GOVERNMENT POLYTECHNIC, KOLHAPUR

(An Autonomous Institute of Government of Maharashtra)

Curriculum Document

CURRICULUM: MPECS 2023

(NEP 2020 Compliant & Outcome Based Curriculum)
For

DIPLOMA IN ELECTRONICS & TELECOMMUNICATION

Secretary **Chairman**

Programme wise Board of Studies (PBOS)
Electronics & Telecommunication Programme
Government Polytechnic, Kolhapur

CURRICULUM STRUCTURE: TEACHING AND EXAMINATION SCHEME OF SEMSTER I

Programme Code	**: ET**	**With Effect From Academic Year**	**: AY 2023-2024**
Duration of Programme	**: 6 Semesters**	**Duration**	**: 16 Weeks**
Semester	**: First**	**Scheme**	**: H**

Sr. No.	Name of Course	Course Abbreviation	Course Type	Course Code	Level	IKS Hrs per Semester	Learning Scheme					Credits	Paper Duration (Hrs)	Assessment Scheme								Based on Self Learning		Total Marks
							CL	TL	LL	Self Learning (TW & Assignment)	Notional Learning Hrs / Week			Theory				Based on LL & TL				SLA		
														FA-TH	SA-TH	Total		FA-PR		SA-PR				
														Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
1	ENGINEERING PHYSICS	HPHA	DSC	CCH101	1	4	4	-	2	2	8	4	1.5	30*#	70*#	100	40	25	10	25@	10	25	10	175
2	BASIC MATHEMATICS	HBMT	AEC	CCH105	1	4	4	2	-	2	8	4	3	30	70	100	40	-	-	-	-	25	10	125
3	ENGINEERING GRAPHICS	HGRC	AEC	CCH109	1	2	2	-	2	0	4	2	-					50	20	50@	20			100
4	BASIC ELECTRONICS	HBTX	DSC	ETH101	1	2	3	-	4	1	8	4	3	30	70	100	40	50	20	25@	10	25	10	200
5	ELECTRONICS WORKSHOP PRACTICE	HWET	SEC	ETH102	1	2	2	-	4	0	6	3	-	-	-	-	-	50	20	50@	20	-	-	100
6	FUNDAMENTALS OF ICT	HICT	SEC	CCH202	2	0	1	-	2	1	4	2	-	-	-	-	-	25	10	25@	10	25	10	75
7	YOGA AND MEDITATION	HYAM	VEC	CCH203	2	1	-	-	1	1	2	1	-	-	-	-	-	25	10	-	-	25	10	50
Total:						15	16	2	15	7	40	20	-	90	210	300		250		175		125		825

CURRICULUM STRUCTURE: TEACHING AND EXAMINATION SCHEME OF SEMSTER II

Programme Code : Electronics & Telecommunication	**With Effect From Academic Year : AY 2023-2024**
Duration of Programme : 6 Semesters	**Duration : 16 Weeks**
Semester : Second	**Scheme : H**

Sr. No.	Name of Course	Course Abbreviation	Course Type	Course Code	Level	IKS Hrs per Semester	Learning Scheme					Credits	Paper Duration (Hrs)	Assessment Scheme								Based on Self Learning		Total Marks
							CL	TL	LL	Self Learning (TW & Assignment)	Notional Learning Hrs / Week			Theory				Based on LL & TL				SLA		
														FA-TH	SA-TH	Total		FA-PR		SA-PR				
														Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
1	APPLIED MATHEMATICS	HAMT	AEC	CCH301	3	2	4	2	-	-	6	3	3	30	70	100	40	-	-	-	-	-	-	100
2	ENGINEERING CHEMISTRY	HCHA	DSC	CCH103	1	4	4	-	2	2	8	4	1.5	30*#	70*#	100	40	25	10	25@	10	25	10	175
3	COMMUNICATION SKILLS	HCMS	AEC	CCH201	2	0	4	-	2	2	8	4	3	30	70	100	40	25	10	-	-	25	10	150
4	APPLIED ELECTRONICS	HATX	DSC	ETH103	1	0	4	-	2	-	6	3	3	30	70	100	40	25	10	25@	10	-	-	150
5	ELECTRICAL ENGINEERING	HEEG	DSC	ETH104	1	0	3	-	2	1	6	3	3	30	70	100	40	25	10	25@	10	25	10	175
6	C PROGRAMMING	HCPR	SEC	ETH105	1	-	2		2	-	4	2	-	-	-	-	-	25	10	25@	10	-	-	50
7	SOCIAL & LIFE SKILLS	HSLS	VEC	CCH204	2	-	-	-	-	2	2	1	-	-	-	-	-	-	-	-	-	50	20	50
Total:						6	21	2	10	7	40	20		150	350	500		125		100		125		850

CURRICULUM STRUCTURE: TEACHING AND EXAMINATION SCHEME OF SEMSTER III

Programme Code	**: Electronics & Telecommunication**	**With Effect From Academic Year**	**: AY 2024-2025**
Duration of Programme	**: 6 Semesters**	**Duration**	**: 16 Weeks**
Semester	**: Third**	**Scheme**	**: H**

Sr. No.	Name of Course	Course Abbrevia-tion	Course Type	Course Code	Level	IKS Hrs per Semester	Learning Scheme					Credits	Paper Duration (Hrs)	Assessment Scheme								Based on Self Learning		Total Marks
							CL	TL	LL	Self Learning (TW & Assignment)	Notional Learning Hrs / Week			Theory				Based on LL & TL				SLA		
														FA-TH	SA-TH	Total		FA-PR		SA-PR				
														Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
1	CIRCUITS & NETWORKS	HCKN	DSC	ETH301	3	0	3	-	2	1	6	3	3	30	70	100	40	25	10	25@	10	25	10	175
2	LINEAR INTEGRATED CIRCUITS	HLIC	DSC	ETH302	3	0	3	-	4	1	8	4	3	30	70	100	40	25	10	25#	10	25	10	175
3	DIGITAL TECHNIQUES & APPLICATIONS	HDTA	DSC	ETH303	3	0	3	-	4	1	8	4	1.5	30*#	70*#	100	40	25	10	25#	10	25	10	175
4	ANALOG COMMUNICATION	HACM	DSC	ETH304	3	0	3	-	2	1	6	3	3	30	70	100	40	25	10	25@	10	25	10	175
5	ELECTRONICS MEASUREMENTS & INSTRUMENTATION	HEMI	DSC	ETH305	3	0	3	-	2	1	6	3	-	-	-	-	-	50	20	25@	10	25	10	100
6	BASIC PYTHON PROGRAMMING	HBPP	AEC	ETH306	3	0	2	-	2	-	4	2		-	-	-	-	25	10	25@	10	-	-	50
7	ESSENCE OF INDIAN CONSTITUTION	HEIC	VEC	CCH205	3	0	1	-	-	1	2	1	-	-	-	-	-	-	-	-	-	50	20	50
Total:						0	18	-	16	6	40	20	-	120	280	400	-	175	-	150	-	175	-	900

ABBREVIATIONS :

CL- CLASSROOM LEARNING , TL- TUTORIAL LEARNING, LL-LABORATORY LEARNING, FA - FORMATIVE ASSESSMENT, SA -SUMMATIVE ASSESSMENT, IKS - INDIAN KNOWLEDGE SYSTEM

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.
    - SELF LEARNING HOURS SHALL NOT BE REflECTED IN THE TIME TABLE.

COURSE CATEGORIES :

A. DISCIPLINE SPECIFIC COURSE CORE (DSC)
B. DISCIPLINE SPECIfiC ELECTIVE (DSE)
C. VALUE EDUCATION COURSE (VEC),
D. INTERN./APPRENTI./PROJECT./COMMUNITY (INP)
E. BILITY ENHANCEMENT COURSE (AEC)
F. SKILL ENHANCEMENT COURSE (SEC)
G. GENERIC ELECTIVE (GE)

SEMESTER I COURSES

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COURSE ID :

COURSE NAME : ENGINEERING PHYSICS (EE/ET/IT)

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 Practical				BASED ON SLA		TOTAL
	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.

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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 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**
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
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	

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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 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**	**08** (06) (02)	**08** (06) (02)
CO: CCH101-3 Select proper material in engineering industry by analysis of its physical properties.			
3	**PROPERTIES OF MATTER**	**12**	**14**

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	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 **No numericals on above topic**	(06) (06)	(10) (04)

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**	**10** (06)	**12** (08)

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	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**	(04)	(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 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**	**14** (06) (04) (04)	**18** (08) (06) (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 Microprojects/ Assignments/ Other Activities under SLA

Sr. No.	List of Microprojects (any one of the following under SLA)	Hrs Allotted
1	Prepare chart showing multipliers required for converting units of physical quantities.	02
2	Prepare prototype vernier caliper of desired least count using card sheet.	02
3	Collect information about ancient astronomical instruments like Chakra, Dhanuryantra, Yasti and Phalaka yantra.	02
4	Collect different materials such as metal, plastic, glass etc and prepare models to show their electrical conductivity.	02
5	Collect different sizes of same material (eg. sugar, salt etc) and list the physical/elerical/optical/chemical/mechanical characteristics for each of them.	02
6	Prepare chart showing the three types of modulus of elasticity developed in a material.	02
7	Prepare working model to differentiate liquids on the basis of viscosity.	02
8	Prepare chart/models to demonstrate magnetic lines of force of different types of magnets.	02
9	Prepare chart/models for series and parallel combination of resistances of different values.	02
10	Prepare a model to demonstrate the variation of angle of refraction with respect to angle of incidence.	02
11	Use keychain laser to differentiate laser with ordinary light.	02
12	Prepare a presentation for application of x-rays in different fields.	02
13	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

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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 microproject/ 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 Semiconductors and Nanotechnology	2	2	4	08	CCH101-2
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	Beiser	Tata Mc-Graw Hill

	physics		
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 ID:

Course Name : BASIC MATHEMATICS
Course Code : CCH105
Course Abbreviation : HBMT
Course Type : AEC
Course Level : 1

LEARNING & ASSESSMENT SCHEME:

IKS Hrs per Semester	Learning Scheme					Credits	Paper Duration (Hrs)	Assessment Scheme								Based on Self Learning		Total Marks
								Theory				Based on LL & TL						
	CL	TL	LL	Self Learning (TW & Assignment)	Notional Learning Hrs / Week			FA TH	SA TH	Total		FA-PR		SA-PR		SLA		
								Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
4	4	2	-	2	8	4	3	30	70	100	40	25	10	-	-	25	10	150

CO,S

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.

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Section I

Unit No.	Topics / Sub-topics	Lectures (Hours)	SA-TH (Marks)
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	14
Unit 2 Statistics	***MEASURES OF DISPERSION*** 2.1 Range,coefficient of Range for Discrete & Grouped Data 2.2 Mean deviation and Standared Deviation about mean 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	10	12
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	06	08
Total		28	34

Section II

Unit No.	Topics / Sub-topics	Lectures (Hours)	SA-TH (Marks)
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
Unit 5 Differential Calculus	5.1 **Functions**:Concept of Functions and simple examples 5.2 Limits:Concept of Limits without examples 5.3 **Derivatives:** 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)	14	16
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 6.4 Radius of curvature	4	6
	Total	32	36

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LIST OF TUTORIALS

Sr. no	Tutorial Title	No.of Hrs	Relevant CO
1	Solve Simple problems of Logarithms based on given application	2	CO1
2	Solve elementary problems on Algebra of Matrices	2	CO1
3	Solve simultaneous equations using Matrix inversion method	2	CO1
4	Resolve into Partial Fractions using linear non repeated, repeated and irreducible quadratic factors	2	CO1
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	2	CO3
6	Solve problems on finding range, coefficient of range and mean deviation	2	CO2
7	Solve problems on Standard deviation, coefficient of variation and comparison of two sets	2	CO2
8	Solve problems on Allied & Compound angles	2	CO4
9	Solve problems on Multiple & submultiple angles	2	CO4
10	Solve problems on factorization & De- factorization formulae	2	CO4
11	Solve problems on Inverse Trigonometric Functions	2	CO4
12	Solve examples on functions & rules of derivatives	2	CO5
13	Solve examples on Derivative of composite function ,inverse & parametric functions,	2	CO5
14	Solve examples on Derivative of exponential,implicit and logarithmic functions	2	CO5
15	Solve examples on Application of Derivatives	2	CO5

COURSE ID:

Course Title : ENGINEERING GRAPHICS
Course Code : CCH109
Course Abbreviation : HGRC

I. COURSE LEVEL LEARNING OUTCOMES (COS)

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

CO1 - Draw geometrical figures and engineering curves.

- CO2 - Apply principles of orthographic projections for drawing given pictorial views.
- CO3 - Apply basic CAD commands for drawing different entities.
- CO4 - Use various drawing codes, conventions and symbols as per IS SP-46 in engineering drawing.
- CO5 - Draw free hand sketches of given engineering elements.

II. TEACHING-LEARNING & ASSESSMENT SCHEME

IKS Hrs per Semester	Learning Scheme					Credits	Paper Duration (Hrs)	Assessment Scheme								Based on Self Learning		Total Marks
								Theory				Based on LL & TL						
	CL	TL	LL	Self Learning (TW & Assignment)	Notional Learning Hrs / Week			FA TH	SA TH	Total		FA-PR		SA-PR		SLA		
								Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
2	2	-	2	0	4	2	-					50	20	50 @	20			100

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III. THEORY CONTENT

Sr.No	Topics/Sub-topics	Lectures	Theory
1	**Basic Elements of Drawing** 1.1 Drawing Instruments and supporting material: method to use them with applications. 1.2 Standard sizes of drawing sheets (ISO-A series) 1.3 I.S. codes for planning and layout. 1.4 Letters and numbers (single stroke vertical) 1.5 Convention of lines and their applications. 1.6 Dimensioning techniques as per SP-46 (Latest edition) – types and applications of chain, parallel and coordinate dimensioning 1.7 Geometrical constructions.		
2	**Engineering curves & Loci of Points.** 2.1 Concept and understanding of focus, directrix, vertex and eccentricity. Conic sections. 2.2 Methods to draw an ellipse by Arcs of circle method& concentric circles method. 2.3 Methods to draw a parabola by Directrix-Focus method & Rectangle method 2.4 Methods to draw a hyperbola by Directrix-Focus method. 2.5 Methods to draw involutes: circle & pentagon,		
3	**Orthographic projections** 3.1 Introduction of projections-orthographic, perspective, isometric and oblique: concept and applications. 3.2 Orthographic projection: First angle and Third angle method, their symbols. Conversion of pictorial view into Orthographic Views – object containing plain surfaces, slanting surfaces, slots, ribs, cylindrical surfaces.		
4	**Computer Aided Drafting** 4.1 Basic entities: line, circle, arc, polygon, ellipse, rectangle, multiline, polyline. 4.2 Commands: trim, delete, copy, offset, array, block, layers. 4.3 Dimensioning: linear, horizontal, vertical, aligned, rotated, baseline, continuous, diameter, radius, angular dimensions. 4.4 Text: Single line, multiline. 4.5 Standard sizes of sheet, selecting various plotting parameters such as paper size, paper units, drawing		

	orientation, plot scale, plot offset, plot area, print preview.		
5	**Free Hand Sketches of EngineeringElements** 5.1 Free hand sketches of machine elements: Thread profiles, nuts, bolts, studs, set screws, washers, Locking arrangements. (For branches other than mechanical Engineering, the teacher should select branch specific elements for free hand sketching)		

I. PRACTICALS

Sr No	Laboratory Practical Exercise	Skills / Competencies to be Developed	Relevant COs
1	Draw horizontal, vertical, 30 degree, 45 degree, 60 & 75 degrees lines using Tee and Set squares/ drafter. (Sketch Book).		CO1
2	Draw different types of lines, dimensioning styles (Sketch Book)		CO1
3	Draw one figure showing dimensioning techniques, two problems on redraw the figures and one problem on lociof points - slider crank mechanism. (Sketch Book)		CO1
4	Draw one figure showing dimensioning techniques, two problems on redraw the figures (01 Sheet)		CO1
5	Draw any four Engineering Curves (Sketchbook)		CO1
6	Draw any four Engineering Curves – (01 Sheet)		CO1
7	Draw two problems on orthographic projections using first angle method of projection having plain surfaces, slanting surfaces and slots etc.- (Sketchbook)		CO2 CO4
8	Draw two problems on orthographic projections using first angle method of projection having plain surfaces, slanting surfaces and slots etc.		CO2 CO4
9	Draw two problems on orthographic projections usingfirst angle method of projection having cylindrical surfaces, ribs etc. (Sketchbook)		CO2 CO4
10	Draw two problems on orthographic projections usingfirst angle method of projection having cylindrical surfaces, ribs etc.- (01 Sheet)		CO2 CO4

11	Draw basic 2D entities like rectangle, rhombus, polygon, arcs, circles using CAD. Commands.		CO3
12	Draw basic 2D entities using rectangular and circular arrays.		CO3
13	Draw basic branch specific components using CAD commands		CO3 CO4
14	Draw complex branch specific components using CAD commands.		CO3 CO4
15	Problem Based Learning: Given the orthographic viewsof at least three objects with few missing lines, the student will try to imagine the corresponding objects, complete the views and draw these views (sketch book).		CO2 CO4
16	Draw freehand Sketches of 12 different standard components (Sketch book)		CO5
17	Draw freehand Sketches of 12 different standard components (1 Sheet)		CO5
18	Correlate ancient Indian sculptures, Indian temples, Monuments, etc. with Engineering Graphics		CO1 CO2 CO3 CO4 CO5

II. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher
1	Bureau of Indian Standards.	Engineering Drawing Practice for Schools and Colleges IS: SP-46	Third Reprint, October 1998 ISBN No. 81-7061-091-2
2	Bhatt, N.D.	Engineering Drawing	Charotar Publishing House, 2010 ISBN No. 978-93-80358-17-8
3	Bhatt, N.D.; Panchal, V. M	Machine Drawing	Charotar Publishing House, 2010 ISBN No. 978-93-80358-11-6
4	Jolhe, D.A.	Engineering Drawing	Tata McGraw Hill Edu. New Delhi, 2010, ISBN No. 978-0-07-064837-1
5	Dhawan, R. K.	Engineering Drawing	S. Chand and Company New Delhi, ISBN No. 81-219-1431-0
6	Pradhan, S.K Jain, K.K	Engineering Graphics	Khanna Book Publishing CO(P) LTD, New Delhi, ISBN No. 978-93-91505-50-9
7	Jeyapoovan T	Engineering Drawing and Graphicsusing AutoCAD	Vikas Publishing House Pvt. Ltd., First Reprint 2013, ISBN NO.978-81259-4000-5

8	Salunkhe R	AutoCAD 2013 2D & 3D for Civil and Mechanical Engineering	Aruta Publishers Chiplun, 2013, ISBN No. 978-81-902648-1-5

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.youtube.com/watch?v=dmt6_n7Sgcg	Free Hand Sketches
2	https://www.youtube.com/watch?v=dmt6_n7Sgcg	Orthographic Projection
3	https://www.youtube.com/watch?v=3WXPanCq9LI	Basics of Projection
4	https://www.youtube.com/watch?v=fvjk7PlxAuo	Introduction to Engineering Graphics
5	https://www.youtube.com/watch?v=cmR9cfWJRUU	Basics of AutoCAD

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COURSE ID :

COURSE NAME : BASIC ELECTRONICS

COURSE CODE : ETH101

COURSE ABBREVIATION : HBTX

A. LEARNING SCHEME:

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	03	04
	Tutorial Learning	00	
	Laboratory Learning	04	
	SLH-Self Learning	01	
	NLH-Notional Learning	08	

B. ASSESSMENT SCHEME:-

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		Total
					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	50	20	25@	10	25	10	200

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 basic electronics course is essential for building foundational knowledge, developing practical skills, preparing for various careers, and fostering technological literacy. It also promotes critical thinking, innovation and interdisciplinary applications, while supporting broader educational and personal development goals. Section I covers Semiconductor Diodes, Rectifiers and Filters and Regulators and Power supply. In section II Bipolar Junction Transistor, Biasing of transistor, BJT amplifiers and Field Effect Transistors (FET) are covered. So this course is the base of all electronic courses offered in forthcoming semesters.

ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

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

1. Maintain and operate semiconductor diode in rectifiers and regulator power supply.
2. Maintain and operate the transistor in basic electronics circuits..

G. COURSE LEVEL LEARNING OUTCOMES (COs)

ETH101-1 Describe construction, working and characteristics of diodes.
ETH101-2 Use rectifiers and filters in electronics circuit
ETH101-3 Maintain DC regulated power supply.
ETH101-4 Use BJT in electronics circuits
ETH101-5 Examine and use various types of biasing circuits of BJT
ETH101-6 Use FET and MOSFET in electronics circuits

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
ETH101-1 Describe construction, working and characteristics of diodes	3	2	-	3	-	-	--	2	--
ETH101-2 Use rectifiers and filters in electronics circuit	3	2	-	2	--	--	--	3	2

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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
ETH101-3 Maintain DC regulated power supply	3	2	2	2	-	--	--	3	3
ETH101-4 Use BJT in electronics circuits	3	1	1	2	--	--	--	3	--
ETH101-5 Examine and use various types of biasing circuits of BJT	3	2	2	2	-	--	--	3	1
ETH101-6 Use FET and MOSFET in electronics circuits	3	2	--	1	--	--	--	3	--

H. CONTENT:

II) Practical exercises

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

Sr. No.	Laboratory experiences	CO
1.	Identification and operation of CRO and Function Generator for voltage and frequency measurement in basic electronics laboratory	ETH 101-1
2.	Identification and operation of Regulated Power Supply for amplitude measurement in basic electronics laboratory	ETH 101-1
3.	Plot V-I characteristics of PN junction diode.	ETH 101-1
4.	Plot V-I characteristics of Zener diode.	ETH 101-1
5.	Plot V-I characteristics of LED.	ETH 101-1
6.	Plot V-I characteristics of Photodiode.	ETH 101-1
7.	Test the performance of half wave rectifier.	ETH 101-2
8.	Test the performance of full wave center tapped rectifier.	ETH 101-2
9.	Test the performance of full wave bridge rectifier.	ETH 101-2
10.	Test the performance of full wave rectifier with capacitor filter.	ETH 101-2
11.	Test the performance of full wave rectifier with LC filter.	ETH 101-2
12.	Test the performance of full wave rectifier with CLC filter.	ETH 101-2
13.	Build and test the performance of regulated power supply using IC 78XX	ETH 101-3
14.	Build and test the performance of regulated power supply using IC 79XX	ETH 101-3
15.	Build and test the performance of regulated power supply using ICLM317	ETH 101-3
16.	Verify performance of zener diode as voltage regulator: Line regulation	ETH 101-3

17.	Verify performance of zener diode as voltage regulator: Load regulation	ETH 101-3
18.	Identify and select transistors using datasheets	ETH 101-4
19.	Build, Test and Plot input and output characteristics of CE configuration	ETH 101-4
20.	Build, Test and Plot input and output characteristics of CB configuration	ETH 101-4
21.	Build and Test the BJT Fixed bias circuit for given input.	ETH 101-5
22.	Build and Test the BJT voltage divider bias circuit for given input.	ETH 101-5
23.	Construct and Test the performance parameters of BJT as Switch.	ETH 101-5
24.	Test the performance of JFET drain characteristics	ETH 101-6
25.	Test the performance of JFET transfer characteristics and calculate transconductance.	ETH 101-6
26.	Build complete circuit diagram of regulated power supply using IC 78XX/79XX on general purpose PCB	ETH 101-3
27.	Build the circuit of BJT as Switch on general purpose PCB	ETH 101-5

III) Theory

Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	ETH101-1 Describe construction, working and characteristics of diodes.		
1	**Semiconductor Diodes** 1.1 Construction, Symbol of P-N junction diode 1.2 P-N Junction with Unbias, forward Bias and reverse Bias. 1.3 Working principle of P-N junction diode 1.4 V-I characteristics of P-N junction diode. 1.5 Ideal diode and practical diode model. 1.6 Important specifications of P-N junction diode: PIV rating, Static forward and reverse resistance, dynamic forward and reverse resistance, Steady state forward current, Static forward voltage drop, Continuous power dissipation 1.7 Breakdown mechanism: Avalanche and zener breakdown 1.8 Zener diode: Construction Symbol, V-I characteristics and applications. 1.9 Specifications of zener diode: Zener voltage, Break over current (I_{ZK}), Zener test current (I_{ZT}) Dynamic Impedance (Z_Z), Power dissipation. 1.10 Construction, symbol and V-I characteristics of LED, photodiode, varactor diode and tunnel diode.	**10**	**14**
	ETH101-2 Use rectifiers and filters in electronics circuit		
2	**Rectifiers and Filters** 2.1 Definition, need and classification of rectifier. 2.2 Half wave and full wave rectifier: Circuit diagram, operation	**6**	**10**

	and waveforms. 2.3 Parameters of rectifier: Average DC value of current and voltage ripple factor ripple frequency, PIV of diode, TUF, efficiency of rectifier of HWR and Full wave Center tapped and Bridge rectifier. (No derivation) 2.4 Definition and need of filter, types of filters: shunt capacitor filter, series inductor filter, LC filter and CLC filter. 2.5 Operation of each filter w.r.t. full wave bridge rectifier. 2.6 Comparison of filters		
	ETH 101-3 Maintain DC regulated power supply.		
3	**Regulators and Power supply** 3.1 Need of Regulated power supply. Basic block diagram of DC regulated power supply and function of each block 3.2 Load and Line regulation. 3.3 Zener diode voltage regulator: load and line regulation 3.4 Fixed voltage IC Regulator: Three terminal Pin diagram, working and specifications of 78XX and 79XX series. 3.5 Complete Circuit diagram of DC regulated power supply. 3.6 Variable voltage IC Regulator : LM 317 pin diagram Simple numerical on IC LM317	**6**	**10**
	Sub-total	**22**	**34**

Section –II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	ETH 101-4 Use BJT in electronics circuits		
4	**Bipolar Junction Transistor** 3.1 BJT-Types, symbols 3.2 Construction of BJT. 3.3 Operating principles of NPN & PNP Transistor 3.4 Transistor configurations: CB,CE,CC 3.5 Modes of operation: Active, Cut-off, Saturation 3.6 Current amplification factor (α,β,γ) and Relation between them 3.7 Transistor input & output characteristic for CE & CB configuration. Numerical based on transistor current and amplification factor.	**7**	**12**
	ETH101-5 Examine and use various types of biasing circuits of BJT		
5	**Biasing of transistor** 4.1 Load line: AC Load line, DC Load Line 4.2 Quiescent Point for DC Load Line 4.3. Bias Stability, stability factor, Factors affecting bias stability, Thermal runaway 4.4 Transistor Biasing Methods: Different transistor biasing circuits. Circuit equations, advantages & disadvantages of 4.4.1 Fixed Bias Circuit 4.4.2 Voltage Divider Bias Circuit	**8**	**12**

	ETH101-6 Use FET and MOSFET in electronics circuits		
6	**Field Effect Transistor (FET)** 6.1 FET as voltage controlled device, Classification of FET **Junction Field Effect Transistor(JFET)** 6.2 Symbols of N-channel and P-channel JFET 6.3 Construction of N-channel and P-channel JFET 6.4 Working principle of N-channel JFET 6.5 Drain and transfer Characteristics of N- channel JFET 6.6 JFET parameters-A.C. drain resistance(rd), transconductance (gm), amplification factor(μ), relation between μ,rd & gm 6.7 Advantages, disadvantages, applications of JFET 6.8 Comparison between JFET and BJT **Metal Oxide Field Effect Transistor:-** 6.9 Types and symbol of MOSFET- Depletion type MOSFET and Enhancement type MOSFET 6.10 Working principle of N-channel depletion type and enhancement type MOSFET 6.11 Applications of MOSFET	**8**	**12**
	Sub-total	**23**	**36**

G : List of Assignments under SLA

Sr. No.	List of Assignment (under SLA)	Hours allotted
1.	Write procedure to measure AC and DC amplitude, time period and frequency using CRO and function generator.	02
2.	Tabulate important characteristics of commonly available semiconductor diodes.	02
3.	Tabulate important characteristics of commonly available zener diodes.	02
4.	Tabulate important characteristics of commonly available LEDs.	02
5.	Write a procedure to test semiconductor diode using DMM	02
6.	Draw a chart showing circuit diagrams of half wave and full wave rectifiers with waveforms and equations.	02
7.	Study rectifier IC KBU 808	02
8.	Study of different types of regulator ICs other than mentioned in curriculum.	02
9.	Study Switch Mode Power Supply.	02
10.	Write procedure to identify terminals of BJT using digital multimeter	02
11.	Select specific BJTs and study the datasheet.	02
12.	Study different types of transistor biasing circuits.	02
13.	Which type of transistor biasing method is widely used? Why?	02
14.	Study working of JFET as variable resistor	02
15.	Study working of MOSFET as variable capacitor	02

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**Eight out of 12 assignments covering all six COs are compulsory. As per the requirement course teacher can modify the assignments.

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	Semiconductor Diodes	4	2	8	14	ETH101-1
I / 2	Rectifiers and Filters	2	2	6	10	ETH101-2
I / 3	Regulators and Power supply	2	8	-	10	ETH101-3
II /4	Bipolar Junction Transistor	2	8	2	12	ETH101-4
II /5	Biasing of transistor	-	4	8	12	ETH101-5
II / 6	Field Effect Transistor	-	4	8	12	ETH101-6
Total Marks		10	28	32	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**

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:

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

K) Teaching and Learning resources:

Chalk board, LCD presentations, Demonstrative kits, Demonstrative charts

LI) Reference Books:

Sr. No	Name of Book	Author	Publication
1	Principles of Electronics	Mehta, V.K. Mehta, RohitMehta	S.Chand New Delhi, edition-2008ISBN-13: 978-8121927833
2	Electronics Circuit and Circuit theory	Robert L.Boylestead	Pearson Education India, ISBN-13978-9332542600
3	A Text book of Applied Electronics	Sedha, R.S.	S.Chand (G/L) & Company Ltd;ISBN-13 978-8121904209
4	Basic Electronics (solid State)	B.L.Theraja	S Chand;ISBN-13 978-8121925556
5	Electronic Principles	Albert P. Malvino, David J.Bates	McGraw Hill; ISBN-13 978-9354602399
6	Basic Electronics and Linear Circuits	by N.N. Bhargava (Author), D.C. Kulshreshtha (Author), S.C. Gupta (Author)	NITTTR Chandigarh 2nd Edition

M) Learning Website & Software

a. www.circuitstoday.com/
b. www.circuitlab.com/
c. www.vlab.com
d. www.tinkercad.com

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COURSE ID :

COURSE NAME : ELECTRONICS WORKSHOP PRACTICE
COURSE CODE : ETH102
COURSE ABBREVIATION : HWET

A. LEARNING SCHEME:

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

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				100
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
--	--	--	--	--	50	20	50@	20	--	--	

(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.

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:-

Engineering diploma holders specializing in electronics are expected to handle various mechanical, electrical and electronics tools in the workshop in any industry in which they are employed. This course provides simulated industrial environment and enable students to perform a variety of operations in various shops using relevant electrical and electronic materials as well as use appropriate hand tools, equipment, tools and machinery. Through this course student will develop practical skills in identifying, testing, soldering, de-soldering, assembly, simulate, PCB design etc. of electronic components and circuits that will also be very useful for projects and other courses that he or she will undertake during the diploma programme as well as in the world of work.

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. Build simple electronic circuits on PCB.

I. COURSE LEVEL LEARNING OUTCOMES

ETH 102.1 Identify and measure the values of passive components.
ETH 102.2 Identify the different types of switches, relays and digital displays
ETH 102.3 Prepare the PCB using SMD component and ICs
ETH 102.4 Identify the different types of cables and connectors
ETH 102.5 Use digital meters and transducers in electronics circuits
ETH102-6 Identify and use oscilloscope and signal generator in electronics circuits.

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 Operate and Maintain:**	**PSO2 Supervision and providing solution :**
Competency: Build simple electronic circuits on PCB	3	1	2	2	0	0	2	2	-
ETH 102.1 CO-1 Identify and measure the values of passive components.	3	2	0	2	0	0	2	2	-
ETH 102.2 CO-2 Identify the different types of switches, relays and digital displays	3	0	0	2	0	0	2	2	-
ETH 102.3 CO-3 Prepare the PCB using SMD	3	0	2	2	0	2	2	2	-

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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 Operate and Maintain:**	**PSO2 Supervision and providing solution:**
component and ICs									
ETH 102.4 CO-4 Identify the different types of cables and connectors	3	0	0	1	0	0	2	2	-
ETH 102.5 CO-5 Use digital meters and transducers in electronics circuits	3	1	0	1	0	0	2	2	-
ETH102-6 CO-6 Identify and use oscilloscope and signal generator in electronics circuits.	3	1	0	1	0	0	2	2	-

J. CONTENT:

III) Practical exercises

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

Sr. no	Laboratory experiences	CO
1	Safety symbols	ETH102-1
2	Fire extinguishers and accessories	ETH102-1
3	Identification and operation of DMM, Breadboard and Test different types of fixed resistors.	ETH102-1
4	Test different types of variable resistors.	ETH102-1
5	Test different types of fixed capacitors.	ETH 102.1
6	Test different types of variable capacitors.	ETH 102.1
7	Test different types of inductors.	ETH 102.1
8	Identification of windings of transformer	ETH 102.1
9	Test performance of relay	ETH 102.2
10	Test performance of Seven segment display	ETH 102.2
11	Test performance of LCD Displays	ETH 102.2

Sr. no	Laboratory experiences	CO
12	Test performance of Switches	ETH 102.2
13	Build simple circuits on a breadboard using resistors, diode, switch and LED.	ETH 102.2
14	Design PCB(Demonstration using software tool or Video)	ETH 102.3
15	Design PCB using copper clad or zero PCB	ETH 102.3
16	Identification of SMDs and ICs	ETH 102.3
17	Identify the different types of cables	ETH 102.4
18	Identify the different types of connectors	ETH 102.4
19	Test the performance of RTD	ETH 102.5
20	Test the performance of LVDT	ETH 102.5
21	Use thermocouple to measure temperature of the given liquid	ETH 102.5
22	Test relation between Linear displacement and output voltage using LVDT	ETH 102.5
23	Identification and operation of Regulated Power Supply for amplitude measurement in basic electronics laboratory	ETH102-6
24	Identification and operation of CRO and Function Generator for amplitude measurement in basic electronics laboratory	ETH102-6
25	Identification and operation of CRO and Function Generator for frequency measurement in basic electronics laboratory	ETH102-6
26	Identification and operation of DSO to measure amplitude and frequency of given signal	ETH102-6
27	Visit the industry	All Cos

IV) Theory

Section I

Sr. no.	Topics/Subtopics	Learning (Hours)
CO: ETH 102.1 Identify and measure the values of passive components.		
1	**Resistors:** 1.1 Components-discrete, non-discrete, Active, passive components. 1.2 Concept of Resistors, Classification of resistors, Resistors general specification: - maximum voltage rating, power rating, temperature coefficient, tolerance, Ohmic range, operating temperature 1.3 Color Coding with three, four and five bands of resistors **Capacitors:** 1.4 Concept of Capacitor 1.5 Classification of capacitors 1.6 Coding of capacitors using numerals and color band system. **Inductors:** 1.7 Concept of Inductor, Classification of Inductor	06

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Sr. no.	Topics/Subtopics	Learning (Hours)
	1.8 Specifications:- self-inductance, mutual inductance, coefficient of coupling, Q factor, Inductive Reactance 1.9 Color coding of Inductor. **Transformers:** 1.10 Definition of transformer. Types of transformer: Step up and Step down transformer	
CO: ETH 102.2 Identify the different types of switches, relays and digital displays		
2	**Switches, Relays and Displays** **Switches:** 2.1 Types of Switches: SPST, SPDT, DPST, DPDT 2.2 Construction and application of Toggle, Rotary, push to on & push to off, Rocker switch, slide switch, limit switch, proximity switch, photo sensor switch. **Relays**: 2.3 Construction and working of electromechanical relay 2.4 Construction and working of solid state relay **Displays:** 2.5 Classifications of displays 2.6 Construction, operation & application of LED, Seven segment display-common cathode & common anode display, Dot matrix display, sixteen, fourteen segment display 2.7Construction, operation & applications of Liquid crystal display (LCD)-Dynamic Scattering Display Different types of switches (IKS learning)	04
3	**Introduction to PCB, SMD and IC** **PCB:** 3.1 Concept of PCB ,Advantages & disadvantages of PCB, Types of PCB 3.2 Base & Conducting material, types of laminates, Flowchart for preparation of single sided PCB **SMD:** . 3.3 Introduction to SMT,SMD 3.4 Advantages & disadvantages of SMD. **Integrated Circuit:** 3.5 Concept of IC, Advantages & disadvantages of ICs 3.6 Classification of IC's, Linear and Digital IC's and its examples, Flowchart for preparation of IC	04

Section –II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
CO: ETH 102.4 Identify the different types of cables and connectors			
4	**Cables and Connectors** **Cables:** 4.1 Types of cable 4.2 Construction, and applications of coaxial cable, telephone cable, FRC cable, Twin core cable(Twisted & Shielded type)cable used for CRO. **Connectors:** 4.3 Types of connectors 4.4 Construction and applications of BNC, TNC, Edge, FRC connectors, Phone Plug & Jacks	04	
CO: ETH 102.5 Use digital meters and transducers in electronics circuits			
5	**Digital meters and introduction to transducers.** 5.1 Concepts of ADC & DAC only 5.2 Advantages and Disadvantages of Digital Instruments , Comparison of digital and analog instruments 5.3 Resolution, Sensitivity and Accuracy of digital display. 5.4 Digital Multimeter: Measurement of electrical quantities. 5.5 Transducers: Definition, classification: Active, Passive, Primary, Secondary, Analog, Digital 5.6 Construction, Operation, Applications : LVDT, RTD.	06	
CO: ETH102-6 Identify and use oscilloscope and signal generator in electronics circuits.			
6	**Oscilloscope and Signal Generator** 6.1 CRO-Front panel control of CRO. 6.2 Digital storage oscilloscope: Function of DSO. 6.3 Uses of CRO & DSO- Amplitude, Frequency and Phase measurement 6.4 Signal / Function generator-AF and RF type- Block diagram and Operation only.	06	

