KUMARAGURU COLLEGE OF TECHNOLOGY

An autonomous Institution affiliated to Anna University, Chennai

COIMBATORE – 641 049.

B.E., ELECTRONICS AND COMMUNICATION ENGINEERING

REGULATIONS 2018

CURRICULUM AND SYLLABI

I to IV Semesters

Department of Electronics and Communication Engineering

VISION

To be a centre of repute for learning and research with internationally accredited curriculum, state-of-the-art infrastructure and laboratories to enable the students to succeed in globally competitive environments in academics and industry.

MISSION

The Department is committed to:

- Motivate students to develop professional ethics, self-confidence and leadership quality.
- Facilitate the students to acquire knowledge and skills innovatively to meet evolving global challenges and societal needs.
- Achieve excellence in academics, core engineering and research.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The Programme Educational Objectives of Electronics and Communication Engineering Undergraduate Programme are:

PEO1: Graduates will be successful as Professionals, Researchers or Entrepreneurs in Electronics, Information and Communication Engineering disciplines.
PEO2: Graduates will continuously be updated with the state-of the art technology through formal and informal education to provide sustainable solutions.
PEO3: Graduates will demonstrate ethical and social responsibilities as an individual and in a team of diverse culture.

PROGRAMME OUTCOMES (POs)

PO1: The graduates would be able to apply the knowledge of mathematics, sciences, engineering fundamentals and skills to solve problems in electronics and communication
PO2: The graduates would acquire skills to analyse complex problems in the domain of electronics and communication engineering.
PO3: The graduates would be able to design, develop and validate solutions for electronics and communication systems meeting the specifications vis-à-vis the society.
PO4: The graduates will have proficiency to acquire, analyse data and interpret results leading to relevant research.
PO5: The graduates would be able to use appropriate modern engineering/simulation tools including modelling and forecasting for complex technological entities.
PO6: The graduates would have awareness of and the need to uphold professional responsibilities and also be aware of health, safety, social and legal aspects of their work.
PO7: The graduates would have an understanding of the societal and human context in which their engineering contributions will provide sustainable development.
PO8: The graduates would carry out professional responsibilities adhering to ethical and standard norms of engineering practices.

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PO9: The graduates would have ability to function effectively as an individual and as a member or leader in diverse teams and in multi-disciplinary environment.
PO10: The graduates would be capable of communicating effectively with the engineering community and society at large.
PO11: The graduates would demonstrate knowledge and understanding of engineering and management principles for technological and socially relevant projects.
PO12: The graduates would recognize the need for and also have ability to engage in continual, life-long learning.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

Graduates of the Electronics and Communication Engineering Programme will have the ability to:
PSO1: Analyze and Design, verify and validate VLSI Systems by selecting appropriate hardware and software tools.
PSO2: Design, develop and validate inter disciplinary products/ process by applying the knowledge and skills of Embedded Systems, Signal Processing, Electromagnetics and Communication Engineering.

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REGULATIONS 2018

B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

CURRICULUM

Semester I										Pre-requisite
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	
1	U18ENI1201	Fundamentals of Communication -I	Embedded - Theory & Lab	BS	2	0	2	0	3	-
2	U18MAI1201	Linear Algebra and Calculus	Embedded - Theory & Lab	HS	3	0	2	0	4	-
3	U18CHI1201	Engineering Chemistry	Embedded - Theory & Lab	BS	3	0	2	0	4	-
4	U18EEI1202	Electrical Machines and Drives	Embedded - Theory & Lab	ES	3	0	2	0	4	-
5	U18CSI1202	Problem Solving and Programming using C	Embedded - Theory & Lab	ES	2	0	2	0	3	-
7	U18INI1600	Engineering Clinic I	Practical &Project	ES	0	0	4	2	3	-
								Total Credits	21	
								Total Contact Hours/week	29	

Semester II										Pre-requisite
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	
1	U18ENI2201	Fundamentals of Communication-II	Embedded - Theory & Lab	BS	2	0	2	0	3	U18ENI1201
2	U18MAI2201	Advanced Calculus and Laplace Transform	Embedded - Theory & Lab	HS	3	0	2	0	4	-
3	U18PHI2201	Engineering Physics	Embedded - Theory & Lab	BS	3	0	2	0	4	-
4	U18MEI2201	Engineering Graphics	Embedded - Theory & Lab	BS	2	0	2	0	3	-
5	U18CSI2201	Python Programming	Embedded - Theory & Lab	ES	2	0	2	0	3	-
6	U18INI2600	Engineering Clinic II	Practical &Project	ES	0	0	4	2	3	U18INI1600
								Total Credits	20	
								Total Contact Hours/week	28	

