the proper device for starting & control of three phase induction motor**.**
EEH311**-**6 Interpret the single phase induction motor.

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** Maintain various types of electrical equipments	**PSO2** Maintain various sections of electrical power systems
EEH311-1	3	2	1	2	2	1	2	2	1
EEH311-2	3	1	-	1	2	-	1	1	-
EEH311-3	3	2	2	2	2	1	2	2	2
EEH311-4	3	1	1	1	2	1	2	2	1
EEH311-5	3	2	2	2	2	1	2	2	1
EEH311-6	3	1	2	2	1	1	1	-	

F. CONTENT:-

I. Practical exercises

The following practical exercises shall be conducted in the *Laboratory Rotating Machine 1 developed* by the Institute in practical sessions of batches of about 20- 22 students:

Sr. no	Laboratory experiences	CO
1	Dissemble/Assemble DC machines identifying the parts.	EEH311-1
2	Connect and run DC motor by using Three-point Starters.	EEH311-1
3	Plot Speed-Torque characteristics of a DC shunt motor.	EEH311-2
4	Plot curve for Speed control of DC shunt motor using Flux Control method.	EEH311-2
5	Plot curve for Speed control of DC shunt motor using Armature Voltage Control method.	EEH311-2
6	Load characteristic of D.C. series motor.	EEH311-2
7	Identify the different parts of 3-ϕ induction motors- Squirrel cage and Slip ring Induction motor.	EEH311-3
8	Reverse the direction of rotation of 3-ϕ induction motor.	EEH311-3
9	Conduct No-load and Blocked-rotor test on given 3-ϕ squirrel cage induction motor and plot the Circle diagram.	EEH311-4
10	Connect and run the motor with DOL starter	EEH311-5
11	Perform Direct loading test on given 1-ϕ induction motor.	EEH311-5
12	Connect and run the motor with Star-delta starter.	EEH311-5
13	Control the speed of given three phase induction motor using Auto-Transformer.	EEH311-5
14	Control the speed of given three phase induction motor using rotor resistance Starter.	EEH311-5
15	Control the speed of given three phase induction motor using pole changing method.	EEH311-5
16	Connect and run given single phase induction motor	EEH311-6

Note:- **All practical are compulsory.**

II) Theory

Section I

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
CO: EEH311-1: Identify the different parts along with materials in the d.c. machines			
1	**Ancient terms related to DC machine(IKS)** D. C. Machines 1.1 Constructional Features of D C Generator		

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
	1.2 Principle of Operation of D C Generator. 1.3 Classification of D C Generator 1.4 EMF Equation of Generator 1.5 Numerical on 1.4 1.6 Load characteristic (Terminal voltage & load current) 1.7 Applications of D C Generator.	8	10
CO: EEH311-2: Determine practically the performance characteristics of d.c. machines			
2	D. C. Motor 2.1 Principles of Operation of D C Motor 2.2 Classification of D C Motor- DC Shunt motor, DC series motor, DC compound motor, Brushless DC motor, 2.4 Concept of Back e.m.f. Voltage equation 2.5 Torque equation of D C Motor 2.6 Load characteristics of D.C. Shunt and D.C. Series motors (Torque & speed, Torque & Current) 2.7 Speed control of D C Series motor and DC shunt Motor (by Flux and armature control method) 2.8 Need of starter for D.C. Motor 2.9 3-Point Starter 2.10 Applications of DC motors 2.11 Losses & Efficiency in D C machines Numerical based on 2.7& 2.11	10	12
EEH311-3: Select the relevant three phase induction motor.			
3	Performance of 3 phase induction motor **Temple Engineering(IKS)** 3.1 Types of induction motor – Single phase & Three Phase 3.2 Working principle of 3 phase induction motor 3.3 Construction of 3 phase induction motor (Stator & Rotor) Squirrel cage induction motor & Slip ring induction motor 3.4 Various parts of 3 phase induction motor 3.5 Production of rotating magnetic field by 3 phase Supply in 3 phase winding. 3.6 Concept of Synchronous speed, actual speed & slip. 3.7 Concept of rotor frequency, rotor induce emf & power factor at starting & running condition. 3.8 Concept of starting torque, full load torque and maximum torque and relation between them. 3.9 Ratio of full load torque to maximum torque, full load torque to starting torque and starting torque to maximum torque. 3.10 Condition for maximum torque under starting and running conditions.	12	12

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
	3.11 Characteristics of slip torque of 3 phase induction motor. 3.12 Power flow diagram of an induction motor (Simple numerical on ratio of various powers) 3.13 Equivalent circuit of an induction motor 3.14 Induction motor as a generalized transformer (phasor diagram) 3.15 Reversal of three phase induction motor.		

Section –II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
EEH311-4: Determine the performance parameters using circle diagram.			
4	Circle Diagram 4.1 No load test & blocked rotor test 4.2 Concept of circle diagram- Series Rx and Parallel Rx branches 4.3 Construction of circle diagram 4.4 Numerical on circle diagram –To find current, power factor, rotor copper loss, rotor input, stator input, rotor efficiency , Motor efficiency at Full load condition. a) Maximum output condition b) Maximum torque condition. c) Rated Input condition.	12	14
EEH311-5: Connect & use the proper device for starting & control of three phase induction motor.			
5	Starting & Speed control of 3 phase induction motor **Ancient Indian Knowledge System Equivalent to speed control of Induction motor.(IKS)** 5.1 Necessity of starter 5.2 Types of starter a) D.O.L Starter b) Stator resistance Starter c) Auto transformer starter d) Star delta starter e) Rotor resistance Starter f) Soft starters. 5.3 Methods of speed control from a) Stator side – By changing supply voltage ,supply frequency & no. of poles. b) Rotor side – By changing rotor resistance, Effect of	14	16

	injection of emf in rotor circuit -cascade operation. 5.4 Applications of 3 phase induction motor a) Squirrel cage induction motor b) Slip ring induction motor		
EEH311-6: Interpret single phase induction motor			
6	Single Phase Induction Motor 6.1 Basic diagram and working of Single phase induction motor 6.2 Double field revolving theory. 6.3 Types of single phase Induction motor: Split phase, Capacitor Motor, Shaded Pole Motor.	04	06
Total		30	36

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

G. LIST OF ASSIGNMENTS UNDER SLA

……..Not Applicable……

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	D. C. Machines	02	04	04	10	EEH311-1
I / 2	D. C. Motor	02	06	04	12	EEH311-2
I / 3	Performance of 3 phase induction motor	04	04	04	12	EEH311-3
II /4	Circle Diagram	02	04	08	14	EEH311-4
II /5	Starting & Speed control of 3 phase induction motor	04	08	04	16	EEH311-5
II / 6	Single Phase Induction Motor	2	4	-	06	EEH311-6
	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
TOTAL		**25**

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
TOTAL		**25**

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
10	Electrical Technology Vol-II	Theraja B.L.	S. Chand, New Delhi, 2012 or latest
11	Electrical Machines	Deshpande M.V.	PHI Learning,, New Delhi, 2012 or latest
12	Electrical Technology	Uppal, S.L.	Khanna Publication, New Delhi, 2012 or latest
13	Electrical Machine	Nagrath I.J. and Kothari, D.P.	Tata McGraw Hill, New Delhi, 2012 or latest
14	Electrical Machine-I	Gupta, J. B.	S. K. Kataria& Sons, New Delhi, 2012 or latest
15	Electrical Machines	Ashfaq Hussain	Dhanpat Rai and Company, New Delhi
16	Electrical Machinery	Bimbhra P. S.	Khanna Publishers, New Delhi, latest edition
17	Electrical Machines	Bhattacharya S.K.	Tata Mc graw-Hill
18	The performance & design of a.c.machines	Say M.G.	CBS Publication

M. LEARNING WEBSITE & SOFTWARE

a. www.nptel.com/iitm/
b. www.howstuffworks.com/
c. www.virtual lab.com
d. www.sskphdmm.com
e. http://www.youtube.com/watch?v=RAc1RYilugI

COURSE NAME : UTILIZATION OF ELECTRICAL ENERGY.
COURSE CODE : EEH312.
COURSE ABBREVIATION : HUEE.

A. LEARNING SCHEME:

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

B. ASSESSMENT SCHEME :-

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Practical/Oral						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR(Oral)				
	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**. : 02** 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 On line Examination

a. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
b. 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.
c. 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.
d. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.*15Weeks
e. 1(one) credit is equivalent to 30 Notional hrs.
f. *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 Diploma electrical supervisor / technician is expected to maintain various heavy electric equipment in heating, welding, and drives systems. Their main job functions are to supervise the operation & control of various electrical drives, electrical furnaces, and electric utility equipments. In the present days of energy crisis, understanding this economics is important, not only for technician himself but also for social awareness. Hence he/ she should get acquainted with maintenance of such systems. This course deals with above job functions preparing the technicians to handle such heavy electrical energy equipment systems. Every diploma electrical engineer therefore should know to operate and maintain main electrical utilities for their efficient operations in domestic, commercial and industrial sector. The students will be able to make proper selection of equipment according to requirement to ensure economical and efficient use of electricity.