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

G:-Assessment Criteria

i) Formative Assessment of Practical:-

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

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

ii) Summative Assessment of Practical:

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

Sr. no	**Criteria**	**Marks allotted**
1	Attendance at regular practical	10
2	Preparedness for practical	10
3	Neat & complete Diagram.	10
4	Observations & handling of instrument.	10
5	Oral Based on Lab work and completion of task	10
TOTAL		**50**

H) Instructional Methods:

6. Lectures cum Demonstrations,
7. Class room practices.
8. Use of projector and soft material for demonstration
4. Animation videos
5. Simulation software

I) Teaching and Learning resources:

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

J) Reference Books:

S.N.	Name of Book	Author	Publication
11	Raghuwanshi B.S.	A Course in Workshop Technology	Dhanpat Rai & Sons, New Delhi, 2017or latest edition
12	Sarathe A.K.	Engineering Workshop Practice	Khanna Book Publishing Co.(P) Ltd. ,New Delhi; 2021 or latest edition ISBN:978-9391505516
13	Gupta J.K., Khurmi R.S.	A Textbook of Manufacturing Process (Workshop Technology)	S. Chand and Co., New Delhi, 2021 or latest edition, ISBN: 978-8121908689
14	Jones, Thomas H.	Electronic Components Handbook	Reston Publishing, Virginia, US, latest edition, ISBN: 978-0879092221
15	Mehta V.K., Mehta Rohit	Principles of Electronics	S. Chand and Co., New Delhi-110 055,2014, ISBN: 978-8121924504
16	Glory Priyadarshini J. , Rani	Engineering	Notion Press, Mumbai, 2021 or

	K.S.S., Maheswari M.P.,Gomathy S.	Workshop practice on Electrical & Electronics Engineering	latest edition, ISBN: 978-1639203819

K) Learning Website & Software

Sr.No	Link / Portal	Description
1	http://fireextinguishertraining.com/	Fire extinguisher
2	www.youtube.com/watch?v=WE-SislzSMY	Fire extinguisher
3	https://www.youtube.com/watch?v=lUojO1HvC8c	Fire extinguisher
4	https://www.youtube.com/watch?v=0jbFC8dvTVY	Electrical tools
5	https://www.electroschematics.com/tools/	Electronic tools
6	https://www.youtube.com/watch?v=Fwj_d3uO5g8	Diodes
7	http://www.eleccircuit.com	Electronic circuit
8	https://mightyohm.com/files/soldercomic/FullSolderComic_EN.pdf	Soldering
9	https://www.tinkercad.com/	3D modeling software
10	Multisim Live Online Circuit Simulator	Simulation software
11	EveryCircuit	Mobile Application

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COURSE ID :

Course Name : Fundamentals of ICT(CE/ME/EE/MT/ET/IT)

Course Code : CCH202

Course Abbreviation : HICT

A. LEARNING SCHEME:

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	01	02
	Tutorial Learning	00	
	Laboratory Learning	02	
	SLH-Self Learning	01	
	NLH-Notional Learning	04	

B. ASSESSMENT SCHEME:-

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

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

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

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

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

D. RATIONALE:

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

E. COMPETENCY:

Apply Fundamental knowledge of computer system to work with simpleapplications.

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

F. 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 preadsheet

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

G. 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

H. 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 withfiles and folders	1.1 Identify various Input/output devices, connections and peripherals ofcomputer system 1.2 Work with Computer System, Input/output devices,	CCH202-1
2.	Work with document files: a) Create, editand save documentin Word Processing. b) Text, lines andparagraph level formatting	2.1 Create and manage word document. 2.2 Apply formatting featureson 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, and printing. 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 andcolumns 6.3 Apply alignment feature oncell	CCH202-3
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 in Spreadsheet.	8.1 Implement data Sorting, Filtering and Data validation features in a worksheet.	CCH202-3
9	Charts for VisualPresentation in Spreadsheet.	9.1 Create charts using various chartoptions in spreadsheet.	CCH202-3

10	Worksheet Printing.	10.1 Print the worksheet by applyingvarious print optionsfor worksheet	CCH202-3
11	Make Slide Show Presentation.	11.1 Apply design themes tothe 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 in presentation	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 Internetand 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 usingdifferent options	CCH202-6

I. 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 langanother. 4) Use cloud based storage drive to store and share your files.

Assignment

Prepare journal of practical performed in the laboratory.

Micro project

The microproject has to be industry application based, internet-based, workshop- based, laboratory-based obased as suggested by Teacher. 1) Perform a survey on various input and output devices available in market a its report. 2) Prepare Time Table, Prepare Notes on Technical Topics, Reports, Biodata with covering letter (S teacher shall assign adocument to be prepared by each students) 3) Prepare slides with all Presentation featur as: classroom presentation, presentation about department, presentation of Technical Topics. (Subject teacher assign a presentation to be prepared by each student). 4) StudentMarksheet, 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 anyindustry ChatGPT/any other AI tool.

J. 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)

K. 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), MemoryUnit 1.2 Internal components: processor, motherboards, randomaccessmemory (RAM), read-only memory (ROM), video cards, sound cards and internal hard disk drives) 1.3 External Devices: Types of input/output devices, typesof 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-editingsoftware, graphics manipulation software System Software compilers, linkers, devicedrivers, operating system 1.5 Network environments: network interface cards, hubs, switches, routers and modems, concept of LAN, MAN, WAN,WLAN, Wi-Fi and Bluetooth 1.6 Working with Operating Systems: Create and manage file andfolders, Copy a file, renaming and deleting of filesand folders, Searching files and folders, application installation, creating shortcut of application on the desktop.	2

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Course Outcome CCH202-2 - Prepare Business document using Word Processing Tool.		
2	**Word Processing** 2.1 Word Processing: Overview of Word processor Basicsof Fonttype, 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 redocommands, 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 apage break, Insert page numbers, Insert the dateand time, Insert	3
Sr. No.	**Topics / Sub-topics**	**Lectures (Hours)**
	special characters (symbols), Insert a picture from a file, Resizeand reposition a picture 2.5 Working with Tables: Insert a table, Convert a table totext, Navigate and select text in a table, Resize table cells,Align text ina table, Format a table, Insert and delete columns and rows, Borders and shading, Repeat table headings on subsequent pageorking with Columned Layouts and Section Breaks:a Columns, Section breaks, Creating columns, Newsletterstyle columns, Changing part of a document layout or formatting, Remove section break, Add columns to remainder of a document, Columnwidths, Adjust	
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, CopyWorksheet, Delete Worksheet, Close and openWorkbook. 3.2 Editing Worksheet: Insert and select data, adjust row heightand 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, SettingFonts, Text options, Rotate Cells, Setting Colors, Text Alignments, Merge and Wrap, apply Borders and Shades,Sheet Options, Adjust Margins, Page Orientation, Headerand Footer, Insert PageBreaks, S 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 usingIF. 3.5 Working with Charts: Introduction to charts, overviewof different types of charts, Bar, Pie, Line charts, creatingand editingcharts. Using chart options: chart title, axis title, legend, data labels, Axes, grid lines, moving chart ina separate sheet. Advanced Operations: Conditional Formatting, DataFiltering, 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 Prese 4.2 Inserting Media elements: Adding and Modifying GraphicalObjects to a Presentation - Insert Images into aPresentation,	4
Sr. No.	**Topics / Sub-topics**	**Lectures (Hours)**
	insert audio clips, video/animation, Add Shapes, Add Visual Styles to Text in a Presentation, Edit Graphical Objects on aSlide, Format 4.3 Working with Tables: Insert a Table in a Slide, FormatTables,and Import Tables from Other Office Applications. Working with Charts: Insert Charts in a Slide, Modify Chart, Import Charts from Other Office Applications.	

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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 effectivelyfor 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 otherApps	3

L. 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

M. 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**

N. INSTRUCTIONAL STRATEGIES:

InstructionalMethods :

a. Lectures cum Discussions
b. Regular Home Assignments.
c. Laboratory experiences and laboratory interactive sessions

Teaching and Learning resources:

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

O. 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, Windows10	QUE Publishing; 8th edition August 2015, ISBN: 978-0789754516
3	Alvaro Felix	Linux: Easy Linux for Beginners	CreatevSpace Independent Publishing Platform- 2016, ISBN-13: 978-1533683731
4	Johnson Steve	Microsoft Office 2010: On Demand	Pearson Education, New Delhi India, 2010. ISBN :9788131770641
5	Schwartz Steve	Microsoft Office 2010 for Windows: Visual Quick Start	Pearson Education, New Delhi India, 2012, ISBN : 9788131766613

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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
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
Sr.No	**Link / Portal**	**Description**
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

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COURSE ID:

Course Name : YOGA & MEDITATION
Course Code : CCH203
Course Abbreviation : HYAM

TEACHING SCHEME:

Pre-requisite Course(s) : <*nil* >

Teaching Scheme:

Scheme component	Hours / week	Credits
Theory	NIL	
Practical	01	

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

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	RelevantCOs
LLO 1.1 Practice warming up for Yoga.	1	Introduction :- 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. Neck movement, ii. Shoulder movement, iii. Trunk movement, iv. Knee movement, v. Ankle movement.	3	CO1
LLO 2.1 Practice Sun salutaion	2	Lab Exp: 2. Perform all the postures of Sun salutation- one by one in a very slow pace, after warm up. Lab Exp 3. Perform multiple Surya Namaskar (Starting with three and gradually increasing it to twelve) in one go. Experiment 2 to 4 must be followed by Shavasana for self relaxation.	4	CO1 CO2

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	RelevantCOs

LLO 3.1 Practice basic Asanas	3	Lab Exp: 4 Perform Sarvangasna,Halasana,Kandharasaa (setubandhasana), uttanpadasan, pavan muktasan. Lab Exp: 5 Perform Bhujangasana,Naukasana,Mandukasan Lab Exp: 6 Perform Shalabhasan, Dhanurasan, Vakrasan, Gomukhasan, Paschimottasana, Ardhamachendrasan. Lab Exp: 7 Perform Veerasan Veerbhadrasana, Vrukshasana,Trikonasana. Follow up experiment 5 to 7 with shavasana for self relaxation	4	CO2
LLO 4.1 Practice basic pranayama	4	Lab Exp: 8 Perform Deep breathing, Anulom Vilom Pranayam Kriya Lab Exp: 9 Practice Kapalbhati Pranayam Kriya, Bhastrika Lab Exp:10 Practice Bhramary and sheetali Pranayam.	2	CO3
LLO 5.1 Practice meditation	5	Lab Exp: 11 Perform sitting in Dhyan Mudra and meditating.Start with five minute and slowly increasing to higher durations. Introduction to Vipasshana, Anapan and Chakras. (Trainer will explain the benefits of Meditation before practice)	2	CO3

Note :

Note:

1. Start and end of each session can be with appropriate Yoga prayers and chanting of Omkar. 2. Trainers can add similar asanas in practical sessions.
3. Students are to be instructed to practice the experiment performed at least twice a week as part of self learning practices.
4. Live demonstration by the trainer needs to be carried out during practical hours. Yogic Videos can be used as well .

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

Micro project

i. Maintain a diary indicating date wise practice done by the student with a photograph of self in yogic posture.

ii. Write up details any five asans illustrating steps to perform, posture image, benefits and precautions.

Assignment

Prepare Diet and nutrition chart for self

Self Learning and Practice

- Practice at least thrice a week.
- Read books on different methods to maintain health, wellness and to enhance mood
- Watch videos on Yoga Practices.

SEMESTER II COURSES

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COURSE ID :

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

A. LEARNING SCHEME:

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

B. ASSESSMENT SCHEME :-

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					Tutorial						
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR				
	MAX	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 LearningAssessment
Legends:@InternalAssessment,#ExternalAssessment,*#OnLine Examination,@$InternalOnlineExamination(TNR 12 font)

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

D. i) RATIONALE:-

Mathematics is an important pre-requisite for the development and understanding of engineering and technological concepts. For an engineer and technologist, knowledge of Mathematics is an effective tool to pursue and to master the applications in the engineering and technological fields. Applied mathematics is

designed for its applications in engineering and technology. It includes integration, differential equation,. The connection between applied mathematics and its applications in real life can be understood and appreciated. Integral calculus helps in finding the area . Differential equation is used in finding curve, rectilinear motion. Statistics and probability will help a student to analyze data of large volume in their higher studies. The fundamentals of these topics are directly useful in understanding engineering applications in various fields.

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

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

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

CCH301-1 : To solve examples on integration using various techniques
CCH301-2 : To solve Differential equation of first order and first degree by various methods
CCH301-3 : To find approximate solution of algebraic equations and simultaneous equations by various methods.
CCH301-4:- To solve problems on Probability distributions
CCH301-5 :- Solve examples on Laplace Transform

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	3	1	1	1	1	1	1		

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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
equation of first order and first 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	1	1		
CCH301-4-CO-4:- To solve problems on Probability distributions	2	2	2	2	2	1	2		
CCH301-5-CO-5:- Solve examples on Laplace Transform	2	1	1	1	1	1	1		

F. CONTENT:

IV) 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

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

G. 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: CCH301-2 : To solve Differential equation of first order and first degree by various methods			
Unit 3 Differential equation	**Differential equation** 4.1 Definition of differential equation 4.2 Order & degree of Differential equations 4.3 Methods of solving Differential equations of first order & first degree of following types: 4.3.1 Variable separable form 4.3.2 Exact Differential equations 4.3.3 Linear Differential Equations	8	10

Section –II

Sr. no.	**Topics/Subtopics**	Learning Hours	Classroom learning evaluation Marks
CO: CCH301-3 :- To find approximate solution of algebraic equations and simultaneous equations by various methods.			
Unit 4 Numerical Methods	**Numerical Methods** 4.1Numerical 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 Trancef orm**	**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

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	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	

I. Assessment Criteria

i) Formative Assessment (Assessment for Learning)

- **Tests**

ii) Summative Assessment (Assessment of Learning)

- **End term exam**

J. Instructional Methods:

9. Lectures cum Demonstrations
10. Classroom practices
11. Use of projector and soft material for demonstration
12. Use of softwares such as Geogebra

K. Teaching and Learning resources:

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

L. Reference Books:

S.N.	Name of Book	Author	Publication
17	Higher Engineering Mathematics	Grewal B.S.	Khanna publication New Delhi,2013 ISBN:8174091955
18	A textbook of Engineering Mathematics	Dutta.D.	New age publication New Delhi,2006 ISBN:978-81-224-1689-3
19	Advance Engineering Mathematics	Kreysizg,Ervin	Wiley publication New Delhi,2016 ISBN:978-81-265-5423-2
20	Advance Engineering Mathematics	Das H.K.	S Chand publication New Delhi,2008 ISBN:978-81-219-0345-5
21	Introductory Methods of Numerical Analysis	S.S.Sastry	PHI Learning Private Limited,New Delhi.ISBN:978-81-203-4592-8
22	Studies in the History of Indian Mathematics	C.S.Seshadri	Hindustan Book Agency (India) P 19 Green Park

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			Extension New Delhi.ISBN 978-93-80250-06-9
23	Calculus & Its Applications	Marvin L.Bittinger David J.Ellenbogen Scott A. Surgent	Addison-Wesley 10th Edition ISBN-13:978-0-321-69433-1
24	An Introduction to Statistical Learning with Application in R	Gareth James,Hastie Robert & Tibshirani	Springer New York Heidelberg Dordrecht London ISBN:978-1-4614-7138-7(eBook)

M. Learning Website & Software

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

COURSE ID :

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 Practical				BASED ON SLA		TOTAL
	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 - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

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

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

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

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D. i) RATIONALE:-

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

ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

Apply principles of advanced chemistry to solve engineering problems.

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

Psychomotor:

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

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

E. COURSE LEVEL LEARNING OUTCOMES (COS)

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:

A. 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, HCl, 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 volt meter.	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 multiplicity, Pauli's exclusion principle. 1.6 Lewis and Langmuir's concept of stable electronic configuration.	**07**	**08**

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	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.** 2.1Definitions- Cathode, Anode, Conductor, Electrolyte, Electrode, Ionisation, Electrolysis. 2.2 Arrhenius Theory Of Ionisation. 2.3 Degree of Ionisation & Factors affecting degree of ionisation. 2.4 Statement of Faraday's first and second law of electrolysis. 2.5 Relation between CE and ECE. 2.6 Electrolysis of molten NaCl. 2.7 Electrolysis of 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. 2.11Wet 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 composite materials.	**13**	**16**

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Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	3.3 PLASTICS 3.3.1Definition of Polymer, Polymerization. 3.3.2Types of polymerization – Addition & Condensation polymerization. 3.3.3Classification 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. 4.5 Disadvantages of hard water for domestic & Industrial purpose - Textile Industry, Sugar Industry, Paper Industry Dying Industry.	**09**	**12**

	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, Bessemerisation, 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) Tinmann'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** 5.1Definition 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 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	**07**	**08**

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

G. List of Assignments under SLA (25 marks)

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

H.

16	Smelting process of Copper with diagram	02
17	Bessemerisation 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. Tinmann'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

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

I. Specification table for setting question paper for semester end theory Examination.

Section / Topic no.	Name of topic	Distribution of marks (level wise)			Total marks	CO
		Remember	Understand	Apply		
I / 1	Atomic Structure and Chemical Bonding	4	2	2	08	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	

J. 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**

K. Instructional Methods:

13. Lectures cum Demonstrations,
14. Class room practices.
15. Use of projector and soft material for demonstration
4. Charts
5. Simulation videos

L. Teaching and Learning resources:-

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

M. 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.

N. 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

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COURSE ID:

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 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	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 assignments here in tabular format At least 6 to 8 assignments to be given)

D. i) RATIONALE:-

Communication, being an integral part of every human activity, plays a fundamental role in education, science and technology. The communication skills are essential for engineering professionals to 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 identified outcome through various learning experiences:

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

E. COURSE LEVEL LEARNING OUTCOMES (COs)

CCH201-1 Use Contextual words in English appropriately.
CCH201-2 Comprehend the concept of communication and identify communication barriers.
CCH201-3 Prepare and participate in dialogue, conversation, elocution and debate.
CCH201-4 Make effective use of body language & graphical communication.
CCH201-5 Write letters, reports, e-mails and technical description in correct language.
CCH201-6 Prepare and present effective media aided presentation.