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Semester III										Pre-requisite
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	
1	U18ECT3101	Signals and Systems	Theory	BS	3	1	0	0	4	-
2	U18ECI3202	Electron Devices and Circuits	Embedded - Theory & Lab	PC	3	0	2	0	4	-
3	U18ECI3203	Digital System Design	Embedded - Theory & Lab	PC	3	0	2	0	4	-
4	U18ECT3004	Electro Magnetic Fields	Theory	PC	3	0	0	0	3	-
5	U18ECT3105	Network theory	Theory	PC	3	1	0	0	4	-
6	U18INI3600	Engineering Clinic III	Practical &Project	ES	0	0	4	2	3	U18INI2600
								Total Credits	22	
								Total Contact Hours/week	27	

Semester IV										Pre-requisite
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	
1	U18ECI4201	Digital Signal Processing	Embedded - Theory & Lab	PC	3	0	2	0	4	U18ECT3101
2	U18ECI4202	Analog Electronics and Integrated Circuits	Embedded - Theory & Lab	PC	3	0	2	0	4	U18ECI3202
3	U18MAT4103	Probability and Random Processes	Theory	BS	3	1	0	0	4	-
4	U18ECT4104	Transmission Lines and Waveguides	Theory	PC	3	1	0	0	4	U18ECT3004
5	U18INI4600	Engineering Clinic IV	Practical &Project	ES	0	0	4	2	3	U18INI3600
6	U18……	Open Elective I	Theory	OE	3	0	0	0	3	-
								Total Credits	22	
								Total Contact Hours/week	28	

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Semester V										Pre-requisite
S.No	Course code	Course Title	Course Mode	CT	L	T	P	J	C	
1	U18ECI5201	Communication Engineering- I	Embedded - Theory & Lab	PC	3	0	2	0	4	U18ECT3101
2	U18ECI5202	Computer Architecture and Microprocessors	Embedded - Theory & Lab	PC	3	0	2	0	4	U18ECI3203
3	U18ECI5203	Communication Networks	Embedded - Theory & Lab	PC	3	0	2	0	4	-
4	U18ECT5004	Control Systems	Theory	PC	3	0	0	0	3	-
5	U18ECT5005	Antennas and wave propagation	Theory	PC	3	0	0	0	3	U18ECT4104
6	U18INI5600	Engineering Clinic V	Practical &Project	ES	0	0	4	2	3	U18INI4600
								Total Credits	21	
								Total Contact Hours/week	27	

Semester VI										Pre-requisite
S.No	Course code	Course Title	Course Mode	CT	L	T	P	J	C	
1	U18ECI6201	Communication Engineering- II	Embedded - Theory & Lab	PC	3	0	2	0	4	U18ECI5201
2	U18ECI6202	Microcontrollers	Embedded - Theory & Lab	PC	2	0	2	0	3	U18ECI5202
3	U18ECI6203	VLSI andHDL Programming	Embedded - Theory & Lab	PC	3	0	2	0	4	U18ECI3203
4	U18…...	Open Elective II	Theory	OE	3	0	0	0	3	-
5	U18ECE…	Professional Elective I	Theory	PE	3	0	0	0	3	-
6	U18ECE…	Professional Elective II	Theory	PE	3	0	0	0	3	-
								Total Credits	20	
								Total Contact Hours/week	23	

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Semester VII										Pre-requisite
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	
1	U18ESP7701	Project Phase I	Project only Course	PW	0	0	0	6	3	-
2	U18ECT7002	Wireless Communication	Theory	PC	3	0	0	0	3	U18ECI6201
3	U18ECI7203	Optical Communication	Embedded - Theory & Lab	PC	3	0	2	0	4	-
4	U18ECI7204	RF and Microwave Engineering	Embedded - Theory & Lab	PC	3	0	2	0	4	U18ECT4103
5	U18ECE…	Professional Elective III	Theory	PE	3	0	0	0	3	-
6	U18ECE…	Professional Elective IV	Theory	PE	3	0	0	0	3	-
7	U18INT7000	Professional Communication & Analytical Reasoning	Theory	HS	3	0	0	0	3	-
Total Credits									23	
Total Contact Hours/week									28	

Semester VIII									
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**
1	U18ESP8701	Project Phase II	Project only Course	PW	0	0	0	24	12
Total Credits									12
Total Contact Hours/week									24