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:

Able to operate and perform maintenance of heavy electrical power utilization systems and equipments.

E. COURSE LEVEL LEARNING OUTCOMES (COS)

EEH312-1: Select & use illumination lights & system.
EEH312-2: Use & operate power factor improvement equipments.
EEH312-3: Maintain electric welding equipment.
EEH312-4: Select and use electric drives.
EEH312-5: Maintain electrical resistance heating system like oven. & induction heating system
EEH312-6: Maintain components of substation of Traction systems.

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"

Program outcomes → / Competency & Course Outcomes ↓	PO 1 Basic & Discipline knowledge	PO 2 Problem analysis	PO 3 Design development of solution	PO 4 Engineering Tools, Experimentation & testing	PO 5 The engineering practices for society, Sustainability & Environment	PO 6 Project management	PO 7 Life long learning	PSO1 Maintain various types of Electrical equipment	PSO2 Maintain various sections of Electrical power systems
Able to operate and perform maintenance of heavy electrical power utilization systems and equipment's..	3	…	2	2	3	1	3	2	1
EEH312-1: Select & use illumination lights & system.	3	…	2	2	3	1	3	2	1

EEH312-2: Use & operate power factor improvement equipment's	3	…	2	2	3	1	3	2	1
EEH312-3: Identify parts & operations of welding equipment.	3	…	…	1	3	…	1	2	0
.EEH312-4 : Select and use electric drives.	3	…	2	2	3	1	3	1	0
EEH312-5: Maintain electrical resistance heating system like ovens& induction heating.	3	…	…	2	3	1	3	2	0
EEH312-6 : Maintain components of substation of Traction systems.	3	…	…	1	3	…	1	2	1

F. CONTENT:-

I) Practical exercises

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

Sr. no	Assignments and drawing sheet	Skill to be developed	Course outcome
1	Assignment on constructional diagram , working & rating with typical location based application of Low & High Pressure Mercury Vapour Lamps, High Pressure Sodium vapour lamps, Metal Halide Lamps, LED lamps	1] Able to select various lamps their rating on location based or requirement. 2] Connection &	EEH312 -1
2	Designing simplest lighting scheme on typical Hall, Road	1] Able to design lighting schemes. 2] Selection of lamps as per scheme.	EEH312 -1
3	Assignments on various types of Tariff schemes	1] Knowing Tariff & operations of energy calculation. 2] Knowing electricity bills for LT & HT type.	EEH312 -2
4	Assignments on various types of power factor improvement schemes.	1] Realize componants useful to improve power factor. 2] Functioning and applications to improve power factor.	EEH312 -2
5	Draw labeled and describe in brief their applications various electric welding	1] Functions of welding machines. 2] To make choice of use of electrical	EEH312 -3

	machines. State comparative study considering advantages and disadvantages.	parts and material required. 3] Circuit diagram and connections. 4] Causes and faults with related maintenance.	
6	Study of various types of motors and their characteristics used as electrical drives. To draw and explain control equipment for starting, speed control and braking of motors.	1] Able to select motors as electrical drives 2] To choose their ratings for various types of loads/ Applications requirement in factory.	EEH312 -4
7	Draw labeled diagram and describe in brief their part list, working & applications various Resistance heating furnace, Arc furnaces. State comparative study, Study heating elements, considering advantages and disadvantages.	1] Functions of Resistance heating furnace, Arc furnaces. 2] Various parts their off. 3] Circuit diagram and connections.	EEH312 -5
8	Draw labeled diagram and describe in brief their part list, working & applications of various Dielectric heating furnace and eddy current heating State comparative study considering advantages and disadvantages	1] Functions of Dielectric heating furnace 2] Various parts their off. 3] Circuit diagram and connections.	EEH312 -5
9	Draw labeled diagram and describe in brief their part list, working & applications of Induction heating furnaces. State comparative study considering advantages and disadvantages	1] Functions of furnace and Induction heating furnaces. 2] Various parts their off. 3] Circuit diagram and connections	EEH312 -5
10	Comparative study of different systems of railway electrification viz. i) DC system, ii) Single phase AC system iii) Three phase system iv) Composite system	1] Follow various voltage levels in tractions. 2] Types of tractions. 3] To make choice of tractions.	EEH312 -6

II) Theory

Section I

EEH312-1: Select & use illumination lights & system.			
1	**Illumination Terminology:** 1.1 Law of Inverse Squares and Lambert's Cosine Law(Simple Numericals) 1.2 Types of Lamps-Low Pressure Mercury Vapour Lamps, High Pressure Mercury Vapour lamps, High Pressure Sodium vapour lamps, Metal Halide Lamps, LED lamps 1.3 Various Lighting Schemes. 1.4 Old Lighting system(IKS)	08	12
EEH312-2: Use & operate power factor improvement equipment's.			
2	**Tariff & Power factor improvement:** 2.1 Desirable Characteristics of Tariff; 2.2 Types of Tariff :- Block Rate Tariff, KVA Max Demand Tariff, TOD (Time Of Day Tariff)(No numerical) 2.3 Power Triangle, Disadvantage of low Power factor, Advantages of improved Power Factor; Causes of Low Power Factor, 2.5 Avoidance of Low power factor without using P.F. improving	14	14

	apparatus, improvement using Static Capacitor: Vector Diagram and Power Triangle, Advantages and Disadvantages.(Simple Numerical) 2.6 Most Economical Power factor: Location of P.F. improving, apparatus from Consumer and Electrical Supply Company point of view.		
EEH312-3: Identify parts & operations of welding equipment.			
3.	**Electric Welding systems:** 3.1 Resistance welding and Equipment's. 3.2 Electric Arc welding: Types and equipment's. 3.3 Comparison of AC & DC welding 3.4 Comparison of metal arc & carbon arc welding.	08	08
	TOTAL	30	34

Section II

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory evaluation Marks
EEH312-4 : Select and use electric drives.			
04	**Electric Drives & Elevator:** **4.1 Traditional method of lifting(IKS)** 4.2 Classification of electric drives 4.3 Factors governing selection of electric drives 4.4 Electrical characteristics Starting, Running characteristics & braking system-- Dynamic, Regenerative type. 4.5 Mechanical features and cost 4.6 Size & rating of motors- Duty cycle (Simple Numericals) 4.7 Motors for particular applications, Load equalization 4.8 Comparison between A.C. and D.C. Drives. 4.9 Advantages of electric drives. Safety in elevators, Lift and elevator Act	10	12
EEH312-5 : Maintain electrical heating system like resistance oven, furnaces			
5	**Electric Heating systems (Resistance & Inductance):** 5.1Modes of heat transfer. 5.2 Methods of electric heating. 5.3Resistance heating, Resistance Ovens. Requirements of heating element & heating materials Radiant & infrared heating. 5.4Induction heating- 5.5.1Core and coreless type induction heating 5.5.2Ajax-Wyatt vertical core type furnace 5.5.3Indirect induction furnace 5.5.4High frequency eddy current heating 5.5 Dielectric heating 5.6Heating by electric arc, Electric Arc furnace	14	16

	5.7 Specifications of Furnace.		
EEH312-6 : To maintain components of substation of Electric Traction system			
6	**Electric Traction Systems:** 6.1 AC and DC electrical traction systems. 6.2 High voltage supply system for traction 6.2.1 substations, Feeding Posts 6.2.2 Feeding and sectioning arrangements 6.2.3 sectioning and paralleling post 6.2.4 sub sectioning post. 6.2.5 Elementary sections. 6.2.6 Miscellaneous equipment's at control post or switching stations. 6.3 Major equipment's at substations.- 6.3.1 Transformer, 6.3.2 circuit breakers, 6.3.3 interrupter, 6.4 Protective system for AC traction-Transformer protection and 25 kV catenary protections. 6.5 Traction motors, 6.6 Comparison of AC and DC electrical traction systems.	06	08
TOTAL		30	36

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

G. List of Assignments under SLA

……..Not Applicable…….

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	**Illumination Terminology**	4	4	4	12	EEH312-1
I / 2	**Tariff & Power factor improvement**	4	4	6	14	EEH312-2
I / 3	**Electric Welding systems**	4	--	4	08	EEH312-3
II /4	**Electric Drives & Elevator**	4	4	4	12	EEH312-4
II /5	**Electric Heating systems**	4	6	6	16	EEH312-5
II / 6	**Electric Traction Systems**	--	4	4	08	EEH312-6
Total Marks					70	

J .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
TOTAL		**25**

ii) Summative Assessment of Practical/oral:

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

Sr. no	Criteria	Marks allotted
1	Knowledge about the course practical	05
2	Punctuality for practical /Oral	05
3	Neat & complete Diagram/Write up-Hand writing	05
4	Observations/Handling of instrument/ Communication/Presentation	05
5	Oral Based on Lab work and completion of task	05
TOTAL		**25**

K. Instructional Methods:

a. Lectures cum Demonstrations,
b. Classroom practices.
c. Use of projector and soft material for demonstration

L. Teaching and Learning resources:

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

M. Reference Books:

S.N.	Name of Book	Author	Publication
1.	Generation and Utilization of Electrical Energy	S.Sivanagaraju M.Balasubba Reedy B.Srilatha	Pearson ***ISBN***: 9789332515673 9332515670 8131733327 9788131733325
2.	Art and Science of Utilization of Electrical Energy	H. Partab	Dhanpat Rai andSons , New Delhi, Latest edition - ***ISBN*** : 8177001442, 9788177001440.
3.	Utilization of Electric Power and Electric Traction.	J. B. Gupta	S. K. Katariaand Sons, New Delhi, Latest edition ***ISBN***-10: 9350142589; ***ISBN***-13: 978-9350142585
4.	Utilization of Electric Power and Electric Traction	G. C. Garg	Khanna Publishers, New Delhi, Latest edition ***ISBN***. 8174091645.