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

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

	PO 1 Basic and Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / Development of solutions	PO 4 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
Industry/Employer Expected Outcome: Communicate in written and oral form of English effectively and informal scenario	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		
CCH201-4 Make effective use of body language & graphical communication.	2	-	-	-	-	2	2		

CCH201-5 Write letters, reports, e-mails and technical description in correct language.	2	-	-	-	-	2	1		
CCH201-6 Prepare and present effective media aided presentation.	1	1	-	-	-	1	1		

F. CONTENT:

I) Practical Exercises

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

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

III. 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

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Section II

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

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

G. List of Assignments/ Activities/Micro-project under SLA

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

Sr. No	List of Assignment (under SLA)	Hrs Allotted
1	Report different types of episodes and anecdotes	02
2	Seminar preparation and Presentation	04
3	Make a pod cost episode based on Indian freedom fighters.	02
4	Present summary of the editorial column of English news paper	02
5	Write review of on any one: short story, novel, film	02

6	Prepare a booklet on Indian scientist/ eminent persons	04
7	Prepare blog, vlogs and pod cast	04
8	Prepare questionnaire for interview on any one: industry personnel, social worker, entrepreneur and conduct interview.	02
9	Prepare charts/tables of vowels, diphthongs, consonant, organs of speech, vocabulary in English	02
10	Prepare charts/tables of types of communication, barrier in communication, aspects of body language	02
11	Prepare a micro project on a given topic.	04

H. Specification Table for Setting Question Paper for Semester End Theory Examination

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

I. Assessment Criteria

i) Formative Assessment of Practical:-

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

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

ii) Summative Assessment of Practical:

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

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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		

I. Instructional Methods:

16. Lecture cum Demonstration,
17. Class room practices.
18. 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
25	Communication Skills	Sanjay Kumar ad Pushp Lata	Oxford University Press
26	Personality Development and Soft Skills	Brun K. Mitra	Oxford University Press
27	Effective Communication Skills	M Ashraf Rizvi	Tata McGraw-Hill
28	Human Communication	Burgoon Michael	SAGE Publication Inc.
29	101 Ways to Better Communication	Elizabeth Hiemey	Pustak Mahal
30	Technical Writing and Professional Communication	Thomas Huckin and Leslie	McGraw-Hill College Division

Learning Website & Software

e. www.nptel.com/iitm/
f. https://www.britishcouncil.in/english/learn-online
g. https://www.vocabulary.com
h. www.newagegolden.com
i. https://www.internationalphoneticassociation.org

COURSE ID :

COURSE NAME : APPLIED ELECTRONICS
COURSE CODE : ETH103
COURSE ABBREVIATION : HATX

A. LEARNING SCHEME:

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

B. ASSESSMENT SCHEME:-

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL 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

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.**

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* 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 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)

ETH103-1 Use transistor as an amplifier.
ETH103-2 Use transistor as a power amplifier.
ETH103-3 Comprehend feedback amplifiers.
ETH103-4 Analyze BJT waveform generator
ETH103-5 Analyze BJT Switching Circuits.
ETH103-6 Demonstrate and analyze linear and nonlinear wave shaping circuits.

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
ETH103-1	2	-	-	1	-	-	2	1	1
ETH103-2	3	-	-	2	2	2	3	3	2
ETH103-3	3	-	-	2	-	1	2	2	2
ETH103-4	3	-	-	2	2	2	1	1	1
ETH103-5	3	-	-	1	-	2	2	1	1
ETH103-6	3	-	-	2	2	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.	Build and test the performance of single stage low power common emitter amplifiers.	ETH103-1

Sr. No.	Laboratory experiences	CO
2.	Build and test the performance of single stage common source FET amplifiers.	ETH103-1
3.	Build and test the performance of two stage direct coupled amplifier through any simulation software tool.	ETH103-1
4.	Build class A power amplifier with resistive load and check output of Circuit.	ETH103-2
5.	Build class B power amplifier in complementary symmetry configuration and check output of circuit.	ETH103-2
6.	Build single tuned voltage amplifier and check output and draw response on semilog graph paper.	ETH103-2
7.	Build and test the performance of voltage series feedback amplifier.	ETH103-3
8.	Build and test the performance of voltage shunt feedback amplifier.	ETH103-3
9.	Build and test the performance of Hartley Oscillator. Calculate the oscillator frequency and verify calculated frequency with actual observed frequency	ETH103-4
10.	Build and test the performance of Colpitts Oscillator. Calculate the oscillator frequency and verify calculated frequency with actual observed frequency	ETH103-4
11.	Build and test the performance of RC phase shift Oscillator. Calculate the oscillator frequency and verify calculated frequency with actual observed frequency	ETH103-4
12.	Build and Test the performance of Astable multivibrator using transistor: time measurement and calculations.	ETH103-5
13.	Build and test the performance of Monostable multivibrator using transistor: time measurement and calculations through any simulation software tool.	ETH103-5
14.	Build RC circuit as Integrator/ differentiator and Check applications of differentiator as wave shaping circuit (response of the circuit for square input)	ETH103-6
15.	Build Positive and negative clipper circuit and Observe Clipping waveform on CRO.	ETH103-6
16.	Build Positive and negative Clamper circuit and Observe Clamping waveform on CRO.	ETH103-6

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II) Theory

Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	ETH103-1 **Use transistor as an amplifier.**		
1	**Amplifier** 1.1 Classification of amplifier, BJT as an amplifier. 1.2 Single stage CE amplifier, frequency response, gain, bandwidth. 1.3 Types of BJT coupling: Circuit diagram, Operation, frequency response and application of RC, transformer, and direct coupling. 1.4 Multistage amplifier: General Multistage amplifier BJT based. 1.5 FET Amplifier: Common Source amplifier, Working Principle, and application. 1.6 Tuned Amplifier: Need of tuned amplifier, basic tuned circuit, circuit diagram, Operating principle, and frequency response of Single tuned, Double tuned and stagger tuned amplifiers.	**11**	**12**
	ETH103-2 **Use transistor as a power amplifier.**		
2	**Power Amplifiers** 2.1 Power Amplifiers: Comparison between small signal amplifier and power amplifier, performance parameter of power amplifiers: bandwidth, gain, frequency band, efficiency. 2.2 Classification of Power Amplifier 2.3 Circuit Diagram, Working, Characteristics, Efficiency of following: 2.3.1 Class A Power Amplifier- Transformer coupled 2.3.2 Class B Power Amplifier and Crossover distortion, Class AB Power Amplifier 2.3.3 Class B Push pull amplifier 2.3.4 Complementary symmetry Class B Push Pull amplifier 2.4. Class C amplifier(only introduction)	**11**	**12**
	ETH 103-3 Comprehend feedback amplifiers.		
3	**Feedback Amplifier** 3.1 Principle of feedback amplifier 3.2 Types of feedback: Negative and positive feedback, Advantages of negative feedback and its effects 3.3 Types of negative feedback (block diagram, Circuit diagram, Operation and comparison) 3.3.1 Current series feedback 3.3.2 Voltage series feedback 3.3.3 Voltage shunt feedback 3.3.4 Current shunt feedback	**8**	**10**

	3.3.5 Darlington pair, Darlington amplifier (only introduction) 3.4 Numericals problems based on feedback formula.		
	Sub-total	**30**	**34**

Section –II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	***ETH103-4* Analyze BJT waveform generator**		
4	**Wave form Generators** 4.1 Oscillators: Need, Comparision of oscillator and amplifier. 4.2 Condition for oscillation (Barkhausen's Criteria), classification of oscillators 4.3 Circuit Diagram, Working, frequency formula of following oscillators: - 4.3.1 Tuned circuit Oscillators 4.3.2 Hartley Oscillator 4.3.3 Colpitts oscillator 4.3.4 RC phase-shift oscillator 4.3.5 Wein Bridge oscillator 4.4 Frequency stability consideration 4.5 Sweep generator: Miller sweep, Bootstrap circuit, current time base generator. 4.6 Numericals based on above	**9**	**12**
	***ETH103-5 Analyze* BJT Switching Circuits**		
5	**BJT Switching Circuits** 5.1 Transistor as a switch, Transistor Switching Times 5.2 Transistorized Multivibrators and its types: - Circuit Diagram, Operation, timing equations & applications of following: - 5.2.1 Astable multivibrator 5.2.2 Monostable multivibrator 5.2.3 Bistable Multivibrator 5.2.4 Schmitt Trigger 5.3 Numericals based on timing equations of above circuits	**9**	**10**
	ETH103-6 Demonstrate and analyze linear and nonlinear wave shaping circuits.		
6	**Wave shaping Circuits** Circuit diagram, waveforms and operation of following:- 6.1 Linear wave shaping circuits. 6.1.1 Differentiator - High pass RC circuits- Response to triangular input & square wave 6.1.2 Integrator- Low pass RC circuit – Response to square input & rectangular input 6.2 Nonlinear wave shaping 6.2.1 Clippers 6.2.1.1 Positive clipper 6.2.1.2 Negative clipper	**12**	**14**

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	6.2.1.3 Combinational clipper 6.2.2 Clampers 6.2.2.1 Positive clampers 6.2.2.2 Negative clampers 6.2.2.3 Voltage doublers and triplers.		
	Sub-total	**30**	**36**

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	Low Power Amplifier	2	6	4	12	ETH103-1
I / 2	High Power Amplifier	2	6	4	12	ETH103-2
I / 3	Feedback amplifier	2	2	6	10	ETH103-3
II /4	Wave form Generators	2	6	4	12	ETH103-4
II /5	BJT Switching Circuits	-	4	6	10	ETH103-5
II / 6	Wave shaping Circuits	-	4	10	14	ETH103-6
Total Marks		8	28	34	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	V. K. Mehta	Principles of Electronics	S.Chand
2	B. L. Theraja	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
7	Bell, Devid	Fundamental of Electronics Devices and circuits	Oxford University

L. Learning Website & Software

1) www.nptel.iitm.ac.in
2) www.learningaboutelectronics.com
3) www.electronics-tutorials.com
4) *https://circuitdigest.com/electronic-circuits*
5) *https://www.tutorialspoint.com/basic_electronics/basic_electronics_transistors.htm*
6) https://www.youtube.com/watch?v=O_pqCNPs6xw
7) https://www.youtube.com/watch?v=0nXEUkFBd8A

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COURSE ID :

COURSE NAME : Electrical Engineering (IE/ET)

COURSE CODE : ETH104

COURSE ABBREVIATION : HEEG

A. LEARNING SCHEME:

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

B. ASSESSMENT SCHEME :-

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		TOTAL
					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

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 : (TNR 11 font)

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

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

D. i) RATIONALE:-

The subject deals in understanding the basics of laws, working principle, construction, operation and applications of the various equipment, instruments and machines in electrical engineering.

ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

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

"**Apply the basic principles of electrical engineering to solve engineering problems".**

E. COURSE LEVEL LEARNING OUTCOMES (COS)

COURSE OUTCOMES:

ETH104-1. Apply basic laws and principles of electrical engineering to electrical aapplications.
ETH104-2. Use principles of magnetic circuits to calculate various parameters in magnetic circuits.
ETH104-3. Interpret basic principles of electromagnetic induction.
ETH104-4. Apply basic principles of AC circuits in electrical devices.
ETH104-5. Interpret circuit parameters in AC circuits.
ETH104-6. Apply basic laws of electromagnetic induction principles in transformer &electric machines.

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

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

PO → / CO	PO1	PO2	PO3	PO 4	PO 5	PO6	PO7	PSO1	PSO2
ETH104-1	3	1	0	1	0	0	0	0	0
ETH104-2	3	1	0	1	0	0	0	0	0
ETH104-3	3	1	0	1	0	0	0	0	0
ETH104-4	3	1	0	1	0	0	0	0	0
ETH104-5	3	1	0	1	1	0	0	0	0
ETH104-6	3	1	0	1	1	0	1	1	0

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F. CONTENT:-

Practical Exercises:

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

Sr. No.	Title of Experiment	Skills to be developed	Course outcome
1.	Calculate the resistance of DC circuit by measuring voltage and current and verify using multi-meter. (Verify Ohm's law)	1.Identify different components in electrical Laboratory 2.Use voltmeter and ammeter.	1
2.	To measure the voltages across resistances in the circuit and verify the readings using Kirchhoff's Voltage Law.	Implement Kirchhoff's voltage law to solve electrical circuits.	1
3.	To measure the currents across resistances in the circuit and verify the readings using Kirchoff's Current Law.	Implement Kirchhoff's current law to solve electrical circuits.	1
4.	Connect resistances in series and parallel connection and measure its resistances by using Ohm's law.	Connect electrical loads in series andparallel.	1
5.	Determine the permeability of magnetic material by plotting its B-H curve.	1.Measure magnetic flux density and electric field intensity. 2.Plot B-H curve of a material.	2
6.	Observe and identify the direction induced emf in the coil with the moving magnet and moving coil. (Verify Faraday's law of electromagnetic induction and Lenz law)	Identify direction of induced emf in given environment.	3
7.	Measure frequency, amplitude, time period, peak to peak value of alternating quantity.	Use CRO to measure different parameters.	5
8.	Calculate R, L and power factor of series RL circuit by measuring voltages and currents in circuit.	Identify AC meters. Measure AC quantities.	5
9.	Calculate R, C and power factor of series RC circuit by measuring voltages and currents in circuit.	Identify AC meters. Measure AC quantities.	5
10.	Calculate R, L, C and power factor ofseries RLC circuit by measuring voltages and currents in circuit.	1.Identify AC meters. 2. Measure AC quantities.	5
11.	Use transformer as step up and step down of single phase transformer.	Measure primary and secondary side voltages of transformer.	6

Theory:

Sr. No.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Mark
	Section I		
	ETH104-1: Apply basic laws and principles of electrical engineering to electrical pplications.		
1	**BASIC LAWS AND PRINCIPLES** 1. Basic terms:-electric current and potential difference. Concept of voltage drop and terminal voltage. 2. Concept of resistance and conductance Laws of resistance (Simple Numerical)Concept of resistivity and conductivity. 3. Classification of electric current: Direct current (DC) & alternating current (AC) 4. Concept of power and energy with simple numerical. (in DC circuit) 5. Series and parallel connection of resistances. (Simple numerical) 6. Theorems for DC circuits: Ohm's Law (Simple Numerical) Kirchhoff's Laws (Simple Numerical with maximum two equations)	06	10
	ETH104-2: Use principles of magnetic circuits to calculate various parameters in magnetic circuits.		
2	**MAGNETIC CIRCUITS** 1. Magnetic Circuit - Ohm's law of magnetic circuit. 2. Definitions concerning magnetic circuit: Magneto-Motive-Force (MMF), Ampere Turns (AT), Reluctance, Permeance, Reluctivity. 3. Comparison between electric and magnetic circuit. 4. Calculations of ampere-turns for simple series magnetic circuit (SimpleNumerical) 5. Concept of magnetization curve (B - H Curve) Magnetization curve for magnetic and non-magnetic materials. 6. Concepts of magnetic hysteresis, hysteresis loop. Significance of areaof hysteresis loop, hysteresis loss. (No Derivation and No Numerical), Definition of eddy current loss and it formula. 8.Concepts of permanent magnet and electromagnet.	08	14

ETH104-3: Understand basic principles of electromagnetic induction.

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3	**ELECTROMAGNETIC INDUCTION** 1. Faraday's laws of electromagnetic induction. (Simple Numerical) 2. Induced E.M.F: Statically induced E.M.F., dynamically induced E.M.F. (Simple Numerical) 3. Direction of induced E.M.F. and currents. Fleming's right hand rule, Fleming's left hand rule. Lenz'slaw. 4. Basic concepts of self induction and mutual induction. (No numerical) 5. Basic principle of elementary alternator. 6. Energy stored in magnetic field (No Derivation and No Numerical) 7. Lorentz force principle (Simple numerical).	7	10
SECTION II			
ETH104-4: Apply basic principles of AC circuits in electrical devices.			
4	**AC FUNDAMENTALS** 1. Generation of alternating EMFs. 2. Some important terms.: cycle, time period, frequency,amplitude, average values, rms value. 3. Equations of alternating voltages and currents. 4. Concept of effective or root mean square (R.M.S.) value of sinusoidal current or voltage. 5. Peak factor and form factor. 6. Phasor representation of alternating quantities. 7. Phase and phase difference, concept of lagging and leading 8. Addition and subtraction of sinusoidal alternating quantities. (Simple Numerical) 9. 9. Multiplication and division of sinusoidal alternating quantities. (SimpleNumerical)	10	12
ETH104-5: Understand circuit parameters in AC circuit.			
5	**AC CIRCUITS (NO NUMERICAL)** 1. Polyphase Generation 2. Three phase power equation 3. Star and delta connections of resistive load. (No derivation) Comparison between star and delta connections of load. 4. A.C. circuits Purely resistive A.C. circuit. Purely inductive A.C. circuit. Purely capacitive A.C circuit. 5. Series A.C. circuits Circuit with resistance and inductance in series (Concept of power factor) Circuit with resistance and capacitance in series (Concept of power factor) Circuit with resistance inductance and capacitance in series (Concept of power factor) 6. Active and reactive power in single phase series circuit.	08	10
ETH104-6: Apply basic laws of electromagnetic induction principles in electric machines.			

6	**TRANSFORMER & MACHINE (NO NUMERICAL)** 1. Basic principle of working of a single phase transformer. 2. Construction of a single phase transformer. 3. Types of transformer based on Construction of core of transformers Number of phases Voltage level Functions of transformer (instrument, power, isolation) 4. Application of transformers in electronic circuit. 5. Basic principle of working of single phase induction motor. 6. Basic principle of working of DC motor. Compare shunt and series DC motors. 7. Stepper Motor- reluctance type stepper motor – working and application 8.Basic principle of earthing, necessity of earthing, types of earthing (pipe earthing and plate earthing)	6	14

G. List of Assignments under SLA(Microproject/activity)

Sr.No	List of Assignment (under SLA)
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	Simple problems on Addition, subtraction, multiplication and division of sinusoidal alternating quantities.
6	Survey the electrical appliances which represents different types of load.(resistive, inductive and capacitive)
7	Compare types of transformer as per voltage level, construction, number of phases, applications.
8	Survey different types of earthing.

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	Basic Laws & Principles	4	4	2	10	ETH104-1
I / 2	Magnetic Circuits	4	4	6	14	ETH104-2
I / 3	Electromagnetic Induction	4	4	2	10	ETH104-3
II /4	AC Fundamentals	4	6	2	12	ETH104-4
II /5	AC Circuits	4	4	2	10	ETH104-5
II / 6	Transformer & Machine	4	6	4	14	ETH104-6
	Total Marks				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 Methods:

19. Lectures cum Demonstrations,
20. Class room practices.
21. 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
31	Basic Electrical Engineering,	Mittle and Mittal	McGraw Education, New Delhi, 2015, ISBN :978-0-07-0088572-5
32	Electrical Technology Vol – I	Theraja, B. L	S. Chand Publications, New Delhi, 2015
33	Electrical Technology Vol – II,	Theraja, B. L	S. Chand Publications, New Delhi, 2015
34	Basic Electrical	V.K Mehta Author),	S. Chandpublications.

	Engineering	Rohit Mehta	

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

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COURSE ID:

COURSE NAME : C PROGRAMMING

COURSE CODE : ETH105

COURSE ABBREVIATION : HCPR

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 (Hrs)	Assessment Scheme								Based on Self Learning		Total Marks
	Theory				Based on LL & TL						
	FAT H	SA TH	Total		FA-PR		SA-PR		SLA		
	Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
-	-	-	-	-	25	10	25@	10	-	-	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, *# 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:

This course is designed to develop programming attitude and attract the interest of the students in the C Language. C is a very powerful, widely used, efficient and compact, which combines features of high-level language and low-level language. It is used in many scientific programming situations. It forms the core of the modern languages Java and C++. Almost every set up in software Engineering domain chooses C as a first priority programming language.

ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

Development of programming skills to solve engineering problems in procedural way. Understanding and implementing concepts of procedural programming. Operating Computer system efficiently. Development of attitude of precision, accuracy, safety, punctuality and aesthetic presentation.

E. COURSE OUTCOMES:

ETH105-1 Identify C expressions with character set and operators.

ETH105-2 Apply decision making and branching and looping constructs in programming.

ETH105-3 Implement user defined functions and arrays.

ETH105-4 Implement library functions for string handling.

ETH105-5 Develop C programs using structures and pointers.

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	PO								
	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 Design and development**	**PSO2 Database and Network management**
Competency: Apply concepts of C Programming to solve engineering problems	3	3	3	2	2	2	1	3	-
ETH105-1	2	1	2	2	2	1	1	-	-
ETH105-2	2	3	3	3	2	1	1	2	-
ETH105-3	2	2	3	3	1	1	1	2	-
ETH105-4	2	2	3	3	1	1	1	2	-
ETH105-5	2	2	2	3	2	1	1	2	-

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PSO 1: Operate and Maintain: Competency to apply the concepts of Industrial Electronics in the operation and maintenance of engineering application systems.
PSO 2: Supervision and providing solution: Ability to supervise work and reach appropriate solution to simple practical problems in Industrial Electronics engineering industry.

F. CONTENT:

I) SUGGESTED PRACTICAL'S/ EXERCISE

The following practical exercises shall be conducted as practical's and assess the student for attainment of the competency. (any 10 out of 13 experiments)

Sr. No.	Title of Experiment	Skills to be developed	Course Outcome
01	Study of Flowchart and Algorithm	• Understanding an Algorithm • Understanding the Flowchart • Study of various Flowchart Symbols • To draw Flowchart on any Practical routine	ETH105-1
02	Installation of C/C++ Compiler and study of its IDE	• Understanding Integrated development environment of any one C compiler • To create and save and compile a program file • To run the compiled program and see the output	
03	Usage of C character set, keywords, identifiers, variables, constants, and expressions	• Study of character set of C language • Study of identifiers, variables, constant, and Keyword • Rules for valid variables, identifiers, constants. • Identify valid and invalid variables, • Study of expressions and different types	ETH105-1
04	Usage of Operators	• Classification of operators in C • Understanding use of C different types operators	ETH105-1

		• Writing imple C programs illustrating use of all category of C operators	
05	To use input and output library functions	Writing simple programs to illustrate the use of- • Standard Input function- scanf() • Standard Output function-printf() • Character input and output functions getchar() ,putchar() • String input and output functions gets(), puts()	ETH105-1
06	Implementation of decision Making and branching using if, if-else, Nested if, ladder if-else structure	Writing simple programs to illustrate the use of- • If statement • If-else statement • Nested if..else • else..if ladder	ETH105-2
07	Implementation of multiple decision making using switch statement	Writing program to illustrate the use of- • switch statement • break statement • default statement	ETH105-2
08	Implementation of looping using for Statement	Writing a program to illustrate the use of- • for statement to implement loop • Nested for loop	ETH105-2
09	Implementation of looping using while and do---while statement	• Exit control and Entry control loop • program based on while loop and do-while	ETH105-2
10	To create and use of one dimensional and multi-dimensional array	Writing a program to illustrate- • creating one and multi-dimensional array • Manipulation of elements of an array	ETH105-3

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11	Program based on User Defined Functions	Writing a program to illustrate- • User defined function declaration or prototype • User defined function definition • Function call or reference • Passing parameters to a function-call by value and call by reference	ETH105-3
12	Strings and string manipulation functions	Writing a program to illustrate- • Ddeclaration and initialization of string variable • reading and writing a string from and to terminal. • String- handling Functions - strlen(),strcmp() strcpy(), strcat(), strupr(), strlwr(), strrev() etc.	ETH105-4
13	Study of Structure	Writing a program to illustrate- • Defining a structure • Declaring and iinitialization of structure variable • Accessing members of structure variable	ETH105-6
13	Implementation of Pointer	Writing a program to illustrate- • Ddeclaration of pointer • Initializing pointer variable • Accessing data using pointer variable	ETH105-6

II) THEORY :

SECTION I

Sr. No.	**Topics / Sub-topics**	**Lectures (Hours)**
Course Outcome ETH105 – 1 Identify C expressions with character set and operators.		
1	**C FUNDAMENTALS** 1.1History of c	**05**

	1.2 C character set 1.3 Identifiers & Keywords, 1.4 Data types 1.5 Variables 1.6 Declarations 1.7 Constants 1.8 Expressions 1.9 C Instructions 1.10 The first C program 1.11 Compilation & Execution	
2	**OPERATORS& DATA INPUT AND OUTPUT FUNCTIONS** 2.1 Operators 2.1.1 Arithmetic Operators 2.1.2 Assignment Operator 2.1.2 Unary operators 2.1.3 Relational & Logical Operators, 2.1.4 Conditional & Comma Operator 2.2 Input and Output Library Functions 2.2.1 printf() 2.2.2 scanf() 2.2.3 getchar() 2.2.4 putchar() 2.2.5 gets() 2.2.6 puts()	**05**
Course Outcome ETH105 -2 Apply decision making and branching and looping constructs in programming.		
3	**CONTROL STATEMENTS** 3.1 Decision making and branching 3.1.1 if Statement(if, if-else, if-else ladder, nested if-else) 3.1.2 Switch, break, continue, goto statement 3.2 Decision making and looping 3.2.1 While, do – while, for Statements 3.2.2 Nested loops	**06**

SECTION II

Sr. No.	**Topics / Subtopics**	**Lectures (Hours)**
Course Outcome ETH105 -3 Implement user defined functions and arrays.		
4.	**ARRAYS & FUNCTIONS**	**06**

	4.1 Defining an array, 4.2 One dimensional array ,Declaration and Initialization of Arrays, 4.3 Two Dimensional Arrays Declaration and Initialization of Arrays, 4.4 Defining a Function, Accessing a function, 4.5 Passing arguments to a Function(call by value and call by reference), Specifying argument data types 4.6 Scope and lifetime of variables 4.7 Function prototypes 4.8 Recursion	
Course Outcome ETH105 -4 Implement library functions for string handling.		
5.	**CHARACTERS & STRINGS** 5.1 The char data type, using character variables, using string 5.2 Declaring and initializing string variables 5.3 Reading strings from terminal 5.4 Writing Strings to screen, putting strings together. 5.5 Comparison of two strings 5.6 String- handling Functions - strcmp(), strlen(), strcpy(), strcat(), strupr(), strlwr(), strrev()	**05**
Course Outcome ETH105 -5 Develop C programs using structures and pointers.		
6.	**Structures and Pointers** 6.1 Simple structures (Defining & declaring structures, accessing structure members) 6.2 Complex structures (structures that contain arrays) 6.3 Understanding pointers, declaring pointer variable, initialization of pointer variable, accessing address of a variable	**5**

G. ASSESSMENT CRITERIA FOR PRACTICAL ASSIGNMENTS AND PRACTICAL EXAMINATION

a) Formative Assessment of Practical:

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

Domain	**Particulars**	**Marks out of 25**
Cognitive	Technical preparedness for practical	05
Psychomotor	Operating skills/Algorithm/ flowchart	05
	Observation/Logic/ Program/Result	05
Affective	Discipline and punctuality	05
	Procedure/ Safety Measures/ Decency/ Presentation	05

TOTAL	**25**

b) Summative Assessment of Practical:

Every student has to perform one practical within 3 hours at semester end practical assessment which shall be assessed as per following criteria.

Sr. No	Criteria	Marks allotted
1	Neat & complete circuit Diagram / schematic Diagram/ Algorithm/ Flowchart/ Program	5
2	Procedure followed to achieve the result	5
3	Observations, Result, Output, Sample Calculations with relevant formulae	5
4	Proper Graphs, workmanship and Safety measures	5
5	Oral	5
	Total	**25**

H. INSTRUCTIONAL STRATEGIES:

Instructional Methods:

1. Online/Offline Lectures cum Discussions
2. Regular home assignments
3. Laboratory work

Teaching and Learning Resources:

1. Chalk and Board 2. Video Clips 3.PPTs 4. Question Bank 5. Charts

I. REFERENCE MATERIAL:

a) Books / Codes

Sr. No.	Author	Title	Publisher
1.	E.Balgurusamy	Programming in ANSI C	Tata McGraw Hill Education
2.	Yashwant Kanetkar	Let us C	BPB Publication
3	Bryon Gottfried	Programming with C	Schaum's Outlines Series
4	kerninghan& Ritchie	The C Programming language	Prentice Hall

b) Websites

1) https://www.w3schools.in/c-tutorial/
2) www.cprogramming.com
3) www.learn-c.org
4) www.tutorialspoint.com/cprogramming
5) https://www.tutorialspoint.com/compile_c_online.php

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COURSE ID :

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 Practical				BASED ON SLA		TOTAL
	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

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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 TLO 1.4 Select the attributes of engineering and socialsystem for measurement, quantification, and	**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 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	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 from the bigger group. ii) Assign a few batches of the students for this course to all thefaculty members.

	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.	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.	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	**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	(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

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	Project / Programs in the selected village / slum TLO 2.4 Undertake Special Camping Programme	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 selectedvillage / slum.	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 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	**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 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	i) Video Demonstrations ii) Flipped Classroom iii) Case Study iv) Role Play v) Collaborative learning vi) Chalk-Board

	TLO 4.10 Forgive andForget	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, Topics for Public Speaking, Placement Process , OCSEM-E-Newspaper, Critical Thinking to overcome challenges 4.5 Determination and Persistence, Guiding and Giving Directions, Language Etiquette & 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	**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	i) Online/Offline Mode ofInstructions ii) Video Demonstrations iii) Presentations iv) Case Study v) Chalk-Board Collaborative learning

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	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	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	

** 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) programmes of 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 open to 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

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:

22. Group Discussion, Flipped Classroom
23. Demonstration, Case Study, Role Play, Collaborative Learning, Cooperative Learning
24. Field Visit, Survey
25. 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
35	Compendium of Training Materials for the Capacity Building of the Faculty and Students of Engineering Colleges on 'IMPROVING THE PERFORMANCE OF RURAL WATER SUPPLY	IRAP, Hyderabad, CTARA, IIT Bombay and UNICEF, Mumbai	UNICEF

	AND SANITATION SECTOR IN MAHARASHTRA' Districts Economic survey reports		
36	Central Public Healthand Environmental Engineering Organisation	Manual on Water Supply and Treatment	Ministry of Urban Development, New Delhi
37	Specifications And Standards Committee	Indian Standards (IS) Codes and Indian Roads Congress (IRC) Codes	Bureau of Indian Standards and The Indian Road Congress
38	Prepared by each district administration	Districts Economic survey reports	Govt. of Maharashtra
39	Local college students,UMA staffs	Sample Case Studies on UMA website	IITB-UMA team

M. Learning Website & Software

j. https://gr.maharashtra.gov.in/Site/Upload/Government%20Resolutions/English/201601131501523808.pdf (Government Resolution of Government of Maharashtra regarding Unnat Maharashtra Abhiyan)

k. https://gr.maharashtra.gov.in/Site/Upload/Government%20Resolutions/English/201606151454073708.pdf (Government Resolution of Government of Maharashtra regarding Unnat Maharashtra Abhiyan Guidelines)

l. https://censusindia.gov.in/census.website/ (A Website of Census of India)

m. https://gsda.maharashtra.gov.in/english/ (A Website of Groundwater Survey and Development Agency, GoM)

n. https://mrsac.gov.in/MRSAC/map/map (A Website where district-wise maps showcasing different attributes developed by Maharashtra Remote Sensing Applications Centre.)

o. https://ejalshakti.gov.in/jjmreport/JJMIndia.aspx (A Website of Jal Jivan Mission, Government of India)

p. https://cpcb.nic.in/ (A Website of Central Pollution ControlBoard, Government of India)

q. http://www.mahapwd.com/# (A Website of Public WorksDepartment, GoM)

r. http://tutorial.communitygis.net/ (A Website for GIS data sets developed by Unnat Maharashtra Abhiyan)

s. https://youtu.be/G71maumVZ1A?si=TzDTxKUpLYaRos7U (A video record of lecture by Prof. Milind Sohoni, IIT Bombay, on Engineering, Development and Society)

t. https://youtu.be/TUcPNwtdKyE?si=wnSWrhGc9dJTC-ac (A keynote talk by Prof. Milind Sohoni, IIT Bombay, on Interdisciplinary Engineering: The Road Ahead)

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SEMESTER III COURSES

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COURSE ID :

COURSE NAME : CIRCUITS AND NETWORKS
COURSE CODE : ETH301
COURSE ABBREVIATION : HCKN

A. LEARNING SCHEME:

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

B. ASSESSMENT SCHEME:-

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL Practical				BASED ON SLA		Total
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
03	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: -

Diploma engineers must deal with the electronic circuit while maintaining various electronic equipment/systems inthe industry. This course will help the students to use principles of circuit and analyse to maintain the electric circuit/network.

ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

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

Build and analyze various electronic circuits and Networks

E. COURSE LEVEL LEARNING OUTCOMES (COs)

ETH301-1 Apply basic laws of Circuit analysis to determine circuit parameters.
ETH301-2 Apply Nodal and Mesh analysis to determine circuit parameters.
ETH301-3 Apply various circuit theorems to calculate circuit parameters .
ETH301-4 Calculate the electrical parameters of single phase A.C. circuit
ETH301-5 Evaluate circuit parameters at series and parallel resonant frequency .
ETH301-6 Determine the circuit parameters of two port network.

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
ETH301-1	3	3	2	3	1	1	2	3	2
ETH301-2	3	3	2	3	1	1	2	3	1
ETH301-3	3	3	2	3	1	1	2	3	1
ETH301-4	3	1	3	2	1	1	1	3	2
ETH301-5	3	2	3	2	1	1	1	3	1
ETH301-6	3	2	3	2	1	1	1	3	1

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F. CONTENT:

I) Practical Exercises

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

Sr. No.	Laboratory experiences	CO
17.	Verify equivalent resistance formulae in series connection and parallel connection of Resistors .	ETH 301-1
18.	Measure current flowing through a resistor and voltage across that resistor and verify it using OHM's law	ETH 301-1
19.	Measure the voltage across resistors in resistive circuit and verify it, using Kirchhoff's Voltage law (KVL).	ETH 301-1
20.	Measure current in various branches of the given circuit and verify it, using Kirchhoff's current law (KCL).	ETH 301-1
21.	Calculate power dissipated in a resistor using I^2R and V^2/R formula	ETH 301-1
22.	Measure voltage across rsistors in resistive circuit and Verify it using Voltage divider Rule	ETH 301-1
23.	Measure current in various branches of the resistive circuit and verify it using Current divider Rule	ETH 301 -1
24.	Measure voltage at particular node and current through branch of network and verify it by nodal analysis	ETH 301-2
25.	Measure current through and voltage across given branch of electric network and verify it by mesh analysis.	ETH 301-2
26.	Measure current through given branch of network and verify it applying Superposition theorem.	ETH 301-3
27.	Measure open circuit voltage and thevenin's resistance ofthe given circuit and verify it using Thevenin's theorem.	ETH 301-3
28.	Vary load resistance to transfer Maximum power in thegiven circuit using maximum power transfer theorem.	ETH 301-3
29.	Measure short circuit current and Norton's resistance of the given circuit and verify it using Norton's theorem.	ETH 301-3
30.	Verify equivalent capacitor formulae in series and parallel connected capacitors	ETH 301-4
31.	Measure initial and final voltage across the capacitor before and after switching input supply.	ETH 301-4
16.	Measure voltage and current in the given RLC series circuit and calculate resonance frequency and impedance atresonance using variable supply frequency.	ETH 301-5
17 .	Measure current of given RLC parallel circuit and calculate resonance frequency and impedance at resonanceby varying supply frequency.	ETH 301-5
18.	Develop RC low pass filter on breadboard and plot its frequency response.	ETH 301-6
19 .	Develop RC high pass filter on breadboard and plot its frequency response.	ETH 301-6
20	Develop RC band pass filter on breadboard and plot it's frequency response.	ETH 301-6
21	Perform minimum 5 practicals from above list using MultiSIM software	ETH 301-1,2,3,4,5,6

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

Micro projects:

- Prepare a report on real life applications of resonance (e.g. musical instruments)
- Prepare power point presentation on source transformation, star- delta transformation, mesh and nodal analysis andgive presentation in the class.
- Build a circuit on breadboard with multiple resistors connected in series and measure voltage across each resistor. Verify using KVL.
- Prepare a chart for comparison of single phase series RLC and parallel RLC circuit and draw input and outputwaveforms also.
- Build a circuit on breadboard with multiple resistors connected in series and measure voltage across and current through each resistor . Verify using Ohms law .
- Build a circuit on breadboard with multiple resistors connected in parallel and measure current across each resistor. Verify using KCL.

Assignments:

- Find circuit parameters of Single Phase AC series (R-L, R-C, R-L-C) and parallel (R-L, R-C, R-L-C) circuit, also draw its phasor diagram.
- Find the resonance condition for the specified series and RLC circuit and calculate current, voltage, bandwidth,quality factor . Observe the behaviour of R, L and C with change in frequency for series circuit.
- Identify the number of loops and nodes in the given circuit and solve the circuit using Nodal analysis and Meshanalysis.
- Simplify complex circuit using Thevenin's theorem, Norton's theorem and draw equivalent circuit for given circuit.

Activities For Specific Learning / Skills Development

- Verification of various network analysis and theorems in Virtual Laboratory (https://asnm-iitkgp.vlabs.ac.in/).
- Verification of various network analysis and theorems using Simulation Software (MATLAB, MultiSIM).
- Perform R-L-C circuit analysis in Virtual Laboratory (https://asnm-iitkgp.vlabs.ac.in/exp/rlc-circuit-analysis/).
- Experimental verification of frequency response of R-L-C series Circuit (https://asnm-iitkgp.vlabs.ac.in/exp/rlc-series-circuit/).
- Test the resonance in Series RLC circuit using Simulation Software (MATLAB, MultiSIM).

Note

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of

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microprojects, assignments, and activities in a similar way.

- The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student inacquiring the desired skills.
- If a microproject is assigned, it is expected to be completed 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.