Total Credits	161

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List of Mandatory courses

S.No	Course Code	Course Title	Course Mode	CT	Sem
1	U18VEP1501	Human Excellence -Personal Values	Lab	HS	1
2	U18VEP2502	Human Excellence-Inter Personal values	Lab	HS	2
3	U18VEP3503	Human Excellence-Family Values	Lab	HS	3
4	U18CHT3000	Environmental Science and Engineering	Theory	MC	3
5	U18INT4000	Constitution of India	Theory	MC	4
6	U18VEP4504	Human Excellence-Professional Values	Lab	HS	4
7	U18VEP5505	Human Excellence-Social Values	Lab	HS	5
8	U18VEP6506	Human Excellence-National Values	Lab	HS	6
9	U18VEP7507	Human Excellence-Global Values	Lab	HS	7

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SEMESTER I

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U18ENI1201 – FUNDAMENTALS OF COMMUNICATION-I

L	T	P	J	C
2	0	2	0	3

(Common to all Branches of I Semester B.E/B/Tech Programmes)

Course Objectives:

1. To communicate effectively by using appropriate grammar and technical parlance in a range of academic scenarios.
2. To interpret and critically evaluate discourses related to functional English.
3. To disseminate professional information through appropriatemeans of communication.

Course Outcomes:

After the course the student will be able to:

CO1: Communicate in English with correct grammar
CO2: Communicate effectively (Oral and Written)
CO3: Use communication skills in the real world

Assessment Methods:

Direct
1. Continuous Assessment of Skills 2. Assignment 3. Written Test 4. End Semester Examination
Indirect
1. Course-end survey

CO/PO Mapping

(S/M/W indicates strength of correlation)S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1										**S**		**S**		
CO2		**M**		**W**		**W**			**M**	**S**		**S**		**M**
CO3		**M**		**M**		**W**			**M**	**S**		**S**		**M**

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No	Topic	Hours
MODULE I - 12 Hrs		
1.1	Parts of Speech	2
1.2	Subject Verb Agreement	2
1.3	Speak up (Self Introduction, JAM)	4
1.4	Writing sentences using 'Be-forms'	3
1.5	Test	1
MODULE II - 12Hrs		
2.1	Articles, Gerunds, Infinitives	2
2.2	Speak up (Greetings & Polite English)	4
2.3	Dialogue Writing	3
2.4	Skimming & Scanning	2
2.5	Listening Skills - I	1
MODULE III - 12 Hrs		
3.1	Tenses & Voice	2
3.2	Sentences & its kinds	2
3.3	Speak up (Narration & Description)	4
3.4	Summarizing & Note-making	3
3.5	Listening Skills - II	1
MODULE IV - 12 Hrs		
4.1	Framing Questions – 4 types	2
4.2	Speak up (Role play)	4
4.3	Letter writing – Formal and Informal & Email Writing	3
4.4	Reading Comprehension & Cloze test	2
4.5	Listening Skills - III	1
MODULE V - 12 Hrs		
5.1	Degrees of Comparison	2
5.2	Clauses	2
5.3	Speak up (Power Point Presentation)	4
5.4	Writing (Picture perception)	3
5.5	Test	1
Total		**60**

Reference:

1. A Modern Approach to Non Verbal Reasoning (English, Paperback, Dr. R S Aggarwal)
2. The Power of Words(Bloomsbury, UK, 2012, Hyacinth Pink)
3. Word Power Made Easy: The Complete Handbook for Building a Superior Vocabulary (By Norman Lewis)
4. Effective Technical Communication Tata Mc Graw Hills Publications (Ashraf Rizvi)
5. English and Soft skills Orient Black Swan Publishers (S. P. Dhanavel)
6. Know Your Grammar: Trans.in Tamil & Malayalam –A Bilingual Approach (Bloomsbury, UK, 2012, Hyacinth Pink)

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U18MAI1201 LINEAR ALGEBRA AND CALCULUS

(Common to All branches)

L	T	P	PJ	C
3	0	2	0	4

COURSE OUTCOMES

After successful completion of this course, the students should be able to:

CO1: Identify eigenvalues and eigenvectors and apply Cayley Hamilton theorem.
CO2: Apply orthogonal diagonalisation to convert quadratic form to canonical form.
CO3: Solve first order ordinary differential equations and apply them to certain physical situations.
CO4: Solve higher order ordinary differential equations.
CO5: Evaluate the total derivative of a function, expand the given function as series and locate the maximum and minimum for multivariate function.
CO6: Determine Rank, Inverse, Eigenvalues, Eigenvectors of the given matrix, Maxima-Minima of the function and Solving Differential equations using MATLAB