5.	Fundamentals of Electrical Drives	G. K. Dubey	Narosa Publishing House. New Delhi, Latest edition ***ISBN***, 8173190410, 9788173190414.

N. Learning Website & Software

1. www.nptel.com/iitm/
2. www.howstuffworks.com/
3. www.virtual lab.com
4. www.sskphdmm.com
5. http://www.youtube.com/watch?v=RAc1RYilugI

GOVERNMENT POLYTECHNIC KOLHAPUR			
Learning and Assessment Scheme for Post S.S.C Diploma Courses			
Programme Name	**: Diploma In Electrical Engineering**		
Programme Code	**: EE**	**With Effect From Academic Year**	**: 2025-26**
Duration Of Programme	**: 6 Semester**	**Duration**	**: 16 week/8 week/6 week**
Semester	**: Fifth**	**Scheme**	**: MPECS 2023**

Sr No	Course Title	Abbreviation	Course Type	level	Course Code	Total IKS Hrs for Sem.	Learning Scheme					Credits	Credits (Round Off)	Assessment Scheme												
							Actual Contact Hrs./Week			Self Learning (Activity/ Assignment /Micro Project)	Notional Learning Hours /Week			Paper Duration (hrs.)	Theory				Based on LL & TL				Based on Self Learning		Total Marks
																			Practical						
							CL	TL	LL						FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
															Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
1	Internship	HINP	INP	5	CCH505		16 week Industrial Training					10	10						100	40	100#	40			200
Duration -8 week (Online 28 July,2025 to 19 September, 2025)																										
2.	Entrepreneurship & Startup	HESU	SEC	5	CCH501	1	2	-	-	1	3	0.8	1										50	20	50
3.	Elective-1 (Management Courses)		AEC	5	CCH502/ 503/504		5			1	6	1.6	2	1	15*#	35*#	50	20					50	20	100
4.	Project	HPRJ	INP	5	EEH503				4	2	6	1.6	2								50#	20	50	20	100
Duration-6 week (Offline)22 September 2025-01 November 2025																										
5.	Rotating Machine- 2	HRM2	DSC	4	EEH401	2	8		4		12	2.4	2	3	30	70	100	40	25	10	25#	10			150
6.	Micro-controller and its applications	HMAA	SEC	4	EEH408		7		2	1	10	2	2	3	30	70	100	40	25	10	25#	10	25	10	175
7.	Robotics and Automation	HRAA	SEC	4	EEH409		3		2		5	1	1						25	10	25#	10			50
Total						**3**	**25**		**12**	**5**	**42**	**19.4**	**20**		**75**	**175**	**250**		**75**		**125**		**175**		**825**

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

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

Note:

1. FA-TH represents an average of two class tests of 30 marks each conducted during the semester.
2. If a 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 a 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.

Course Category: Discipline Specific Course Core (DSC): 2, Discipline Specific Elective (DSE): 0, Value Education Course (VEC): 1, Intern. /Apprentice. /Project. /Community (INP) : 0, Ability Enhancement Course (AEC) : 2, Skill Enhancement Course (SEC) : 2, Generic Elective (GE) : 0

ELECTIVE-I COURSES

Sr No	Course Title	Abbreviation	Course Type	level	Course Code	Total IKS Hrs for Sem.	Learning Scheme					Credits	Credits (Round Off)	Assessment Scheme												
							Actual Contact Hrs./Week			Self Learning (Activity/ Assignment /Micro Project)	Notional Learning Hours /Week			Paper Duration (hrs.)	Theory				Based on LL & TL				Based on Self Learning		Total Marks
																			Practical						
							CL	TL	LL						FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
															Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
ELECTIVE-I																										
1.	Industrial Organization and Management	HIOM	AEC	5	CCH502		5			1	6	1.6	2	1	15*#	35*#	50	20					50	20	100
2.	Marketing Management	HMKM	AEC	5	CCH503		5			1	6	1.6	2	1	15*#	35*#	50	20					50	20	100
3.	Project Management	HPRM	AEC	5	CCH504		5			1	6	1.6	2	1	15*#	35*#	50	20					50	20	100

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 Practical				BASED ON SLA		TOTAL
NIL	FA- TH	SA- TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
	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 Guidlines of GR of Maharashtra Govt.) under Self Learning with guidance of industry supervisor / Mento.

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. The 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, experimentation 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**
CCH505.4	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^{th} to 12^{th} week of 4^{th} Semester
2	Allocations of Student and Mentor as per availability (Mentor: Student Ratio (1:15)	13^{th} week of 4^{th} semester
3	Communication with Industry and obtaining its confirmation Sample letter Format	14^{th} week of 4^{th} semester
4	Securing consent letter from parents/guardians of students (Sample Format 2)	15^{th} week of 4^{th} semester
5	Enrollment of Students for industrial training (Format 3)	Before 12^{th} week of 4^{th} semester
6	Issue of letter to industry for training along with details of students and mentor (Format 4)	After 4th Semester
7	Organize Internship Orientation session for students	After completion of 4^{th} 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	5th Semester ESE

Suggestions-

a. Department can take help of alumina or parents of students having contact in different industries for securing placement.
b. 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.
c. 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.
d. 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 marls
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.
   b) If yes, whether you offer 16 weeks training: Yes/No
   c) 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 your Government Polytechnic, Kolhapur institute 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

_____

iii. 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 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-3

(Students Enrollment for Industrial Training (To *be maintained by Department*)

(Academic Year –)

Sr. No.	Roll No.	Name of Student	Name of Industry	Name of Mentor at Institute

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 at.

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 _____

Sr. No.	Roll No.	Name of Student	Name and designation of Mentor

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 _____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:
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]
		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16	Total [80 Marks] [A]	

Name and Designation of Mentor **Name and Designation of Industry Supervisor**

Week 1: From _____To _____

Day	Activities carried out	Remark
1		
2		
3		
4		
5		
6		

Signature of Mentor : _____

Signature of Industrial Supervisor : _____

The same format need to follow for every week of the industrial training.

Course Name : ENTREPRENEURSHIP AND START-UP
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)	--	
Self-Learning Hours (SLH)	01	
Notional Learning (NLH)	3	

B. ASSESSMENT SCHEME:

PAPER DURATION IN HRS	Theory				Based on LL & TL Practical				Based on Self Learning		Total Marks
	FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
	Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
-	-	-	-	-					50	20	50

(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 manage-ment	PO 7 Life-long learning	PSO1	PSO2
Competency									
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 Exercise:

Not Applicable

ii. THEORY

Sr. No.	Topics / Sub-topics	Lectures (Hours)
1	**Entrepreneurship Development- Concept and Scope** **Indian Knowledge System for entrepreneurship development(IKS)** 1.1 Concepts and Overview of Entrepreneurship. Evolution and Growth of Entrepreneurship in India. Role of Entrepreneurship in Economic Development. Entrepreneurship as a career. 1.2 Traits of successful intrapreneur / entrepreneur: Consistency, creativity, initiative, independent decision making, assertiveness, persuasion, persistence, information seeking, 1.3 Entrepreneurship: Scope in local and global market. 1.4 Intrapreneur and entrepreneur. 1.5 Types of enterprises and their features: Manufacturing, Service and trading. 1.6 Steps in Setting up of a business	**03**
2	**Entrepreneurial Opportunities and Selection Process:** 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. 2.2 Process selection: Technology life cycle, forms and cost of transformation, Factors affecting process selection, Location for an industry, Material handling. 2.3 Market study procedures: Questionnaire design, sampling, Market survey, Data analysis 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).	04
3	**Support Systems:** 3.1 Categorization of MSME, Ancillary Industries. 3.2 Support System-Government Agencies: MCED, NI- MSME, PMEGP, DI, KVIC. 3.3 Support agencies for entrepreneurship guidance, training, registration, technical consolation, technology transfer and quality control, marketing and finance 3.4 Breakeven point, return of investment and return on sales.	**03**
4	**BUSINESS PLAN PREPARATION:** 4.1 Sources of Product for Business: Feasibility study. 4.2 Ownership, Capital, Budgeting, Matching Entrepreneur with the project, Feasibility report preparation and evaluation criteria. 4.3 Business plan preparation.	**03**

5	**Managing Enterprise:** 5.1 Unique Selling proposition (U.S.P.): Identification, Developing a marketing plan. 5.2 Preparing Strategies of handling Business: Policy making, negotiation and bargaining techniques. 5.3 Risk management: [planning for calculated risk taking, initiation with low-cost projects, integrated futuristic planning, angel investors, venture capitalist. 5.4 Incubation centres: Role and procedure.	**03**

G. SUGGESTED MICRO PROJECTS / ASSIGNMENTS/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING) UNDER SLA

Sr. No.	Assignments	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

*-Suggested assignment for the students.