III) Theory

Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Theory evaluation Marks
	ETH301-1 Apply basic laws of Circuit analysis to determine circuit parameters		
1	**BASIC THEORY** 1.1 Electric charge and current , voltage , Power and Energy 1.2 Voltage and current sources , Independent and Dependent sources . 1.3 Ohm's law and its limitations . 1.4 Definitions of Node, Branch, Loop, Mesh 1.5 Series circuits - Kirchhoff's voltage law, Voltage divider rule , Total resistance of Series connected resistors . 1.6 Parallel circuits - Kirchhoff's current law, Current divider rule , Total resistance of Parallel connected resistors . 1.7 Concept of Ground , Open circuit and short circuit **(Numericals based on above concepts)**	**8**	**12**
	ETH301-2 Apply Nodal and Mesh analysis to determine circuit parameters.		
2	**Methods of Circuit analysis** 2.1 Conversion of voltage to current source and current to voltage source 2.2 Series and parallel connection of Sources 2.3 Nodal Analysis method 2.4 Super Node analysis 2.5 Mesh Analysis method 2.6 Super Mesh Analysis **(Numericals based on above concepts)**	**6**	**10**

	ETH 301-3 Apply various circuit theorems to calculate circuit parameters		
3	**Network Theorems** 3.1 Linearity property. 3.2 Superposition Theorem 3.3 Thevenin's theorem 3.4 Norton's theorem 3.5 Maximum power transfer theorem 3.6 Millman's theorem 3.7 Tellegen's theorem **(Numericals based on above concepts)**	**8**	**12**
	Sub-total	**22**	**34**

Section II

Sr. no.	Topics/Subtopics	Learning (Hours)	Theory evaluation Marks
	ETH301-4 Calculate the electrical parameters of single phase A.C. circuit		
4	**Single phase AC circuits** 4.1 Current , Voltage and energy expressions in inductor and capacitor . 4.2 Series and parallel connection of inductor and capacitor 4.3 Phase relationship between current and voltage in an inductor and capacitor . 4.4 Representation of complex number in polar and rectangular form 4.5 Impedance and admittance calculations in AC circuits 4.6 Time constant in RL and RC circuit 4.7 Charging and discharging equations and curves in inductor and capacitor 4.8 Power in inductor and capacitor **(Numericals based on above concepts)**	**8**	**12**
	ETH301-5 ***Evaluate circuit parameters at series and parallel resonant frequency***		
5	**Resonance in Series and Parallel circuits** 5.1 Resonance in series circuit: Impedance, phase angle, voltage, current, bandwidth, Quality factor (Q), magnification factor for series resonance circuit 5.2 Behaviour of RLC series circuit with change in input frequency 5.3 Resonance in Parallel Circuit: Impedance, phaseangle, voltage, current, bandwidth, Quality factor (Q), magnification factor for parallel resonance circuit 5.4 Behaviour of RLC parallel circuit with change in input	**8**	**12**

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	Frequency 5.5 Applications of resonant circuits **(Numericals based on above concepts)**		
	ETH301-6 Determine the circuit parameters of two port network.		
6	**Analysis of two port network** 6.1 Network Types: Active and Passive, Bilateral andUnilateral, Linear and Nonlinear, Symmetrical and Asymmetrical, Single port and Two port network 6.2 Attenuators: Definition, types-T and Pi, features,frequency response, applications, comparison 6.3 Passive Filters: Definition, types- Low pass filter(LPF),high pass filter (HPF), band pass filter(BPF) and band stop filter (BSF), features, frequency response, applications, comparison **(Numericals based on above concepts)**	**7**	**12**
	Sub-total	**23**	**36**

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	Basic Theory	-	4	8	12	ETH301-1
I / 2	Methods of Circuit analysis	-	4	6	10	ETH301-2
I / 3	Network Theorems	-	4	8	12	ETH301-3
II /4	Single phase AC circuits	2	6	4	12	ETH301-4
II /5	Resonance in Series and parallel circuits	4	4	4	12	ETH301-5
II / 6	Analysis of Two Port Networks	4	4	4	12	ETH301-6
Total Marks		14	26	30	70	

H. ASSESSMENT METHODOLOGIES/TOOLS-

I) Formative Assessment (Assessment for learning)

- Two offline unit tests of 30 marks and average of two-unit test marks will be considered for out of 30 marks.

- Each practical will be assessed considering 60% weightage to process, 40% weightage to product.
- For formative assessment of laboratory learning 25 marks

II) Summative Assessment (Assessment of Learning)

- End semester summative assessment is of 25 marks for laboratory learning
- End semester assessment is of 70 marks.

I. Reference Books:

Sr. No.	Name of Book	Author	Publication
1	Electric circuits	Alexander and Sadiku	McGraw Hill
2	Circuit Analysis	Hayt and Kemmerly	McGraw Hill
3	Electrical Networks	Ravish Singh	McGraw Hill
4	Circuit and network	Sudhakar and Shyammohan	McGraw Hill
5	Electric Circuit Analysis	P. Ramesh Babu	SciTech Publication (India) Pvt. Ltd

J. LEARNING WEBSITES & Portals

	Link / Portal	Description
1	www.scilab.org/scilab	Open-source simulator for simulation of theorems
2	www.ni.com/multisim	Open-source simulator for simulation of theorems and circuit analysis
3	https://www.nptelvideos.com/course.php?id=462	NPTEL Circuit Theory Video Lectures
4	https://asnm-iitkgp.vlabs.ac.in/	Virtual laboratory link for theorems, R-L-C circuit analysis and its frequency response
5	https://www.udemy.com/course/electrical-circuit-for-electrical-electronics-engineering/	Basics, circuit element, circuit solving, network theorems, transient analysis
6	https://everycircuit.com/app	Online and mobile app to design and simulate electronic circuits

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COURSE ID :

COURSE NAME : LINEAR INTEGRATED CIRCUITS
COURSE CODE : ETH302
COURSE ABBREVIATION : HLIC

A. LEARNING SCHEME:

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	03	04
	Tutorial Learning	00	
	Laboratory Learning	04	
	SLH-Self Learning	01	
	NLH-Notional Learning	08	

B. ASSESSMENT SCHEME:-

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		Total
					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

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: -

The physical world is inherently analog. To process analog signals, in many electronic systems, Linear Integrated Circuits are used as basic building blocks. Operational amplifier (OPAMP) is most versatile linear integrated circuit used to develop various applications in electronic circuit and equipment. Hence this course is intended to develop the skills to build, test, diagnose and rectify OPAMP based electronic circuits. It also covers IC555 and its applications which plays major role in industry, consumer and domestic 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:

Maintain electronics circuits consisting of linear integrated circuits.

E. COURSE LEVEL LEARNING OUTCOMES (COs)

ETH302-1 Select suitable OPAMP with appropriate parameters for any application.

ETH302-2 Construct various configurations of OPAMP for different applications.

ETH302-3 Make use of OPAMP for various non-linear applications.

ETH302-4 Maintain various waveform generator circuits.

ETH302-5 Design various active filters using OPAMP

ETH302-6 Use IC555 to develop various 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 Operate and Maintain	PSO2 Supervision and Providing Solution
ETH302-1 Select suitable OPAMP with appropriate parameters for any application.	3	-	-	1	-	-	--	2	--
ETH302-2 Construct various configurations of OPAMP for different applications.	3	2	2	3	--	--	--	3	1
ETH302-3 Make use of OPAMP for various non-linear applications.	3	2	2	3	-	--	--	3	1
ETH302-4 Maintain various waveform	3	-	-	3	--	--	--	3	--

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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**
generator circuits.									
ETH302-5 Design various active filters using OPAMP	3	3	2	3	-	--	--	3	1
ETH302-6 Use IC555 to develop various applications.	3	-	2	3	--	--	--	3	--

F. CONTENT:

I) Practical exercises

The following practical exercises shall be conducted in the laboratory in practical sessions of batches of about 20- 22 students. Any 20 experiments should be performed. All COs should be covered.

Sr. No.	Laboratory Experiments	CO
1.	Measure output voltage swing of IC741.	ETH302-1
2.	Build the circuit to measure input offset voltage and output offset voltage of IC741	ETH302-1
3.	Build the circuit of Inverting and non-inverting amplifier with feedback using IC741 and measure its gain.	ETH302-2
4.	Build and test the circuit of inverting adder using IC741.	ETH302-2
5.	Build and test the circuit of non-inverting adder using IC741.	ETH302-2
6.	Build and test the circuit of subtractor using IC741.	ETH302-2
7.	Build and test the circuit of integrator using IC741.	ETH302-2
8.	Build and test the circuit of differentiator using IC741.	ETH302-2
9.	Build V to I converter circuit using IC741 and measure output current.	ETH302-3
10.	Build the circuit of Zero crossing detector using IC741 and test the output.	ETH302-3
11.	Build and test performance of non-inverting comparator with positive and negative reference voltage.	ETH302-3
12.	Build and test performance of inverting comparator with positive and negative reference voltage.	ETH302-3
13.	Build the circuit of RC phase shift oscillator using IC741 and measure output frequency.	ETH302-4
14.	Build the circuit of Wein bridge oscillator using IC741 and measure output frequency.	ETH302-4

Sr. No.	Laboratory Experiments	CO
15.	Simulate the working of Quadrature oscillator using IC741 using Multisim or relevant software.	ETH302-4
16.	Build and test Astable multivibrator using IC741.	ETH302-4
17.	Simulate the circuit of Monostable multivibrator using IC741.	ETH302-4
18.	Build the circuit of first order low pass filter using IC741and and measure the bandwidth and cutoff frequency.	ETH302-5
19.	Simulate the circuit of first order high pass filter using IC741and measure the bandwidth and cutoff frequency.	ETH302-5
20.	Build notch filter using IC741 and measure cutoff frequency.	ETH302-5
21.	Build and test Astable multivibrator using IC555.	ETH302-6
22.	Simulate the circuit of Monostable multivibrator using IC555.	ETH302-6
23.	Build and test voltage-controlled oscillator using IC555.	ETH302-6
24.	Build and test Schmitt trigger using IC555.	ETH302-6

II) Theory

Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	ETH302-1 Select suitable OPAMP with appropriate parameters for any application.		
1	**Basics of Operational Amplifier (OPAMP)** 1.1 Differential amplifier: circuit diagram and description of Dual input balanced output, Dual input unbalanced output, Single input balanced output, Single input unbalanced output differential amplifier. 1.2 Block diagram of OPAMP. 1.3 Symbol and equivalent circuit of OPAMP. 1.4 IC741 pin configuration and description 1.5 Ideal OPAMP electrical characteristics, ideal voltage transfer curve 1.6 Electrical parameters of OPAMP and its value for IC741: Input offset voltage, Input offset current, Input bias current, Differential input resistance, Input capacitance, Input voltage range, Common mode rejection ratio (CMRR), Supply voltage rejection ratio (SVRR), Large signal voltage gain, Output voltage swing, Output resistance, Slew rate, Supply current, Power	**04**	**08**

	consumption, Gain bandwidth product.		
	ETH302-2 Construct various configurations of OPAMP for different applications.		
2	**OPAMP configurations and feedback** 2.1 Open loop configurations of OPAMP: Inverting, Non inverting and Differential amplifier. 2.2 Virtual ground and virtual short concept of OPAMP 2.3 Block diagram representation of feedback configurations: Voltage series, voltage shunt, current series, current shunt 2.4 Closed loop configurations of OPAMP: Voltage series feedback amplifier (Non Inverting amplifier), Voltage shunt feedback amplifier (Inverting amplifier). (Circuit diagram and derivations for voltage gain, effect of feedback on gain, input resistance, output resistance and bandwidth.) 2.5 Voltage follower, Inverter (sign changer) 2.6 Differential amplifier with one OPAMP (subtractor) 2.7 Summing, Scaling, and averaging amplifier in inverting and non-inverting configuration 2.8 Basic and practical differentiator 2.9 Basic and practical integrator. Circuit diagram, working, input output waveforms, derivation for output voltage and simple numericals based on it for all above applications of OPAMP.	**10**	**14**
	ETH302-3 Make use of OPAMP for various non-linear applications.		
3	**OPAMP Applications** 3.1 Comparators: Inverting and non-inverting comparators with positive reference voltage, negative reference voltage, Zero crossing detector. 3.2 Window comparator (detector) 3.3 Schmitt trigger 3.4 Voltage to current (V to I) converter with floating load and grounded load, Current to voltage (I to V) converter. 3.5 Precision rectifier half wave and full wave. 3.6 Instrumentation amplifier using three OPAMP. 3.7 Sample and hold circuit 3.8 Peak detector Circuit diagram, working, input output waveforms,	**8**	**12**

	derivation for output voltage and simple numericals based on it for all above applications of OPAMP.		
	Sub-total	**22**	**34**

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Section –II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	ETH302-4 Maintain various waveform generator circuits.		
4	**Waveform Generator** 4.1 Astable multivibrator using OPAMP. 4.2 Monostable multivibrator using OPAMP. 4.3 Bistable multivibrator using OPAMP. 4.4 Triangular wave generator using OPAMP. 4.5 Sawtooth wave generator using OPAMP. 4.6 RC phase shift oscillator using OPAMP. 4.7 Wein bridge oscillator using OPAMP. 4.8 Quadrature oscillator using OPAMP. 4.9 Voltage controlled Oscillator IC566, block diagram, pin diagram. Circuit diagram, operation, waveforms, equations for time periods /frequency and simple numercials based on it.	**10**	**14**
	ETH302-5 Design various active filters using OPAMP		
5	**Active Filters** 5.1 Introduction to filters, classification of filters 5.2 Advantages of active filter over passive filter 5.3 Ideal and practical frequency response curve of low pass, high pass, band pass and band reject filters 5.4 Terms related to filters: order of filter, cutoff frequency, center frequency, pass band, stop band, roll off rate, bandwidth and Q factor. 5.5 First order Butterworth low pass and high pass filter. 5.6 Second order Butterworth low pass and high pass filter. 5.7 Band pass filter (wide band pass and narrow band pass). 5.8 Band reject filter (wide band and narrow band or notch filter) 5.9 All pass filter Circuit diagram, operation, frequency response, equation for gain and cutoff frequency (no derivation). Simple numericals based on design of low pass and high pass.	**7**	**12**
	ETH302-6 Use IC555 to develop various applications.		
6	**Timer IC 555** 6.1 Block diagram of IC555.	**6**	**10**

	6.2 Pin diagram and specifications of IC555 6.3 Astable multivibrator using IC555 6.4 Monostable multivibrator using IC555 6.5 Bistable multivibrator using IC555 6.6 Schmitt trigger using IC555 6.7 Voltage control oscillator using IC555 6.8 Water level controller using IC555 Circuit diagram, operation, waveforms, equations for time periods /frequency and simple numercials based on it.		
	Sub-total	**23**	**36**

G. List of Assignments under SLA

Sr. No.	Microprojects
16.	Develop clap switch using IC741
17.	Build automatic light operated switch using LDR and IC741
18.	Build automatic evening lamp using IC555
19.	Develop square wave generator using IC741
20.	Develop low pass filter for cutoff frequency 2KHz
21.	Build notch filter for frequency 5 KHz
22.	Develop water level controller using IC555
23.	Automatic street light using IC555
24.	Simple metal detector using IC555
25.	Light sensitive switch using IC741

Above is a suggestive list of microprojects. 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 in a group of 2 or 3 students.

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	Basics of Operational amplifier (OPAMP)	4	4		08	ETH302-1
I / 2	OPAMP configurations and feedback	4	4	6	14	ETH302-2
I / 3	OPAMP Applications		4	8	12	ETH302-3

II /4	Waveform Generator		6	8	14	ETH302-4
II /5	Active filters	2	4	6	12	ETH302-5
II / 6	Timer IC555		4	6	10	ETH302-6
Total Marks		10	26	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**

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:

26. Lectures cum Demonstrations
27. Class room practices
28. 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	OPAMPs and Linear Integrated Circuits	Ramakant A Gayakwad	PHI New Delhi
2	Integrated Circuits	Botkar K R	Khanna Publisher

3	Linear Integrated Circuits	D Roy Choudhary	New Age International Publisher

M. Learning Website & Software

a. https://www.monolithicpower.com/en/operational-amplifiers
b. https://ae-iitr.vlabs.ac.in/List%20of%20experiments.html
c. https://how2electronics.com/op-amp-ic-lm741-basics-characteristics-pins-applications/#google_vignette
d. https://archive.nptel.ac.in/courses/108/108/108108114/
e. https://www.hackatronic.com/voltage-controlled-oscillator-circuit-using-566-ic/
f. https://www.electronics-tutorials.ws/filter/filter_5.html#

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COURSE ID :

COURSE NAME : DIGITAL TECHNIQUES & APPLICATIONS
COURSE CODE : ETH303
COURSE ABBREVIATION : HDTA

A. LEARNING SCHEME:

Scheme component		Hours	Credits
Actual Contact Hours / week	Classroom Learning	**03**	**04**
	Tutorial Learning	**00**	
	Laboratory Learning	**04**	
	SLH-Self Learning	**01**	
	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	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN			
1.5	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: -

It is essential to know the basics of digital techniques for understanding the applications of digital systems. This course will help the student to comprehend logic and circuit design. Digital technique course provides a foundation for understanding embedded systems and microcontroller-based applications. By encouraging hands-on experimentation and project-based learning, the digital electronics course can inspire students to think creatively and apply their knowledge to develop innovative technologies and applications. This course ensures that diploma students are prepared to work with the latest digital technologies, such as microcontrollers, programmable logic devices, embedded systems, and digital communication systems.

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 digital systems by applying principles of digital techniques

E. COURSE LEVEL LEARNING OUTCOMES (COs)

ETH303-1: Use number system and codes for interpreting working of digital system
ETH303-2: Use Boolean expressions to realize logic circuits
ETH303-3: Understand different Logic families
ETH303-4: Build combinational circuits, multiplexers, demultiplexers and decoders
ETH303-5: Build sequential circuits
ETH303-6: Test data converters in digital electronics systems

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
ETH303-1 (Use number system and codes for interpreting working of digital system)	2	3	2	1	1	-	1	1	-
ETH303-2 (Use Boolean expressions to realize logic circuits)	2	3	3	1	1	-	1	3	2
ETH303-3 (Understand different Logic families)	2	1	-	1	1	-	1	3	1
ETH303-4 (Build combinational circuits, multiplexers, demultiplexers and decoders)	2	3	3	1	1	-	1	3	3
ETH303-5	2	3	3	1	1	-	1	3	3

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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
(Build sequential circuits)									
ETH303-6 (Test data converters in digital electronics systems)	2	2	3	1	1	-	1	3	3

F. CONTENT:

I) Practical exercises

The following practical exercises shall be conducted in the *Laboratory for Digital Techniques* in practical sessions of batches of about 20- 22 students.