Pre-requisite: Basics of Matrices, Differentiation and Integration

CO/PO Mapping

S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	S	S			M				M	M		M	M	
CO2	S	S			M				M	M		M	M	
CO3	S	S			M				M	M		M	M	
CO4	S	S			M				M	M		M	M	
CO5	S	S			M				M	M		M	M	
CO6	S	S			M				M	M		M		

Course Assessment methods:

DIRECT

1. Continuous Assessment Test I, II (Theory component)
2. Open Book Test; Cooperative Learning Report, Assignment; Journal Paper Review, Group Presentation, Project Report, Poster Preparation, Prototype or Product
3. Demonstration etc (as applicable) (Theory component)
4. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component)
5. Model Examination (lab component)
6. End Semester Examination (Theory and lab components)

INDIRECT

1. Course-end survey

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THEORY COMPONENT

MATRICES **6 Hours**

Rank of a matrix – Consistency of a system of linear equations - Rouche's theorem - Solution of a system of linear equations - Linearly dependent and independent vectors– Eigenvalues and Eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors – Cayley Hamilton theorem (excluding proof)

DIAGONALISATION OF A REAL SYMMETRIC MATRIX **6 Hours**

Orthogonal matrices – Orthogonal transformation of a symmetric matrix to diagonal form – Reduction of quadratic form to canonical form by orthogonal transformation.

FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS 11 Hours

Leibnitz's equation – Bernoulli's equation – Equations of first order and higher degree - Clairauts form – Applications: Orthogonal trajectories.

HIGHER ORDER LINEAR DIFFERENTIAL EQUATIONS **11 Hours**

Linear equations of second and higher order with constant coefficients – Euler's and Legendre's linear equations – Method of variation of parameters – First order Simultaneous linear equations with constant coefficients – Applications.

FUNCTIONS OF SEVERAL VARIABLES **11 Hours**

Total derivative – Taylor's series expansion – Maxima and minima of functions of two variables – Constrained maxima and minima: Lagrange's multiplier method with single constraints – Jacobians.

REFERENCES

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 41st Edition, 2011.
2. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., New Delhi, 11th Reprint, 2010.
3. Kreyzig E., "Advanced Engineering Mathematics", Tenth Edition, John Wiley and sons, 2011.
4. Veerarajan T., Engineering Mathematics (for First Year), Tata McGraw Hill Pub. Co. Ltd., New Delhi, Revised Edition, 2007
5. Kandasamy P., Thilagavathy K., and Gunavathy K., "Engineering Mathematics", S. Chand & Co., New Delhi, (Reprint) 2008
6. Venkataraman M.K., "Engineering Mathematics", The National Pub. Co., Chennai,2003
7. Weir, MD, Hass J, Giordano FR: Thomas' Calculus, Pearson education 12th Edition, 2015
8. P.Bali., Dr. Manish Goyal., Transforms and partial Differential equations, University Science Press, New Delhi, 2010
9. G.B.Thomas and R.L.Finney, Calculus and analytical geometry, 11th Edition, PearsonEducation, (2006)

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LAB COMPONENT **30 Hours**

List of MATLAB Programmes:

1. Introduction to MATLAB.
2. Matrix Operations - Addition, Multiplication, Transpose, Inverse
3. Rank of a matrix and solution of a system of linear equations
4. Characteristic equation of a Matrix and Cayley-Hamilton Theorem.
5. Eigenvalues and Eigenvectors of Higher Order Matrices
6. Curve tracing
7. Solving first order ordinary differential equations.
8. Solving second order ordinary differential equations.
9. Determining Maxima and Minima of a function of one variable.
10. Determining Maxima and Minima of a function of two variables.

Theory: 45	Tutorial: 0	Practical: 30	Project: 0	Total: 75 Hours

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U18CHI1201	ENGINEERING CHEMISTRY (Common to All Branches)	L	T	P	J	C
		3	0	2	0	4

Course Outcomes

After successful completion of this course, the students should be able to

CO1: Apply the basic principles of chemistry at the atomic and molecular level.

CO2: Analyze the impact of engineering solutions from the point of view of chemical principles

CO3: Apply the chemical properties to categorize the engineering materials and their uses

CO4: Integrate the chemical principles in the projects undertaken in field of engineering and technology

CO5: Develop analytical proficiency through lab skill sets to demonstrate in professional practice.