Complete any 8 assignments mentioned below given by subject teacher.

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
TOTAL		**25**

ii) 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
	TOTAL	**25**

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

COURSE NAME : INDUSTRIAL ORGANISATION AND MANAGEMENT
COURSE CODE : CCH502
COURSE ABBREVIATION : HIOM

A. LEARNING SCHEME:

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	05	2
	Tutorial Learning	--	
	Laboratory Learning	--	
	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			
1	15*#	35*#	50@$	20	--	--	--	--	50	20	100

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

a. If a candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as “Detained" in that semester.
b. If a 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.
c. Notional Learning hours be reflected in the Time Table.

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

D. i.RATIONALE:

Management ability is a higher-grade ability, which every successful engineer must possess. This science has been developed in those days when it was treated as an art in earlier stages. It is impossible for an individual though technically sound to achieve goals of the organizations. Effective implementation of management policies is a tough task. The Diploma holder should learn these principles of management and various techniques.

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:

To improve management ability of individual through teaching.

E. COURSE OUTCOMES (COs):

CCH502.1 Apply principles of management and carry out various functions of management
CCH502.2 Prepare organization structure for small and medium scale industry.
CCH502.3 Perform duties of stores in-charge and materials manager.
CCH502.4 Practice industrial safety rules, codes, practices and acts.
CCH502.5 Apply various modern management techniques

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

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**		
Competency: The aim of this course is to improve management ability of individual through teaching.	3	3	2	2	3	3	3	3	**3**
CCH502-1	3	2	2	2	2	3	3	2	3
CCH502-2	3	3	2	3	2	3	3	3	2
CCH502-3	3	3	3	3	2	3	3	2	2
CCH502-4	2	3	3	3	2	3	3	3	3
CCH502-5	2	3	3	3	2	3	3	3	3

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

F. CONTENT:

I) PRACTICAL EXERCISES - Not Applicable

ii) THEORY

SECTION-I			
Sr. No.	**Topics**	**Teaching (Hours)**	**Theory evaluation**
Course Outcome CCH502-1: - Apply principles of management and carry out various functions of management			
1	**PRINCIPLES OF MANAGEMENT** 1.1 Concept of management 1.2 Principles of management 1.3 Objectives of management 1.4 Scope and importance of management 1.5 Levels of management 1.6 Managerial competencies: Communication, Planning and Administration, Team work, Strategic action and General awareness	**04**	**4**
Course Outcome CCH-502-1: - Apply principles of management and carry out various functions of management			
2	**Functions of Management** 2.1 Planning: Forms of planning, Strategic levels and Planning, Phases of Planning 2.2 Decision Making: Decision making conditions, Basic types of Decisions 2.3 Organizing: Introduction to Organization design, basic types of Departmentalization, Co-ordination, Authority 2.4 Motivation: Work Motivation, Three approaches to Motivation, 2.5 Leadership: Leadership and Power, Leadership Development 2.6 Communication: The Communication process, Impact of Information Technology, Hurdles to effective communication 2.7 Controlling: Foundations of control, creative Effective control, Primary methods	**06**	**5**
Course Outcome CCH502-1: - Apply principles of management and carry out various functions of management			
3	**HUMAN RESOURCE MANAGEMENT.** 3.1 Definition and concept, 3.2 Aim, Objectives and functions of HR dept. 3.2 Principles of personnel policy, details recorded in policy 3.3 Recruitment and selection of employees 3.4 Training: Objectives, benefits, types and methods 3.5 Workers Participation in Management	**06**	**5**

Course Outcome CCH502-2: Prepare organization structure for small and medium scale industry.			
4	**FORMS OF BUSINESS ORGANISATION** 4.1 Types of industrial sectors 4.2 Forms of business organization 4.3 Individual Proprietorship 4.4 Partnership 4.5 Joint stock companies 4.6 Co-operatives, Public sectors, Government undertakings.	**05**	**5**
SECTION II			
Course Outcome CCH502.3: Perform duties of stores in-charge, material and finance manager.			
5	**MATERIALS MANAGEMENT** 5.1 Importance of purchase 5.2 Functions and Objectives 5.3 Duties of purchasing officer 5.4 Methods of purchasing and procedure 5.5 Scope and importance of material management 5.6 Objectives of material management 5.7 Duties of Material manager 5.8 Concept of supply chain management 5.9 Modern trends in material management: MRP, ERP	**05**	**4**
6	**FINANCIAL MANAGEMENT** 6.1 Concept, Scope and Importance 6.2 Functions of financial management 6.3 Types of capital: Fixed, working 6.4 Factors affecting Working capital 6.5 Capitalization: over, under 6.6 Sources of Finance 6.7 Industrial taxation	**05**	**4**
CCH502.4: Practice industrial safety rules, codes, practices and acts.			
7	**INDUSTRIAL ACT & SAFETY** 7.1 Factory Act, Electricity Act, Workmen Compensation Act, ESI Act, pollution Control Act 7.2 Accidents: Economic aspects, direct and indirect cost of accidents Causes, Types, Remedies, Personal Protective Equipment's (PPE), Reporting & Investigation of accidents 7.3 Safety management: safety in industry, committees, programs, Safety codes, Safety training, 7.4 Occupational Safety and Health Administration – Promoting, norms and standards Housekeeping: definition, concept, necessity, advantages, procedure	**05**	**4**
CCH502.5: Apply various modern management techniques.			
8	**MODERN MANAGEMENT TECHNIQUES** 8.1 PERT & CPM 8.2 Various terms related with network analysis 8.3 Various Time estimates 8.4 Construction of Network Diagram Computation of Critical Path	**04**	**4**
	Total	**40**	**35**

Online Exam for this course.

G. 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	Apply		
1	Principles Of Management	02	02	--	CCH502.1	04
2	Functions Of Management	02	02	01	CCH502.1	05
3	Human Resource management	02	02	01	CCH502.1	05
4	Forms Of Business organization	02	02	01	CCH502.2	05
5	Materials Management	02	01	01	CCH502.3	04
6	Financial Management	02	01	01	CCH502.3	04
7	Industrial Act & Safety	02	01	01	CCH502.4	04
8	Modern Management Techniques	02	01	01	CCH502.5	04
TOTAL						**35**

H. INSTRUCTIONAL METHODS

a. Lectures cum Demonstrations
b. Classroom practices

I. TEACHING AND LEARNING RESOURCES:

Chalk board, LCD presentations, Audio presentations, Question Bank.

J. REFERENCE BOOKS:

Sr. No.	Author	Title	Publisher
1	Bangaand Sharma	Industrial Organisation & Management	Khanna Publisher
2	O P Khanna	Industrial Engg. & Management	DhanpatRai & sons New Delhi
3	P.C. Pandey & C. K. Sing	Management Science	DhanpatRai & sons New Delhi
4	Industrial Organisation	P.T. Ghan	Tata McGraw Hill
5	Management Information System	Waman S. Jawadekar	Tata McGraw Hill
6	P.C. Pandey & C. K. Sing	Management Science	DhanpatRai & sons New Delhi

K. LEARNING WEBSITE & SOFTWARE: -

a. https://nptel.ac.in/courses/122/106/122106031/
b. https://nptel.ac.in/courses/110/105/110105154/
c. https://nptel.ac.in/courses/110/101/110101150/
d. https://nptel.ac.in/courses/110/101/110101153/

COURSE NAME : MARKETING MANAGEMENT
COURSE CODE : CCH503
COURSE ABBREVIATION : HMKM

A. LEARNING SCHEME:

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	05	2
	Tutorial Learning	--	
	Laboratory Learning	--	
	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			
1	15*#	35*#	50@$	20	--	--	--	--	50	20	100

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

a. If a candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as “Detained" in that semester.
b. If a 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.
c. Notional Learning hours be reflected in the Time Table.

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

D.i. RATIONALE:

The globalization has lead to the requirement of multi-skilled personnel to execute the works and that too in a cost effective way. It is observed that the diploma holder in Engineering has wide spectrum for development, if the enters the marketing field. Provided he has the interest with proper initiative. Marketing now a day can provide fruitful employment to the diploma holder to make a career in marketing.

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:

Work as a marketing personnel for electrical components or business.

E. COURSE OUTCOMES (COs):

CCH503-1:-Interpret different marketing techniques.
CCH503-2:-Identify different types of markets.
CCH503-3:-Carry out different marketing works/functions.
CCH503-4:-Assist in marketing work of industrial products.
CCH503-5:-Carry out market studies for products.