Sr. No.	Laboratory experiences	COs
1	Test the functionality of NOT, AND, OR logic gates using breadboard. (IC 7404,7408,7432)	ETH303-2
2	Test the functionality of NAND & NOR logic gates using breadboard. (IC 7400 & IC 7402)	ETH303-2
3	Test the functionality of EX-OR & EX-NOR logic gates using breadboard.	ETH303-2
4	Construct AND, OR & NOT gates using Universal gates NAND & NOR and verify their truth tables.	ETH303-2
5	Build and test the logic circuit on breadboard to check De Morgan's theorems for 2 input variables.	ETH303-2
6	Design Half adder & Full adder using Boolean expressions	ETH303-4
7	Design Half subtractor & Full subtractor using logic gates	ETH303-4
8	Construct & test BCD to 7-segment decoder using IC 7447/7448	ETH303-4
9	Design and implementation of 4-bit binary adder/subtractor and BCD adder using IC 7483	ETH303-4
10	Build & test function of MUX using IC 74151/74150/any other equivalent IC	ETH303-4
11	Build & test function of DeMUX using IC 74138/74139/any other equivalent IC	ETH303-4
12	Design 8:1 MUX using 4:1 MUX using circuit simulator.	ETH303-4
13	Build & test function of decoder IC 74155/74154/any other IC	ETH303-4
14	To study and Implement 4-Bit Magnitude Comparator using IC-74LS85	ETH303-4
15	Build/ test function of RS flip flop using NAND gate	ETH303-5
16	Build & test function of JK flip flop using IC 7476	ETH303-5
17	Build and test the functionality of D flip flop	ETH303-5
18	Build and test the functionality of T flip flop	ETH303-5
19	Build 4-bit Right Shift Register using D flip flop IC 7474	ETH303-5

20	Implement 4-bit ripple counter using IC 7476	ETH303-5
21	Build and test MOD-10 counter using IC 7490	ETH303-5
22	Build and test UP/DOWN counter using IC 74193	ETH303-5
23	Build an R-2R ladder DAC circuit using precision resistors	ETH303-6
24	Build weighted resistor DAC circuit using resistors	ETH303-6
25	Construct a Dual slope ADC circuit and apply an analog input voltage	ETH303-6

II) Theory

Section I

Sr. No.	Topics	Teaching hours	Marks
ETH303-1: Use number system and codes for interpreting working of digital system.			
1	**Number system & codes** 1.1 Introduction to number system: Binary, Octal, Decimal Hexadecimal, unsigned and signed numbers 1.2 Conversion from one number system to other number system 1.3 Binary arithmetic operations: rules of binary addition, binary subtraction, binary subtraction using 2's complement. 1.4 Computer codes: BCD, ASCII Code, Gray code and Excess-3 code 1.5 Code Conversion: Gray to binary and binary to gray conversion (up to 4 bits) 1.6 BCD Arithmetic: BCD addition, BCD subtraction using 9's and 10's complement. 1.7 Parity: even and odd parity	**06**	**10**
ETH303-2: Use Boolean expressions to realize logic circuits.			
2	**Boolean Algebras**: 2.1 Boolean algebra (rules, laws, Boolean expressions) 2.2 De Morgan's Theorem 2.3 Logic gates: Symbol, logical expression, truth table and ICs of basic logic gates (AND, OR, NOT) Universal gates (NAND and NOR) and Special purpose gates (EX- OR, EX-NOR), realization of basic gates using universal gates. 2.4 Standard Boolean representation: Sum of Product (SOP) and Product of Sum (POS), Min-term and Max-term, Conversion between SOP and POS forms 2.5 K map reduction technique: Minimization of Boolean functions up to 4 variables (SOP and POS form), realization using NAND/NOR gates, don't care condition	**10**	**16**
ETH303-3: **Understand different Logic families**			
3	**Digital Logic Families** 3.1 Characteristics of logic families: fan in, fan out,	**06**	**08**

	propagation delay, power dissipation, noise margin 3.2 TTL family: Circuit diagram & working of TTL NAND gate 3.3 CMOS family: a) Circuit diagram & working of CMOS inverter b) Circuit diagram & working of CMOS NAND & NOR gates(2 inputs) 3.4 Comparison of logic families TTL & CMOS.		
	Sub total (Section I)	**22**	**34**

Section II

Sr. No.	Topics	Teaching hours	Marks
ETH303-4: Build combinational circuits, multiplexers, demultiplexers and decoders			
4.	**Combinational circuits** 4.1 Design of arithmetic circuits using K-map: Half and full Adder, half and full Subtractor 4.2 Adder and subtractor using IC7483, BCD adder / subtractor 4.3 BCD to 7 segment decoder/driver (IC 7447 /7448) 4.4 Binary to gray code converter and gray to binary code converter. 4.5 Comparator: 1 bit and 2 bit (design and realization using K map), 4 bit comparator using IC7485. 4.6 **Multiplexer:** Necessity, types of multiplexers 2:1, 4:1, 8:1, 16:1 (realization using gates and ICs 74150, 74151), Multiplexer tree 4.7 **Demultiplexer:** Necessity, types of demux 1:2, 1:4, 1:8, 1:16 (realization using gates), Demultiplexer tree 4.8 **Decoder:** concept of decoder, 2 line to 4 line, 3 line to 8 line, 4 line to 16 line decoder (realization using gates and ICs 74154, 74155)	**10**	**16**
ETH303-5: Build Sequential circuits			
5	**Sequential Logic Circuits** 5.1 **Basic memory cell:** RS-latch using NAND and NOR 5.2 **Triggering Methods:** Edge trigger and level trigger 5.3 **SR Flip Flops:** SR-flip flop, clocked SR flip flop with preset and clear 5.4 **JK Flip Flops:** Clocked JK Flip flop with preset and clear, race around condition in JK flip flop, Master slave JK flip flop. D flip flop and T type flip flop, Block schematic and function table of IC-7474, IC-7475 5.5 Shift Register Logic diagram of 4- bit Shift registers: Serial Input Serial Output, Serial Input Parallel Output, Parallel Input Serial Output, Parallel Input	**08**	**12**

	Parallel Output, 4 Bit Universal Shift register 5.6 **Counters:** Asynchronous counter using T flipflop: 4-bit Ripple counter, 4 bit up/down Counter, modulus of counter, Block schematic of IC 7490, Decade counter, IC 7490 as MOD N Counter (using 4 bits)		
ETG 306-6: Test data converters in digital electronics systems			
6.	**Data converters** 6.1 DAC Types – Weighted resistor method and R-2R method, specifications of DAC 6.2 Types of ADC, specifications of ADC, block diagram and working of Dual slope ADC and Successive approximation ADC 6.3 Numericals on DAC and ADC	**05**	**08**
	Sub total (Section II)	**23**	**36**

Assignments under SLA

Sr. No.	List of Assignment (under SLA)	Hours allotted
1.	Convert the decimal number 156 to binary, octal, and hexadecimal.	02
2.	Convert the binary number 110101 to decimal, octal, and hexadecimal.	02
3.	Convert the octal number 245 to binary, decimal, and hexadecimal.	02
4.	Convert the hexadecimal number 3F2 to binary, decimal, and octal.	02
5.	Implement a 2-input AND gate using logic gates and create its truth table.	02
6.	Implement a 3-input OR gate using logic gates and create its truth table.	02
7.	Implement a 4-input XOR gate using logic gates and create its truth table.	02
8.	Design and implement an SR flip-flop using NAND gates.	02
9.	Design and implement a D flip-flop using NOR gates.	02
10.	Design and implement a 4-bit shift register using D flip-flops.	02
11.	Design a 4-to-1 multiplexer using logic gates and verify its functionality.	02
12.	Design a 3-bit binary counter using flip-flops and verify its counting sequence.	02

**Out of 12, eight assignments covering all six COs are compulsory. As per the requirement course teacher can modify the assignments.

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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	**Number system & codes**	2	2	6	10	**ETH101-1**
I / 2	**Boolean Algebra**	2	6	8	16	**ETH101-2**
I / 3	**Digital Logic Families**	2	6	-	08	**ETH101-3**
II /4	**Combinational Circuits, Multiplexers, demultiplexers and decoders**	2	6	8	16	**ETH101-4**
II /5	**Sequential Logic Circuits**	2	4	6	12	**ETH101-5**
II / 6	**Data converters**	2	2	4	08	**ETH101-6**
Total Marks		**12**	**26**	**32**	**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	05
2	Circuit building, handling of ICs	05
3	Observation & Conclusion	05
4	Oral based on performed practical	05
5	Analytical, Logical problem solving skills, Creativity skills, time management	05
TOTAL		**25**

I. Instructional Methods:

1. Classroom Learning
2. Active Learning
3. Collaborative Learning
4. Experimental Learning
5. 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	Digital Design	M. Morris Mano	Pearson Education
2	Modern Digital Electronics	R.P. Jain	McGraw Hill
3	Fundamentals of Digital Circuits	Kumar Anand and Bhupendra Kumar Singh	PHI Learning Pvt. Ltd.

L. Learning Website & Software

1. Electronics Hub: electronicsforu.com
2. All About Circuits: allaboutcircuits.com
3. Virtual Lab: https://dec-iitkgp.vlabs.ac.in/
4. Digital Electronics Course by NPTEL: nptel.ac.in (NPTEL's official website)
5. Multisim by National Instruments: ni.com/Multisim
6. MATLAB and Simulink: mathworks.com/products/matlab.html

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COURSE ID

COURSE NAME : ANALOG COMMUNICATION

COURSE CODE : ETH304

COURSE ABBREVIATION : HACM

A. LEARNING SCHEME:

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

B. ASSESSMENT SCHEME:-

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL				BASED ON SLA		Total
					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

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: -

Analog Communication is the subject that presents information about the basic processes, circuits and other building blocks of communication system. The study of basic operating and handling of various analog communication systems will help to troubleshoot and maintain analog communication systems used for various types of communication.

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:

3. Identify and measure electrical parameters of analog communication circuits.
4. Maintain and operate analog communication circuits.

E. COURSE LEVEL LEARNING OUTCOMES (COs)

ETH304-1: Choose relevant frequency ranges for different communication systems
ETH304-2: Match relevant modulation techniques for specific applications.
ETH304-3: Select Frequency modulation and Phase modulation for specific applications
ETH304-4: Maintain receiver circuits of Am and FM
ETH304-5: Identify relevant type Antenna for various applications.
ETH304-6: Use relevant media for transmission and reception of signals.

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
Competency: Explain, operate and maintain different Analog communication systems.	2	1	2	1	-	-	-	1	1
ETH304-1	1	-	-	-	-	-	-	-	-
ETH304-2	2	-	2		-	-	-	-	1
ETH304-3	2	-	1	1	-	-	-	-	1
ETH304-4	1	2	2	-	-	-	-	1	1
ETH304-5	-	1	-	-	-	-	-	-	-
ETH304-6	-	1	-	-	-	-	-	-	-

F. CONTENT:

I) Practical exercises

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

Sr. No.	Laboratory experiences	CO
25.	Generate Amplitude modulation Wave Trace the circuit identify carrier, Modulating signal and modulated signal.	ETH 304-2
26.	Observation & measurements of AM wave Observe AM waveform on CRO Calculate modulating index	ETH 304-2
27.	Study trapezoidal pattern Observe various trapezoidal patterns on CRO. Calculate modulating index using this pattern	ETH 304-2, 4
28.	Demodulation of FM using Diode detector Trace the circuit, Identify Modulated and demodulated signal and observe waveforms on CRO.	ETH 304- 2,3
29.	Generation of Frequency modulated waveform Trace the circuit, identify carrier, modulating signal and modulated signal.	ETH 304-2, 3 6
30.	Observation and measurement of FM wave Observe FM waveforms on CRO Calculate modulating index	ETH 304- 2,3
31.	Demodulation of FM signal Observe FM and FM demodulated waveforms on CRO. Observe similarities in modulated signal and demodulated signal.	ETH 304-2, 4
32.	Visit to AM Transmitter Understand AM transmitter and prepare a project report.	ETH 304-1, 3, 5
33.	Visit to FM Transmitter Understand FM transmitter and prepare a project report	ETH 304-1, 3, 5
34.	Study of super heterodyne radio receiver Identify different blocks & expected waveforms of superheterodyne radio receiver, Identify different controls and their functions and measure the voltages at different check points.	ETH 304-1- 4
35.	Fault finding in Super heterodyne receiver Locate faults using voltage and waveform technique at different check points and correct them.	ETH 304-1- 4
36.	To plot selectivity and fidelity curve for superheterodyne radio receiver Give input AM wave from signal generator to the circuit and observe output on CRO. Plot the selectivity & fidelity curve by varying carrier frequency.	ETH 304-4,
37.	Study of FM Receiver Identify different blocks & expected waveforms of slope or ratio detector. Identify different controls and their functions and measure the voltages at different check points	ETH 304-4, 5
38.	Study and design Of Yagi-Uda Antenna Draw diagram of yagi_uda antenna. Identify and describe parts of yagi_uda antenna.	ETH 304-6 ,5
39.	Study and design of Parabolic reflector (Dish Antenna) Draw diagram of Dish antenna. Identify and describe parts of Dish antenna for particular λ	ETH 304-6

II) Theory

Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	ETH304-1 Choose relevant frequency ranges for different communication systems.		
1	**Introduction to electronic communication system** 1.1Elements of basic electronic communication system 1.2 Classification of electronic communication systems into Wired and Wireless, Uni-cast and Broadcast, simplex, half duplex and full duplex. 1.3 Types of transmission media(Wired transmission). 1.3 Noise Fundamentals, Types, Noise figure, Noise Temperature, numerical based on noise figure and noise Temperature. 1.4 Electromagnetic Frequency spectrum 1.5 Bandwidth and Information Capacity 1.6 Modulation and Demodulation (Definition, Need of Modulation)	**6**	**08**
	ETH304-2 Match relevant modulation techniques for specific applications.		
2	**Amplitude Modulation and SSB Techniques.** 2.1 Amplitude modulation theory. 2.2 Sidebands, Frequency domain representation and bandwidth of AM wave 2.3 Time domain representation of AM wave and Trapezoidal pattern. 2.4 Power relation in AM wave. 2.5 Amplitude modulator circuits. 2.6 AM Transmitters – Low level and High level 2.7 Single side band technique (SSB) 2.7. 1 Advantages and disadvantages of SSB 2.7.2 Suppression of carrier. 2.7.3 Suppression unwanted side band. 2.8 Concept of vestigial sideband & waveforms 2.9 Numerical problems based on AM & SSB theory.	**9**	**14**
	ETH304-3 Select Frequency modulation and Phase modulation for specific applications		
3	**Angle Modulation and FM Transmitters** 3.1 Frequency modulation and Phase modulation theory. 3.2 Mathematical representation of FM and PM 3.3 FM and PM waveforms. 3.4 Difference between FM and PM 3.5 Modulation index, Deviation ratio, Bandwidth, Power Considerations. 3.6 Generation of FM – Direct and Indirect methods 3.7 FM transmitters - Direct and Indirect 3.8 Comparison between AM and Angle modulation 3.9 Numerical problems based on FM and PM theory.	**7**	**12**
	Sub-total	**22**	**34**

Section –II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	ETH304-4 Maintain receiver circuits of Am and FM		
4	**Radio Receivers** 4.1 AM Receivers 4.1.1 TRF receivers, Super heterodyne receiver. 4.1.2 Receiver performance characteristics 4.1.3 RF section 4.1.4 Frequency mixer and down converters 4.1.5 Image frequency and its rejection 4.1.6 IF amplifiers 4.1.7 AM detector 4.1.8 AGC circuits. 4.2 FM receivers: 4.2.1 FM discriminators – slope detector, ratio detector, PLL detector (Basic working of PLL to be covered) 4.2.2 Pre-emphasis and De-emphasis	**10**	**14**
	ETH304-5 Identify relevant type Antenna for various applications		
5	**Antennas** 5.1 Radiation Mechanism. 5.2 Radiation pattern 5.3 Antenna gain, resistance, polarization, beam width, bandwidth 5.4 Resonant and non-resonant antennas. 5.5 Half wave dipole 5.6 Loop antenna. 5.7 Helical antenna. 5.8 Yagi-Uda antenna. 5.9Parabolic reflector antenna	**5**	**10**
	ETH304-6 Use relevant media for transmission and reception of signals		
6	**Electromagnetic Wave Propagation** 6.1 Electromagnetic waves and polarization 6.2 Reflection, refraction, diffraction of waves 6.3 Ground (surface) waves propagation. 6.4 Space wave propagation. 6.5 Sky wave propagation 6.5.1 Virtual height. 6.5.2 Critical frequency and critical angle 6.5.3 Skip distance. 6.5.4 Maximum usable frequency. 6.6 Fading	**8**	**12**
	Sub-total	**23**	**36**

III) List of Assignments under SLA

Sr. No.	List of Assignment (under SLA)	Hours allotted
26.	Write procedure to measure AC and DC Amplitude, time period and frequency using CRO and function generator.	02
27.	Tabulate important characteristics of commonly available analog communication system	02
28.	Tabulate important characteristics of AM modulation..	02
29.	Tabulate important characteristics of , FM, PM modulation	02
30.	Write a procedure to generate amplitude modulated signal.	02
31.	Draw a chart showing waveform of AM, FM, PM modulation	02
32.	Study of SSB techniques	02
33.	Study of different types of Radio Receivers.	02
34.	Draw a chart of different types of antenna.	02
35.	Study different types of Electromagnetic Wave Propagation.	02
36.	Draw a chart different type of Radio Receivers.	02
37.	Study of modulation and demodulation concept.	02
38.	Study different types of antenna.	02
39.	Draw a radiation pattern of different types of antenna.	02
40.	Study working of Pre-emphasis and De-emphasis	02

**Out of 12 eight assignments covering all six COs are compulsory. As per the requirement course teacher can modify the assignments.

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	**Introduction to electronic communication system**	4	4	=	8	ETH304--1
I / 2	**Amplitude Modulation and SSB Techniques**	4	4	6	14	ETH304--2
I / 3	**Angle Modulation and FM Transmitters**	2	6	4	12	ETH304--3
II /4	**Radio Receivers**	2	8	4	14	ETH304--4
II /5	**Antennas**	4	4	2	10	ETH304--5
II / 6	**Electromagnetic Wave Propagation**	4	6	2	12	ETH304--6
Total Marks		20	32	18	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:

29. Lectures cum Demonstrations
30. Class room practices
31. 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.	Electronic Communication Systems	Wayne Tomasi	Pearson Publication
2.	Communication Electronics	Louis Frenzel	TMH Publication
3.	Electronic Communication Systems	Kennedy.	TMH Publication
4.	Electronic Communication	Roddy Coolen	PHI Publication

L. Learning Website & Software

1) www.nptel.ac.in
2) www.antenna-theory.com
3) www.explainthatstuff.com/antennas.html
4) www.circuitstoday.com/single-chip-fm-radio-circuit

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COURSE ID :

COURSE NAME : ELECTRONICS MEASUREMENTS & INSTRUMENTATION
COURSE CODE : ETH305
COURSE ABBREVIATION : HEMI

A. LEARNING SCHEME:

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

B. ASSESSMENT SCHEME:-

PAPER DURATION IN HRS	THEORY				BASED ON LL&TL Practical				BASED ON SLA		Total
	FA-TH	SA-TH	TOTAL		FA -PR		SA-PR		MAX	MIN	
	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN			
-	-	-	-	-	50	20	25@	10	25	10	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, *# 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: -

Diploma students must have the skill to demonstrate the various electronic measuring instruments while maintaining various electronic equipment/systems. This subject intends to provide the students practical information & technical background. It also provides the students with concepts, principles and procedures of Analog and Digital electronic measuring instruments and the measurement techniques for the measurement of various electronic quantities. Because of the scope of the subject, students are well exposed to a good and wide area of the various electronic measuring instruments as the subject comprises of those basic equipment and transducers of which students should have knowledge.

ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to attend following industry identified competency through various teaching learning experiences: • Demonstrate and maintain electronic measuring equipments while troubleshooting of electronic circuits.