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	PSO2
Competency: Work as a marketing personnel for electrical components or business.	3	3	2	2	3	3	3	3	**3**
CCH503-1:-Interpret different marketing techniques.	3	2	2	2	2	3	3	2	3
CCH503-2:-Identify different types of markets.	3	3	2	3	2	3	3	3	2
CCH503-3:-Carry out different marketing works/functions.	3	3	3	3	2	3	3	2	2
CCH503-4:-Assist in marketing work of industrial products.	2	3	3	3	2	3	3	3	3
CCH503-5:-Carry out market studies for products.	2	3	3	3	2	3	3	3	3

F. CONTENT:

a. PRACTICAL EXERCISES - Not Applicable

b. THEORY

Section I

Sr.No.	TOPICS Sub-Topics	Periods	Marks
CCH503-1:Interpret different marketing techniques.			
1	**Marketing** 1.1 Meaning and significance of marketing 1.2Marketing system 1.3 Concept of marketing 1.4 Product selling 1.5 Trends in modern marketing	8	6
CCH503-2:Identify different types of markets.8			
2	**Markets** 2.1 Meaning of market 2.2 Types of market 2.3 Government and industrial market	8	6
CCH503-3:Carry out different marketing works/functions.			
3	**Functions & Management** 3.1 Marketing functions 3.2 Meaning of marketing 3.3 Management and functioning 3.4 Types of marketing organizations 3.5 Marketing manager and his duties	8	6

Section II

Sr.No.	TOPICS Sub-Topics	Periods	Marks
CCH503-4:Prepare scheme for marketing industrial products.			
4	**Marketing Industrial Products** 4.1 Types of industrial products 4.2 Characteristics and marketing considerations 4.3 Marketing planning 4.4 Product decision 4.5 Pricing decision	8	6
CCH503-5:Carry out market studies for products.			
5	**Strategies** 5.1 Marketing strategy 5.2 Marketing mix 5.3 Market survey 5.4 Market information systems 5.5 Buying behaviors	8	6
CCH503-6:Devise proper advertising techniques for industrial products.			
6	**Advertising** 6.1 Role of advertising in marketing 6.2 Marketing management without advertising 6.3 Brief introduction to cost component of advertising	8	5
	Total	40	35

G. SPECIFICATION TABLE FOR SETTING QUESTION PAPER FOR SEMESTER END THEORY EXAMINATION:

Topic No.	Name of topic	Distribution of marks (Cognitive level- wise)			Total Marks
		Remember	Understand	Apply	
1	Marketing	2	2	2	6
2	Markets	2	2	2	6
3	Marketing Functions & Management	2	2	2	6
4	Marketing Industrial Products	2	2	2	6
5	Strategies	2	2	2	6
6	Advertising	2	2	1	5
TOTAL					**35**

H. INSTRUCTIONAL METHODS

a. Lectures cum Demonstrations
b. Classroom practices

I. TEACHING AND LEARNING RESOURCES:

Chalk board, LCD presentations, Audio presentations, Question Bank

J. REFERENCE BOOKS:

1) Basic Marketing - by Cundiff & Still. 2) Marketing Management - by R. S. Davar.
3) Salesmanship, Sales Management & Advertising - by Satyanarayana.
4) Modern Marketing Management - by R. S. Davar.
5) Marketing Management (cases & Concepts) - by Dholakia, Khurana & Jain

Websites :

i https://nptel.ac.in/courses/122/106/122106031/
ii https://nptel.ac.in/courses/110/105/110105154/
iii https://nptel.ac.in/courses/110/101/110101150/
iv https://nptel.ac.in/courses/110/101/110101153/

***

COURSE NAME : PROJECT MANAGEMENT
COURSE CODE : CCH504
COURSE ABBREVIATION : HPRM

A. LEARNING SCHEME:

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	05	2
	Tutorial Learning	--	
	Laboratory Learning	--	
	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			
1	15*#	35*#	50@$	20	--	--	--	--	50	20	100

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

a. If a candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as “Detained" in that semester.
b. If a 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.
c. Notional Learning hours be reflected in the Time Table.

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

D. RATIONALE:

A diploma holder in Electrical Engineering now a day finds himself entrusted with managing projects or part there off. The age at which he/she is entrusted such responsibilities is declining day by day as a result of which he is stressed much and expected to perform well. This course intends to introduce the elementary aspects of Scientific Project Management whose emphasis is on success, though everybody has his own style of managing projects successfully.

ii. EXPECTED OUTCOME:

Use the principles of project management as a supervisor in relevant works.

E.COURSE OUTCOMES (COs):

CCH504-1: Identify project types and the tools/techniques used in it.
CCH504-2: Identify actions for project manager using computer based project management systems as well.
CCH504-3: Assist in establishing a project.
CCH504-4: Carry out project control activities.
CCH504-5: Implement projects using different techniques.

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

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**
Competency: Use the principles of project management as a supervisor in relevant works.	3	3	2	2	3	3	3	3	**3**
CCH504-1	3	2	2	2	2	3	3	2	3
CCH504-2	3	3	2	3	2	3	3	3	2
CCH504-3	3	3	3	3	2	3	3	2	2
CCH504-4	2	3	3	3	2	3	3	3	3
CCH504-5	2	3	3	3	2	3	3	3	3

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

F.CONTENT:

I) PRACTICAL EXERCISES - Not Applicable

II) THEORY

Section I

Sr. no.	Topics / subtopics	Teaching (Hours)	Theory Marks
CCH504-1:Identify the tools and techniques used in project management.			
1	**Project Management and its tools/techniques** 1.1 Idea of project 1.2 Characteristics of project 1.3 Categories of projects 1.4 Project life cycle phases (definition of each phase) 1.5 Project life cycle curve. Tools And Techniques For Project Management 1.6 Selection techniques 1.7 Execution planning and techniques 1.8 Scheduling and co-ordination techniques 1.9 Cost and productivity control techniques. 1.10 Communication and clean up techniques	8	7
CCH504-2:Identify actions for project manager using computer based project management systems as well.			
2	**Project Management System** 2.1 Block diagram with brief description , Computer based project management 2.2 Rationale behind computerized project management systems **Project Management** 2.3 Need of project manager 2.4 Problems of project manager 2.5 Basic education for project manager 2.6 Roles and responsibilities of project management as a profession	8	7
	Total		

Section II

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory Marks
CCH504-3:Work in a group to establish a project.			
3	**Establishing Project** (Scope & Cost) 3.1Guidelines given by planning commission (brief description about guidelines) 3.2 Financing arrangements, capital cost, sources of financing 3.3 Internal and external sources 3.4 Terms of finance Short, intermediate and long term 3.5 Names of financial institutions with their mode of working in brief 3.6 Preparation of cost estimates types of estimates with very brief description: Order of magnitude, study estimate, preliminary estimate, Definitive estimate, detailed estimate.	8	7

Sr. no.	Topics Subtopics	Teaching (Hours)	Theory Marks
CCH504-4:Carry out project control activities.			
4	**Project Activities And Profitability** 4.1 Project implementation schedule 4.2 Basis of time estimation 4.2.1 Time study 4.2.2 Previous project data 4.2.3 Estimates from the vendors/ contractors 4.2.4 Allocated time and committed time. Overall implementation schedule Bar chart Evaluation of project profitability methods 4.2.5 Pay-back period (PBP) return on investments (ROI) concept of zero date 4.3Pre-project activities and advance actions (very brief description)	8	7
CCH504-5:Implement project task using different techniques.			
5	**Implementation Control & Monitoring** **Implementation** 5.1 Work breakdown structure 5.2Project execution plan (brief description) Project procedure manual 5.3 Project control system 5.4 Need for flexibility 5.5 Project diary **Control & Monitoring** 5.6 Direction reviews meeting creativity techniques such as questioning 5.7 Attribute listing 5.8Brain Communications in a project feed back and forward 5.9 Unscheduled meetings and social get-togethers	8	7
	Total	40	35

G.SPECIFICATION TABLE FOR SETTING QUESTION PAPER FOR SEMESTER END THEORY EXAMINATION:

Topic No.	Name of topic	Distribution of marks (Cognitive level- wise)			Total Marks
		Remember	Understand	Apply	
1	Project Management and its tools/techniques	3	2	2	7
2	Project Management System	3	2	2	7
3	Establishing Project	3	2	2	7
4	Project Activities and Profitability	3	2	2	7
5	Implementation Control & Monitoring	3	2	2	7
TOTAL					**35**

H. INSTRUCTIONAL METHODS

a. Lectures cum Demonstrations
b. Classroom practices

H.TEACHING AND LEARNING RESOURCES:

Chalk board, LCD presentations, Audio presentations, Question Bank

I. REFERENCE BOOKS:

1. Project Management - by S. Choudhury (Tata McGraw Hill Pub.)
2. Project Management - A System Approach to planning, Scheduling & Controlling By Harold Kerzner (CBS Publishers & Distributors)

J. Websites :

i https://nptel.ac.in/courses/122/106/122106031/
ii https://nptel.ac.in/courses/110/105/110105154/
iii https://nptel.ac.in/courses/110/101/110101150/
iv https://nptel.ac.in/courses/110/101/110101153/

COURSE NAME : PROJECT
COURSE CODE : EEH503
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	08	

B. ASSESSMENT SCHEME :-

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL Practical				BASED ON SLA		TOTAL
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	100
--	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN			
	-	-	-	-			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 ExaminationNote :

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:-

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)

EEH503-1 Plan and identify materials, processes and other resources optimally.

EEH503-2 Develop innovative and creative idea.

EEH503-3 Develop leadership, interpersonal skill and team work.

EEH503-4 Develop sense of environmental responsibility.

EEH503-5 Purchase raw material/standard parts and interpret the drawings, manufacture, assemble, inspect & if necessary modify the parts/unit/assembly of the project work.

EEH503-6 Prepare a structured report.

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** Maintain various types of electrical equipments	**PSO2** Maintain various sections of electrical power systems
EEH503-1 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
EEH503-2 Develop innovative and creative idea	3.00	3.00	3.00	2.00	-	1.00	2.00	3.00	3.00
EEH503-3 Develop leadership, interpersonal skill and team work.	-	- -	-	-	2.00	2.00	-	3.00	3.00
EEH503-4 Develop sense of environmental responsibility.	2.00	-	-	1.00	2.00	-	-	-	-
EEH503-5 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
EEH503-6 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: EEH503-1 Plan and identify materials, processes and other resources optimally.	
1	1.1 Literature survey 1.2 Project identification
CO: EEH503-2 Develop innovative and creative idea.	
2	2.1 Initial Design
CO: EEH503-3 Develop leadership, interpersonal skill and team work.	
3	3.1 Project Design
CO: EEH503-4 Develop sense of environmental responsibility.	
4	4.1 Identify impact of project on society and environment, if implemented in large scale.
CO: EEH503-5 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: EEH503-6 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 helps 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 Arduino IDE, AutoCAD, Proteus, and Excel through online tutorials and practice.
3. **Component Study and Selection:**
   - Gain knowledge of electronic and mechanical components by reading datasheets and specifications.
4. **Design and Simulation:**
   - Practice designing circuits and mechanical parts using simulation tools to validate project ideas before physical implementation.
5. **Practical Skill Development:**
   - Improve hands-on skills such as soldering, wiring, programming, and assembly through repeated practice.
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
Total		**50**

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
Total		**100**

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. Oscilloscope
2. Soldering station with drill machine
3. PCB formulation kit
4. Clip on meter/ multi-meter/ power supplies.
5. IC tester/ continuity tester/ Component tester
6. Auto-transformer
7. Other equipment as per the need of the project
8. Simulation tools
9. 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
ii.http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-867- machine learning-fall-2006/

iii. http://www.indiabix.com/online-test/electrical-engineering-test/143

M. Guidelines for report writting

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 NAME : ROTATING MACHINE- 2
COURSE CODE : EEH401
COURSE ABBREVIATION : HRM2

A. LEARNING SCHEME:

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	08	3
	Tutorial Learning	-	
	Laboratory Learning	04	
	SLH-Self Learning	--	
	NLH-Notional Learning	12	

B. ASSESSMENT SCHEME :-

PAPER DUR	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Practical						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR				
	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. : 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 ExaminationNote :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
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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 study of Special Machines is essential due to their wide applications in robotics, automation, electric vehicles (EVs), and renewable energy systems. These machines offer higher efficiency, precision, and control compared to conventional machines, making them crucial for modern industry. Understanding their design, operation, and integration with power electronics helps engineers develop advanced motor drive systems. With the rise of smart grids, AI-driven motor control, and industrial automation, expertise in special machines is increasingly valuable.

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:

Apply knowledge of rotating machines in CNC machines, conveyor systems, and medical equipment.

E. COURSE LEVEL LEARNING OUTCOMES (COS)

EEH401-1 Identify the parts of three phase alternator.

EEH401-2 Test the performance of three phase alternator.

EEH401-3 Operate three phase synchronous motor at a given set of conditions.

EEH401-4 Use BLDC motor for given industrial applications.

EEH401-5 Use PMSM, servo motor and linear induction motor for given industrial applications.

EEH401-6 Use stepper, switched reluctance, hysteresis and universal motors for given industrial applications.

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** Maintain various types of electrical equipments	**PSO2** Maintain various sections of electrical power systems
EEH401-1 Identify the parts of three phase alternator.	1.00	1.00	1.00	1.00	-	1.00	1.00	3.00	2.00
EEH401-2 Test the performance of three phase alternator.	3.00	2.00	2.00	2.00	-	1.00	1.00	3.00	2.00
EEH401-3 Operate three phase synchronous motor at a given set of conditions.	3.00	2.00	2.00	2.00	-	1.00	1.00	3.00	2.00
EEH401-4 Use BLDC motor for industrial applications.	3.00	2.00	2.00	2.00	1.00	1.00	3.00	3.00	-
EEH401-5 Use PMSM, servo motor and linear induction motor for industrial applications.	2.00	2.00	1.00	2.00	1.00	1.00	3.00	3.00	-
EEH401-6 Use stepper, switched reluctance, hysteresis and universal motors for industrial applications.	2.00	2.00	1.00	2.00	-	1.00	3.00	3.00	-

F. CONTENT:-

I) Practical exercises

The 80% of the following practical exercises shall be conducted in the *Laboratory for Machine developed* by the Institute in practical sessions of batches of about 20- 22 students:

Sr. no	Laboratory experiences	CO
1	Identification of different parts of a three phase alternator, interpretation of the nameplate of three phase alternator.	EEH401-1
2	Operation of three phase alternator for variable frequency output by controlling speed of its prime mover	EEH401-2
3	Direct loading test of a three-phase alternator for determining voltage regulation with resistive load.	EEH401-2
4	Direct loading test of a three-phase alternator for determining voltage regulation with inductive load.	EEH401-2
5	Direct loading test of a three-phase alternator for determining voltage regulation with capacitive load.	EEH401-2
6	Determination of regulation of three phase alternator by synchronous impedance method.	EEH401-2
7	Determination of efficiency of three phase alternator by OC and SC test.	EEH401-2
8	Start 3 phase synchronous motor and run synchronous motor in forward and reverse direction.	EEH401-3
9	Conduct test to plot V and inverted V curve of 3 phase synchronous motor.	EEH401-3
10	Identify parts of BLDC motor	EEH401-4
11	Speed control of BLDC motor	EEH401-4
12	Identify parts of servo motor	EEH401-5
13	Speed control of servo motor	EEH401-5
14	Identify the parts of stepper motor.	EEH401-6
15	Speed control of stepper motor	EEH401-6
16	Speed control of universal motor	EEH401-6

II) Theory

Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO: EEH401-1: Identify the parts of three phase alternator.			
1	**Introduction to three phase alternator:** 1.1 Construction of three phase alternator: Construction and function of each part- Stator frame, stator core, types of slot (open, semi-closed, closed), rotor (salient pole and smooth cylindrical), damper windings, armature winding. 1.2 Short pitch winding and pitch factor (simple numerical) 1.3 Distribution factor (simple numerical) 1.4 Equation of induced EMF (simple numerical)	8	12
CO: EEH401-2: Test the performance of three phase alternator.			
Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks

2	**Performance of three phase alternator:** 2.1 Effect of loading on terminal voltage (armature resistance, reactance and reaction) 2.2 Concept of armature reaction 2.3 Concept of synchronous reactance 2.4 Voltage regulation and related phasor diagrams 2.5 Determination of voltage regulation: synchronous impedance method (simple numerical), ampere turn method and zero power factor method 2.6 Concept of q axis and d axis in salient pole rotor synchronous alternator 2.7 Power developed in cylindrical rotor synchronous motor (simple numerical) 2.8 Parallel operation of alternator 2.9 Concept of synchronizing power 2.10 Concept of load angle and condition for maximum power output.	8	12
CO: EEH401-3: Operate three phase synchronous motor at a given set of conditions.			
3	**Three phase synchronous motor** 3.1 Principle of operation 3.2 Methods of starting (small DC motor, pony motor, damper winding) 3.3 Power flow and equivalent circuit diagram of synchronous motor 3.4 Power developed by cylindrical type synchronous motor (simple numerical) 3.5 Effect of excitation and loading on the performance of synchronous motor 3.6 Characteristics and applications	8	10

Section –II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO: EEH401-4: Use BLDC motor for industrial applications.			
4	**BLDC Motor** 4.1 Basics of DC Motors and the need for brushless technology 4.2 Comparison between Brushed DC and Brushless DC motors 4.3 Construction and working principle of BLDC motors 4.4 Types of BLDC motors: Inner Rotor BLDC Motor and Outer Rotor BLDC Motor 4.5 Role of Hall-effect sensors and concept of position feedback 4.6 Concept of electronic commutation and its advantages over mechanical commutation 4.7 Torque-speed characteristics 4.8 Efficiency and power factor	11	14