E. COURSE LEVEL LEARNING OUTCOMES (COs)

ETH305-1 Describe various characteristics of measuring instruments.
ETH305-2 Determine the unknown values of components using bridges and demonstrate various digital meters.
ETH305-3 Explain & demonstrate the use of various test instruments.
ETH305-4 Interpret working of various types of sensors and transducers.
ETH305-5 Interpret working of various types of sensors and transducers.
ETH305-6 Maintain signal conditioning and data acquisition systems.

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
ETH305-1	3	-	-	2	-	-	--	1	1
ETH305-2	3	2	-	3	--	--	--	3	1
ETH305-3	3	2	-	3	-	--	--	3	1
ETH305-4	3	2	-	3	--	--	1	2	1
ETH305-5	3	2	-	3	-	--	1	3	1
ETH305-6	3	2	--	3	--	--	1	3	1

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F. CONTENT:

I) Practical exercises

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

(Any 10)

Sr. No.	Laboratory experiences	CO
32.	Demonstrate the use of analog and digital multimeter.	ETH 305-2
33.	Demonstrate the use of LCR--Q meter	ETH 305-2
34.	Demonstrate the use of CRO as component tester.	ETH 305-3
35.	Identify various types of transducers.	ETH 305-4
36.	Demonstrate the use CRO for measurement of AC/DC voltage & frequency.	ETH 305-3
37.	Test performance of inductive transducer LVDT.	ETH 305-5
38.	Demonstrate the use of CRO for measurement of phase & frequency using Lissajous figures.	ETH 305-3
39.	Demonstrate the use of function generator.	ETH 305-3
40.	Study of whetstone's bridge for measurement of unknown resistances.	ETH 305-2
41.	Demonstrate the use of detectors for Ac bridge like headphone.	ETH 305-2
42.	Measurement of unknown capacitance using bridge.	ETH 305-2
43.	Measurement of unknown inductance using bridge.	ETH 305-2
44.	Demonstrate the use of use of frequency meter	ETH 305-2
45.	Demonstrate the use of any type of temperature transducer.	ETH 305-5
46.	Demonstrate any data acquisition system. (Use lab setup/video/visit).	ETH 305-6

II) Theory

Section I

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	ETH305-1 Describe various characteristics of measuring instruments.		
1	**Fundamentals of Measuring Instruments** 1.1 Classification of Instruments: Absolute , Secondary Instruments 1.2 Definitions of Static characteristics of Instruments: Accuracy, Precision, Sensitivity, Resolution, Static error, Reproducibility, Drift, Dead Zone. 1.3 Definitions of dynamic characteristics of Instruments: Speed of response, Lag, fidelity, Dynamic error. 1.4 Types of Errors- Gross, Systemic, Random	**6**	**NA**

	1.5 Units of measurement of fundamental quantity. 1.6 Definition of Standards and their classification.		
	ETH305-2 Determine the unknown values of components using bridges and demonstrate various digital meters.		
2	**Measurement of Electrical Parameters** 2.1 Bridge balance condition for DC bridge. 2.2 Block diagram, principle of working and numerical of DC bridges: Whetstone's bridge, Guarded whetstone's bridge, Kelvin's bridge. 2.3 Block diagram, principle of working and numerical of AC bridges: Capacitance comparison bridge, Inductance comparison bridge, Maxwell's bridge, Hay bridge, Schering's bridge, Wien's bridge. 2.4 Concepts of ADC & DAC 2.5 Advantages and Disadvantages of Digital Instruments and comparison with analog instruments. 2.6 Definition of Average & RMS value. 2.7 PMMC- Working Principle, Construction. 2.8 Resolution, Sensitivity and Accuracy of digital display. 2.9 Digital Voltmeter-Successive approximation type, Digital frequency meter, LCR, Q meter- Block diagram and operation only	**8**	**NA**
	ETH305-3 Explain & demonstrate the use of various test instruments.		
3	**Test &Measuring Instruments** 3.1 Oscilloscope subsystems- 3.1.1 Display subsystems- CRT, Deflection of electron beam in CRT, sensitivity. 3.1.2 Vertical deflection subsystems- Input Coupling selector, Input attenuator, Pre-amplifier, Main vertical amplifier, delay line. 3.1.3 Horizontal deflection subsystems- Trigger circuit, Time base generator, Main Horizontal amplifier. 3.1.4 CRO Probes- General block diagram of CRO probe, passive voltage probe, and their compensation, Active voltage probes, current probes. 3.2 CRO-Block diagram of single beam dual trace and dual beam oscilloscope. 3.3 Block diagram of Digital storage oscilloscope. 3.4 Uses of CRO- Frequency and phase measurement, Tracing of diode and transistor characteristics. 3.5 Signal generator-AF and RF type- Block diagram and Operation only. 3.6 Function generator - Block diagram, Simple controls and operation only. 3.7 Specifications. 3.8 Concept of time domain and frequency domain Instruments. 3.9 Spectrum & Logic analyzer- Block diagram and Operation only.	**9**	**NA**
	Sub-total	**23**	**--**

Section –II

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	ETH305-4 Interpret working of various types of sensors and transducers.		
4	**Sensors and Transducers** 4.1 Instrumentation System: Block diagram of Instrumentation system, function of each block. 4.2 Sensors and Transducer: definition, difference betweensensors and transducers ,classification of sensors 4.3 Thermal, optical, magnetic and electric sensors: working principle and applications 4.4 Transducer: Need for Transducer, selection criteria of transducer, types: primary and secondary, active and passive, analog and digital, resistive, capacitive, inductive(Linear variable differential transformer (LVDT), Rotary variable differential transformer (RVDT), Piezo electric transducer	**9**	**NA**
	ETH305- 5 Measure physical quantities using various types of transducers and sensors.		
5	**Application of Sensors and Tranducers** 5.1 Temperature measurement types: Resistance Temperature Detector (RTD)– (PT-100) , Thermistors, Thermocouple – Seeback & Peltier effect , Type J, K, R, S,T etc. (Based on material, temperature ranges) 5.2 Pyrometer– Optical type 5.3 Pressure measurement types: Bourdon Tube, Bellows, Diaphragm 5.4 Flow measurement types: variable head flow meter, venturimeter, orifice plate. Variable area flow meter: Rotameter, electromagnetic flow meter. 5.5 Special transducers and measurement: Humiditymeasurement using hygrometer, pH measurement	**9**	**NA**
	ETH305-6 Maintain signal conditioning and data acquisition systems.		
6	**Data Acquisition System** 6.1 Signal conditioning: Introduction, types, block diagram and working of AC and DC signal conditioning circuits. 6.2 Data Acquisition Systems (DAS): Introduction, block diagram, working and applications of DAS	**4**	**NA**
	Sub-total	**22**	**--**

G. Assessment Criteria

i) Formative Assessment of Practical: -

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

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

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**

H. Instructional Methods:

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

I. Teaching and Learning resources:

Chalk board, LCD presentations, Demonstrative kits, Demonstrative charts

J. Reference Books:

Sr. No.	Name of Book	Author	Publication
1	Electrical & Electronic Measurements & Instrumentations	A.K. Sawhney	Dhanpat Rai & Co

K. Text Books

Sr. No	Name of Book	Author	Publication
1	Modern Electronic Instrumentation & Measurement Techniques	W.D. Cooper	Pearson Education,
2	Electronic Instruments	H.S.Kalsi	Tata Mc Grow Hill

L. 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

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COURSE ID:

COURSE NAME : BASIC PYTHON PROGRAMMING
COURSE CODE : ETH306
COURSE ABBREVIATION : HBPP

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 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			
	-	-	-	-	25	10	25@	10	-	-	50

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.

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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: -

Electronics based industries needs to deal with creating circuits design, simulation, signal processing and control systems which can be developed using Python. This course deals with the basics of python to enhance the programming skills of diploma students. The course will enable students to write python programs as well as use different python libraries to solve given problems.

ii) INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to attain the following industry/employer expected outcome throughvarious teaching learning experiences:

Develop programs using python to solve wide-reaching electronics engineering related problems.

E. COURSE LEVEL LEARNING OUTCOMES (COs)

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

- **ETH306-1 - Develop script to demonstrate use of basic building blocks of python.**
- **ETH306-2 - Implement conditional and looping statements for given problem statement.**
- **ETH306-3 - Perform operations on sequence structures in python.**
- **ETH306-4 - Implement basics of object oriented programming concepts.**
- **ETH306-5 - Create modules and packages for given purpose.**

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
ETH306-1	2	-	-	-	-	-	-	-	-
ETH306-2	2	-	-	1	-	-	-	-	-
ETH306-3	1	1	1	2	-	-	-	-	-
ETH306-4	1	2	2	2	-	-	-	-	-
ETH306-5	1	1	1	2	-	-	-	-	-

F. CONTENT:

I) Practical exercises

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

(Minimum 12 of the following practical exercises are to be performed)

Sr. No.	Laboratory experiences	Skills to be developed	CO
47.	*Install and configure Python IDE. Write Python program to display message on screen. (Any relevant python IDE like IDLE/PyCharm/VSCode/Jupiter Notebook/OnlinePython Compiler.)	Install Python Integrated Development Environment.	ETH306-1
48.	*a) Write simple Python program to calculate equivalent registers connected in series and parallel.Accept values of R1, R2 and R3 from the user. *b) Write simple Python program to calculate value ofvoltage by applying Ohm's law. Accept value of Current(I) and Resistance(R) from the user.	Use operators in Python	ETH306-1
49.	*Write program to check whether entered frequency isradio frequency or audio frequency.	Implement two-way branching statement	ETH306-2
50.	*a)Write program to display various radio frequencybands using if..elseif ladder. *b)Write program to display resistor color code usingswitch statement.	Implement multi-waybranching statement	ETH306-2
51.	*a. Write a simple Python program to demonstrate useof control loops: i) while ii) do while *b. Create a simple program, to demonstrate use of: forloop in Python (e.g.: various pattern building, printing multiplication table, checking palindrome number etc.)	Implement control loops for solving iterative problems	ETH306-2
52.	*Write Python program to perform following operations on List: a) Create b) Access c) Update d) Delete elements from list.	Perform basic operations on the Lists	ETH306-3
53.	Develop Python program to perform following	Execute various tupleoperations	ETH306-3

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Sr. No.	Laboratory experiences	Skills to be developed	CO
	operations on Tuples: a) Create b) Access c) Update Delete Tuple elements		
54.	Write Python program to perform following operationson Set: a) Create b) Access c) Update d) Delete Access Set elements	Implement various set operations	ETH306-3
55.	*Create a program to perform following operations onDictionaries in Python: a) Create b) Access c) Update d) Delete e) Looping through Dictionary	Execute various operations on Dictionaries	ETH306-3
56.	a) *Create python program to demonstrate use of mathbuilt-in function. b) *Create python program to demonstrate use of string built-in function.	Use built-in mathematical functions andstring functions in python	ETH306-4
11.	Write python programs to define function with arguments. a) Calculate factorial of a number b) Swapping of two variables	Create user defined functions in Python	ETH306-4
12.	Write programs to define function with default arguments.	Implement function with default arguments	ETH306-4
13.	*Create a program to demonstrate use of: Built-in module (e.g. numeric, mathematical functional andprogramming module) in Python.	Use built-in python mathematical modules	ETH306-5
14.	Write program to create a user-defined module (e.g.:building calculator) in python.	Write user-defined module in python	ETH306-5
15.	*Develop Python program to demonstrate use of NumPy package for creating, accessing and performing different array operations.	Use python built-in packages	ETH306-5
16.	Write program to demonstrate the use of user definedpackages in Python.	Implement user-defined packages in python	ETH306-5

II) Theory

Sr. no.	Topics/Subtopics	Learning (Hours)	Classroom learning evaluation Marks
	ETH306-1 Develop script to demonstrate use of basic building blocks of python.		
1	**Basic Python's Constructs** 2.10 Introduction to Python- Python as scripting Language, Programming language Vs Scripting Language (C vs Python), Python's Technical Strength, Application in different domains 2.11 Python's building blocks- Identifiers, Keywords, Variables, Constants, Indentation, Comments in python 2.12 Python's Data Types – Numbers, Strings, List, Tuples, Dictionaries, Sets 2.13 Input and Output statements in python 2.14 Operators in Python- Operators as Arithmetic, Assignment, Unary Minus, Relational, Logical, Boolean, Bitwise, Membership, Identity, Operator precedence and Associativity	**6**	**-**
	ETH306-2 Implement conditional and looping statements for given problem statement.		
2	**Control Statements in Python** 2.1 Types of Control Statements – Decision making statements, Looping statements 2.2 Decision Making Statements: - if, if….else, else-if ladder ,nested if and switch statement 2.3 Looping statement: - while loop, for loop, nested loop 2.4 Manipulating Loops- use of break, continue and pass statements	**5**	**-**
	ETH306-3 Perform operations on sequence structures in python.		
3	**Data Structures in Python** 3.1 List- Defining List, Creating list, Accessing values from list, Updating the elements of a list, Concatenation of two lists, Repeating of Lists, Membership in list, Aliasing and cloning Lists, Methods to process Lists, Nested Lists 3.2 Tuples- Defining Tuple, Creating Tuples, Accessing the Tuple elements, Inserting elements in a Tuple, modifying elements of a Tuple, Deleting elements from a Tuple, Basic operations in Tuples, Functions to process Tuples, Nested Tuples 3.3 Sets- Defining Set, Creating a Set, Accessing elements	**7**	**-**

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	from set, Add and update Set, Remove an elements from a Set, Built in functions with Set, Set methods to perform mathematical operations, other relevant set methods 3.4 Dictionaries- Defining Dictionary, Creating Dictionary, Accessing elements from Dictionary, Add and update Dictionary, Delete an element from a Dictionary, Built in functions of Dictionary, Methods to perform Dictionary.		
ETH306-4 *Implement basics of object oriented programming concepts.*			
4	**Functions with Basic OOP concepts** 4.1 Python Functions- Use of python built in functions (e.g. type/data conversion functions, math and string functions), User defined function- Function definition, function calling, function arguments and parameter passing, Return statement, scope of variables (Global and Local Variables) 4.2 Basic OOP concepts- Introduction to object-oriented programming, Creating classes and objects, Constructors and Destructors in python, Data abstraction and Encapsulation	**7**	**-**
ETH306-5 ***Create modules and packages for given purpose***			
5	**Modules and Packages in Python** 5.1 Modules- Writing modules, importing module, python built in modules (Numeric and mathematical module, Functional Programming Module) 5.2 Python packages- Introduction, Writing python packages, using standard packages (NumPy, matplotlib) and user defined package statements	**5**	**-**

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	Technical preparedness for practical	05
Psychomotor	Operating skills/Algorithm/ flowchart	05
	Observation/Logic/ Program/Result	05
Affective	Discipline and punctuality	05
	Procedure/ Safety Measures/ Decency/ Presentation	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	Neat & complete circuit Diagram / schematic Diagram/ Algorithm/ Flowchart/ Program	5
2	Procedure followed to achieve the result	5
3	Observations, Result, Output, Sample Calculations with relevant formulae	5
4	Proper Graphs, workmanship and Safety measures	5
5	Oral	5
	Total	**25**

H. Instructional Methods:

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

I. Teaching and Learning resources:

Chalk board, LCD presentations, Demonstrative kits, Demonstrative charts

J. Reference Books:

Sr. No	Author	Title	Publisher with ISBN Number
1	Giancarlo Zaccone	Natural Computing with Python	BPB, ISBN:9789388511612
2	Martin C. Brown	Python: The Complete Reference	Tata McGraw Hill ISBN: 9789387572942
3	Yashwant Kanetkar	Let Us Python	BPB, ISBN: 978-9391392253
4	Kumar Naveen, Taneja Sheetal.	Python Programming: A modularapproach	Pearson, ISBN: 978-9352861293
5	Mark Lutz and DavidAscher	Learning Python	O'Reilly, ISBN: 978-1449355739
6	Paul Barry	Head First Python	O'Reilly, ISBN: 978-1449382674
7	John Guttag	Introduction to Computation andProgramming Using Python	MIT Press, ISBN: 978-0262529624
8	David Beazley	Python Essential Reference	Addison-Wesley Professional, ISBN: 978-0672329784

9	Dr. R. Nageswara Rao	Core Python Programming	DREAMTECH PRESS, ISBN: 978-9386052308

K. Learning Website & Software

Sr. No	Link / Portal	Description
1	https://www.programiz.com/python-programming	Python Programming
2	https://python-iitk.vlabs.ac.in/Introduction.html	Virtual Lab for Python Programming-Basic Constructs in Python
3	https://www.geeksforgeeks.org/python-programming-language/	Python Programming
4	https://intellipaat.com/academy/course/introduction-to-pytho n-programming-free-course/	Online Course-Python Programming
5	https://www.w3schools.com/python/	Python Programming
6	https://www.tutorialspoint.com/python/index.htm	Python Programming
7	https://www.python.org/	Python Programming
8	https://spoken-tutorial.org/tutorial-search/?search_foss=Pyt hon+3.4.3&search_language=English	Spoken Tutorial on Python Programming
Note : Teachers are requested to check the creative common license status/financial implications of the suggestedonline educational resources before use by the students		

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Programme :- ALL

Semester : THIRD

Course Title : ESSENCE OF INDIAN CONSTITUTION

Course Code : CCH205

A. RATIONALE

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

B. INDUSTRY / EMPLOYER EXPECTED OUTCOME

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

C. COURSE LEVEL LEARNING OUTCOMES (COS)

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

D. TEACHING-LEARNING & ASSESSMENT SCHEME

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

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Total IKS Hrs for Sem. : 4 Hrs
Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment
Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @$ Internal Online Examination
Note :

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

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

CO2 - Follow fundamental rights and duties as responsible citizen and engineer of the country. CO3 - Analyze major constitutional amendments in the constitution.

CO4 - Follow procedure to cast vote using voter-id.

CO5-List the roles and responsibilities of State Election Commission towards peoples in the state.

CO-6 List Judiciary provisions for the peoples in general

E. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

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	**CCH205.4** 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	**CCH205.5**. 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	**CCH205.6.** 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**

F. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES

: N.A.

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

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

2. Assignments are to be provided by the course teacher in line with the targeted COs.

3. Prepare an essay on Constitution of India .

4.Prepare a comparative chart of Unique features of Indian Constitution of India and Constitution of USA

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

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

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

Seminar

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

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Group discussions on current print articles.

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

Activity

Arrange Mock Parliament debates.

Prepare collage/posters on current constitutional issues.

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

H. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED :

NOT APPLICABLE

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

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Constitution and Preamble	CO1	4	0	0	0	0
2	II	Fundamental Rights and Directive Principles	CO2	4	0	0	0	0
3	III	Governance and Amendments	CO3	4	0	0	0	0
4	IV	Electoral Literacy and Voter's Education	CO4	3	0	0	0	0
Grand Total				**15**	**0**	**0**	**0**	**0**

J. ASSESSMENT METHODOLOGIES/TOOLS

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

Assignment, Self-learning and Terms work Seminar/Presentation

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

K. SUGGESTED COS - POS MATRIX FORM

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

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

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