	4.9 Comparison with PMSM (Permanent Magnet Synchronous Motor) 4.10 Control Technique for BLDC Motors: open loop 4.11 Applications of BLDC Motors: Industrial automation and robotics, Electric vehicles (EVs) and hybrid electric vehicles (HEVs)		
CO: EEH401-5: Use PMSM, servo motor and linear induction motor for industrial applications.			
5	**PMSM, servo motor and linear induction motor** 5.1 Need for special machines 5.2 PMSM: construction, working principle, speed control, speed torque characteristics, applications. 5.3 Servo motor (DC): construction, working principle, speed control, speed torque characteristics, applications. 5.4 Linear induction motor: construction, working principle, speed control, speed torque characteristics, applications.	07	12
CO: EEH401-6: Use stepper, switched reluctance, hysteresis and universal motors for industrial applications.			
6	**Stepper, switched reluctance, hysteresis and universal motors** 6.1 Stepper motor: construction, working principle, speed control, speed torque characteristics, applications. 6.2 Switched reluctance motor: construction, working principle, speed control, speed torque characteristics, applications. 6.3 Hysteresis motor: construction, working principle, speed control, speed torque characteristics, applications. 6.4 Universal motor: construction, working principle, speed control, speed torque characteristics, applications. 6.5 Application of rotating system in Indian ancient establishments (IKS learning)	06	10

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

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 three phase alternator	4	4	4	12	EEH401-1
I / 2	Performance of three phase alternator	4	4	4	12	EEH401-2
I / 3	Three phase synchronous motor	2	4	4	10	EEH401-3
II /4	BLDC Motor	4	4	6	14	EEH401-4
II /5	PMSM, servo motor and linear induction motor	4	4	4	12	EEH401-5
II / 6	Stepper, switched reluctance, hysteresis and universal motors	2	4	4	10	EEH401-6
	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	05
	Application	05
Psychomotor	Operating Skills	05
	Drawing / drafting skills	05
Affective	Attendance/Discipline and punctuality	05
TOTAL		**25**

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
TOTAL		**25**

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	Electrical Technology Vol-II	Theraja B.L.	S. Chand, New Delhi, 2012 or latest
2	Electrical Machines	Ashfaq Husain	Dhanpat Rai & Co.
3	Electrical Machines	Deshpande M.V.	PHI Learning,, New Delhi, 2012 or latest
4	Electrical Technology	Uppal, S.L.	Khanna Publication, New Delhi, 2012 or latest
5	Electrical Machine	Nagrath I.J. and Kothari, D.P.	Tata McGraw Hill, New Delhi, 2012 or latest
6	Electrical Machine-I	Gupta, J. B.	S. K. Kataria& Sons, New Delhi, 2012 or latest

L. Learning Website & Software

a. www.nptel.com/iitm/
b. www.howstuffworks.com/
c. www.virtual lab.com
d. www.sskphdmm.com
e. http://www.youtube.com/watch?v=RAc1RYilugI

COURSE NAME : MICROCONTROLLER &ITS APPLICATION

COURSE CODE : EEH408

COURSE ABBREVIATION: HMAA

A. LEARNING SCHEME:

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	07	04
	Tutorial Learning	-	
	Laboratory Learning	02	
	SLH-Self Learning	01	
	NLH- Notional Learning	10	

B. ASSESSMENT SCHEME:-

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

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: -

A microcontroller is the sole of all embedded electronic types of equipment and is used in most areas of electrical where automation and monitoring are needed. They include product lines ranging from small consumer electronic products to sophisticated industrial process controllers. A electrical diploma engineer needs to maintain such systems. Programming practices will further enhance students' ability to develop local applications based on microcontrollers. Hence this course is designed to address the above.

ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to attend following industry identified competency through various teaching learning experiences: • Maintain electronic equipment/systems comprising of discrete electronic components.

E.COURSE LEVEL LEARNING OUTCOMES (COs)

EEH408-1: Interpret the prominent features of different types of microcontrollers.
EEH408-2: Interpret the salient architectural features of 8051 microcontroller
EEH408-3: Develop and maintain assembly language program for different operations
EEH408-4: Interface and program different I/O devices with 8051 in assembly
EEH408-5: Interface and serial communication of I/O devices with 8051 in assembly
EEH408-6: Maintain different 8051 based applications

Course outcomes and programme outcomes/ programme specific outcomes (CO- PO/PSO) matrix

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

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**
EEH408-1	1	1	2	-	-	-	2	2	2
EEH408-2	1	3	2	-	-	-	2	2	2
EEH408-3	-	3	3	1	-	-	2	2	2
EEH408-4	1	2	3	1	-	-	3	3	3
EEH408-5	1	2	-	-	-	-	2	3	3
EEH408-6	1	1	-	-	-	-	3	3	3

F.CONTENT:

I) Practical exercises

The following practical exercises shall be conducted in the *Laboratory for Microcontrollers* by the Institute in practical sessions :

Sr. No.	Laboratory experiences	CO
1.	*Identification of various blocks of 8051 microcontroller development board.	EEH408-2
2.	Identify different menus available in compiler software KEIL and demonstrate their use.	EEH408-1
3.	*Develop an Assembly Language Program (ALP) for addition of two numbers using various addressing modes and assembler directives.	EEH408-3
4.	*Develop an ALP to perform arithmetic operations: addition, subtraction, multiplication and division on 8-bit data.	EEH408-3
5.	*Develop an ALP to perform arithmetic operations: addition, subtraction on 16-bit data.	EEH408-3
6.	*Develop an ALP to perform addition of BCD data stored at external and store result in internal memory.	EEH408-3

Sr. No.	Laboratory experiences	CO
7.	*Develop an ALP for sum of series stored in RAM locations 40-49H. Find the sum of the values at the end of the program the lower byte store in 30H the higher byte in 31H.	EEH408-3
8.	Develop an ALP to exchange block of data from source to destination location of internal/ external data memory.	EEH408-3
9.	*Develop an ALP for identifying smallest number from the given data bytes stored in internal/ external data memory.	EEH408-3
10.	Develop an ALP for identifying largest number from the given data bytes stored in internal/ external data memory.	EEH408-3
11.	*Develop an ALP for arranging numbers in ascending order stored in internal/ external data memory.	EEH408-3
12.	Develop an ALP for arranging numbers in descending order stored in internal/ external data memory.	EEH408-3
13.	*Interface LED with microcontroller and turn it 'ON' with microcontroller interrupt.	EEH408-4
14.	Interface 4 X 4 LED matrix with 8051 to display various pattern.	EEH408-4
15.	*Interface 7-segment display to display the decimal number from 0 to 9.	EEH408-4
16.	Interface relay with microcontroller and turn it 'ON' and 'OFF'.	EEH408-4
17.	Develop an ALP to generate delay using timer register.	EEH408-4
18.	*Develop an ALP to generate pulse and square wave by using timer delay.	EEH408-4
19.	*Develop an ALP to transfer 8 bit data serially on serial port.	EEH408-4
20.	*Interface LCD with 8051 microcontroller to display the characters and decimal numbers.	EEH408-5
21.	Interface ADC with 8051 microcontroller and verify input/output.	EEH408-5
22.	Interface Stepper motor to microcontroller and rotate in clockwise and anticlockwise direction at the Given angle	EEH408-6
23.	Design water level controller using any suitable open source simulation software to detect and control the water level in a tank.	EEH408-6

*-Atleast 6 practicals are mandatory. Other practicals can be done by students in self learning activity.

II) Theory

Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	EEH408-1 Interpret the prominent features of different types of microcontrollers.		
1	**Introduction to Microcontrollers** 1.1 Evolution of Microcontrollers 1.1.1 Block diagram of Microcomputer 1.1.2 Elements of Microcomputer (Buses Microprocessor, Memory,I/O devices) 1.1.3 Types of buses (Address, Data and control bus) 1.2 Types of architectures: Von Neuman and Harward Architecture.	**04**	**08**

	1.3 Comparison of Microcontroller and Microprocessor on basis of: Memory, Complexity, Type of Architecture, Cost, Applications, Typical examples of Microcontrollers and Microprocessors 1.4 **Need for Microcontrollers in Electrical Engineering** (Power Systems, Smart Metering, Motor Control)		
	EEH408-2 Interpret the salient architectural features of 8051 microcontrollers.		
2	**Architecture of 8051Microcontroller** 2.1.1 8051 Architecture: Features and Selections factors for Microcontroller 2.1.2 Architectural Block diagram of 8051, function of each block 2.1.3 Pin diagram, function of each pin 2.1.4 Memory organization of Internal memory (RAM and ROM) 2.1.5 Various registers and SFRs of 8051	**08**	**12**
	EEH408-3 Develop and Maintain the assembly language program for different operations.		
3	**8051 Instruction Set and Programs** 3.1 Overview of 8051 instruction set 3.1.1 Instruction Format for 8051 Microcontroller 3.1.2 Introduction to Assembler and Various addressing modes 3.2 Classification of instructions 3.2.1 Data transfer instructions 3.2.2 Arithmetic instructions 3.2.3 Logical instructions 3.2.4 Branching instructions 3.2.5 Bit manipulation instructions 3.2.6 Stack, subroutine and interrupt related instructions 3.2.7 Assembler Directives: ORG, DB, EQU, END, CODE, DATA 3.3 Simple Programs based on above instructions and directives.	**08**	**14**
	Sub-total	**20**	**34**

Section –II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	EEH408-4 Interface and program different I/O devices with 8051 in assembly		
4	**8051 Internal Peripherals and Related Programs** 4.1 Configuration and Programming of I/O Port :P0, P1, P2, P3 4.2 I/O interfacing: LED, Relays, Seven segment display 4.3 Timer/Counter programming 4.3.1 Timer / Counter logic and modes 4.3.2 Simple programs on timer to generate time delay and square wave.	**06**	**14**
	EEH408-5 Interface and serial communication of I/O devices with 8051 in assembly		
5	**Serial communication** 5.1 Serial communication SFRs: SCON,SBUF,PCON 5.2 Modes of serial communication 5.3 Simple programs for serial communication	**08**	**14**
	EEH408-6 Maintain different 8051 based applications		
6	**Peripheral interfacing and Applications** Interfacing diagram with programming of following with 8051 6.1 LCD display interfacing 6.2 8 bit ADC and DAC interfacing (0808/0809) 6.3 DC and Stepper Motor interfacing 6.4 Water Level controller design using 8051	**08**	**08**
	Sub-total	**22**	**36**

G. Suggested micro-project / assignment/ activities for specific learning / skill development (SELF LEARNING)

Micro project

a. Build a class period bell using microcontroller 8051.
b. Build a circuit using 8051 microcontroller to blink LED.
c. Build a circuit to display number 0 to 9 with a given delay.
d. Build digital clock with 8051 microcontroller.
e. Develop Fire Detection System using smoke and temperature sensor.

Student Activity

a. Prepare power point presentation on applications of microcontroller.
b. Undertake a market survey of different microcontrollers.

Assignment

a. Prepare a chart of various features using data sheets of 8051 microcontroller and its derivatives.
b. Prepare chart of stepper motor to display its features and steps for its operations using data sheets.
c. Prepare a chart of various types of ADC and DAC to display its features and pin functions using data sheets.

d. Prepare a chart of various types of LCDs to display its features , pin functions and steps of operations using data sheets.
e. Prepare a power point presentation on 8051 interfacing/applications.

H. Specification table for setting question paper for semester end theory assessment

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	Interpret the prominent features of different types of microcontrollers..	02	2	4	**8**	EEH408-1
I / 2	Interpret the salient architectural features of 8051 microcontrollers.	02	4	6	**12**	EEH408-2
I / 3	Develop and Maintain the assembly language program for different operations.	02	6	6	**14**	EEH408-3
II /4	Interface and program different I/O devices with 8051 in assembly	02	4	8	**14**	EEH408-4
II /5	Interface and serial communication of I/O devices with 8051 in assembly	02	6	6	**14**	EEH408-5
II / 6	Maintain different 8051 based applications	02	2	4	**8**	EEH408-6
Total Marks		**12**	**24**	**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	Discipline and punctuality	05
TOTAL		**25**

J. Instructional Methods:

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

K:- Teaching and Learning resources:

Chalk board, LCD presentations, Demonstrative kits, Demonstrative charts

L. Reference Books:

Sr. No.	Name of Book	Author	Publication
1	Kenneth, Ayala	8051 Microcontroller Architecture Programming and Application	PHI Learning
2	Deshmukh, Ajay	Microcontroller Theory and Application,	McGraw Hill.
3	Kamal, Raj,	Microcontroller Architecture Programming, Interfacing and System Design	Pearson Education India,
4	Mathur; Panda,	Microprocessors and Microcontrollers	PHI Learning
5	Krishna Kant,	Microprocessors and Microcontrollers: Architecture programming and System Design	PHI Learning

i. Text Books

Sr. No	Name of Book	Author	Publication
1	Mazidi, Mohmad Ali; Mazidi, Janice Gelispe; MckinlayRoline D.	The 8051 Microcontroller and Embedded system	Pearson Education
2	Pal, Ajit,	Microcontroller Principle and Application	PHI Learning
3	Ayala Kenneth J	The 8051 Microcontroller	Thomson Delmar Learning, 2004 ISBN: 9781401861582
4	Chattopadhyay Santanu	Microcontroller and Applications	All India Council for Technical Education, 2023

M.Learning Website & Software

i. www.nptel.iitm.ac.in
ii. www.learningaboutelectronics.com
iii. www.futurlec.com
iv. www.bis.org.in
v. www.electrical4u.com
vi. www.cadsoft.io
vii. www.electronics-tutorials.com

*****

COURSE NAME : ROBOTICS & AUTOMATION
COURSE CODE : EEH409
COURSE ABBREVIATION : HRAA

A. LEARNING SCHEME:

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	03	1
	Tutorial Learning	-	
	Laboratory Learning	02	
	SLH-Self Learning	--	
	NLH-Notional Learning	05	

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	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	50
--	--	--	--	--	**25**	**10**	25@	10	**--**	**--**	

(Total IKS Hrs for Sem. : Nil)

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 ExaminationNote :

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:-

Industrial robots are widely used in many manufacturing industries, to make it more competitive and efficient. The most obvious impact of industrial robots is that they eliminate many dull, dirty, dear, difficult and dangerous tasks. The use of robot helpful in hazardous and challenging environments. The purpose of Industrial Robotics course is to respond the demands of workforce in industry. It is enormous need that students to learn Industrial Robotics to

become industry ready.

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. Operate industrial robot by developing program and using various sensors.

E. COURSE LEVEL LEARNING OUTCOMES (COS)

EEH409-1 Maintain safe practices while handling or working with robot.
EEH409-2 Identify basic components of industrial robot.
EEH409-3 Operate & Program robot for given application.

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** Maintain various types of electrical equipments	**PSO2** Maintain various sections of electrical power systems
EEH409-1 Maintain safe practices while handling or working with robot.	-	-	-	2.00	3.00	-	3.00	-	-
EEH409-2 Identify basic components of industrial robot.	1.00	2.00	-	-	-	-	-	2.00	-
EEH409-3 Operate & Program robot for given application..	-	3.00	3.00	2.00	-	-	2.00	-	-

F. CONTENT:-

I) Practical exercises

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

Sr. no	Laboratory experiences	CO
1	Introduction to Industrial robotics lab and safety	EEH409-1
2	Demonstration operation of teach pendant	EEH409-2
3	Operation of Motor and drive	EEH409-2
4	Interfacing of end effectors	EEH409-2

Sr. no	Laboratory experiences	CO
5	Introduction to microcontrollers and PLC	EEH409-3
6	Robot programming basic- Basic Robot Program Instructions: MOVE, POINT, WAIT, SET, IF, ELSE, LOOP, HALT, JUMP	EEH409-3
7	Robot programming for Conditional Statements.	EEH409-3
8	Perform the sorting of packages using given robotic arm.	EEH409-3
9	Industrial robot program for Merged Movements, Circular and Arc Movements	EEH409-3
10	Setup, operating and Programming for Machine Tending with Industrial Robotic Arm	EEH409-3

Note:-Atleast 6 practicals need be completed.

II) Theory

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO: EEH409-1: Maintain safe practices while handling or working with robot.			
1	1.1 Introduction, Definition, need, brief history of Industrial Robots. 1.2 Introduction, need, brief & computer languages needed for computer programming of industrial robots 1.3 Automation: Type of automation, Need for automation 1.4 Application of Robots in Industries 1.5 Types of Robots 1.6 Safe Practices while operating 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.	5	--
CO: EEH409-2: Identify basic components of industrial robot.			
2	2.1 Robot configurations- Polar (Spherical), Cylindrical, Cartesian 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 2.7 Introduction to I/O and PLC: For connection of computer to	6	--

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	robot for programming of robot		
CO: EEH409-3: Operate & Program robot for given application.			
3	Three phase synchronous motor 3.7 Robot Operation, Switching Modes, Jogging, Homing the Robot 3.8 Managing Robot Errors and Faults, Logging in and Configuring I/O 3.9 Robot Programming & Operating: Brief Introduction 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, 3.10 Introduction to programming industrial robot by interfacing and programming of programmable logic controller 3.11 Introduction to programming industrial robot by interfacing and programming of microcontroller	7	--

G. 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	Attendance/Discipline and punctuality	05
TOTAL		**25**

H. Instructional Methods:

7. Lectures cum Demonstrations,
8. Class room practices.
9. Use of projector and soft material for demonstration

I. Teaching and Learning resources:

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

J. Reference Books:

S.N.	Name of Book	Author	Publication
7	Robotics And Industrial	R.K. Rajput	S.Chand Limited New Delhi

	Automation		2022
8	Industrial Robotics - Technology ,Programming and Applications	Nicholas Odrey	McGraw Hill Education
9	Robotics and Control	R. Mittle	McGraw Hill Education
10	Robotics Technology and Flexible Automation	S. R. Deb	McGraw Hill Education

K. Learning Website & Software

a. https://nptel.ac.in/courses/112105319
b. https://nptel.ac.in/courses/112105249
c. https://www.gre.ac.uk/
d. https://www.exeter.ac.uk/