Pre-requisites : -

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	S	M												
CO2	S	M		M										
CO3	S	M		S										
CO4	S	M		S										
CO5	M	S		S										

Course Assessment methods

Direct
1. Continuous Assessment Test I, II 2. Open book test; Cooperative learning report, Assignment; Journal paper review, Group 3. Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc (as applicable) 4. End Semester Examination
Indirect
1. Course-end survey

Theory Component

CHEMICAL BONDING **7 Hours**

Bonding: Introduction – Ionic bonding - Van der Waal's forces (dipole - dipole, dipole - induced dipole, induced dipole - induced dipole interactions) - hydrophobic interaction.

Bonding in organic molecules: covalent and co-ordinate bonds (overview only) - hybridization (sp, sp2, sp3) - hydrogen bonding and its consequences.

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THERMODYNAMICS **7 Hours**

Introduction - Thermodynamic process – Internal energy – Enthalpy – limitations of First law of thermodynamics – Second law of thermodynamics - Entropy - Third law of thermodynamics – Free Energy and Work Function – Clausius-Clapeyron equation – Maxwell's relations – Kirchhoff's equation.

ELECTROCHEMISTRY AND CORROSION **7 Hours**

Electrodes - Electrode Potential – Nernst equation and problems - Galvanic cell - Electrochemical Series.

Corrosion: Classification and mechanism of chemical and electrochemical corrosion - Factors influencing corrosion

Corrosion control: Inhibitors – Cathodic protection (Sacrificial anodic protection, Impressed current cathodic protection) – Protective coating: Electroplating (Au) and Electroless plating (Ni).

WATER TECHNOLOGY **6 Hours**

Introduction - soft/hard water - Disadvantages of hard water in industries– scale, sludge, priming and foaming, caustic embrittlement.

Treatment of hard water: External treatment (Ion exchange method) - Internal treatment (colloidal, carbonate, phosphate and calgon conditioning) - Desalination (Reverse osmosis, Electrodialysis)

ENGINEERING MATERIALS **9 Hours**

Polymer: Introduction – Preparation, Properties and Applications of PMMA, PET, PVC.

Composites: Constituents of Composites – Polymer Composites - Metal Matrix Composites - Ceramic Matrix Composites – Applications

Lubricants: Classification - Functions - Properties (viscosity index, flash and fire point, oiliness, carbon residue, aniline point, cloud point and pour point) - Semi solid lubricant (greases with calcium based, sodium based, lithium based) - Solid lubricants (graphite, molybdenum disulphide)

SURFACE CHEMISTRY AND CATALYSIS **9 Hours**

Adsorption: Types of adsorption – Adsorption isotherms: Freundlich's adsorption isotherm – Langmuir's adsorption isotherm – Applications of adsorption on pollution abatement.

Catalysis: Catalyst – catalytic poisoning and catalytic promoters - autocatalysis –- acid base catalysis – enzyme catalysis – Michaelis-Menten equation – applications.

Chemical kinetics: Introduction – first order, pseudo first order, second order, zero order equations – parallel reactions – opposing reactions.

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REFERENCES

1. Jain P.C. and Jain. M., Engineering Chemistry, 16th Edition, Dhanpat Rai Publishing Company, New Delhi, Reprint 2017.
2. Puri B.R., Sharma L.R., Pathania, M.S. Principles of physical chemistry, Vishal Publishing Co., 2017
3. Atkins, P. and de Paula, J., Atkin's Physical Chemistry, 9th ed., Oxford Univ. Press, 2009.
4. Glasstone S., An introduction to Electrochemistry, 10th Edition, Affiliated to East West Press Private Limited, 2007.
5. Samir Sarkar., Fuels and Combustion, 3rd Edition, Orient Longman, India, 2009.
6. Dara S.S. and Umare S.S., A text book of Engineering Chemistry, S.Chand and Company Limited, New Delhi, 2014.
7. Engineering Chemistry, Wiley India Editorial Team, Wiley, 2018.

LABORATORY COMPONENT

LIST OF EXPERIMENTS

1. Preparation of Standard solutions
2. Conductometric estimation of mixture of acids vs strong base
3. Estimation of extent of corrosion of Iron pieces by Potentiometry
4. Estimation of the extent of dissolution of Copper / Ferrous ions by spectrophotometry.
5. Estimation of acids by pH metry.
6. Determination of total, temporary and permanent hardness by EDTA method.
7. Estimation of DO by Winkler's method
8. Estimation of Alkalinity by Indicator method.
9. Estimation of Chloride by Argentometric method
10. Estimation of Sodium and Potassium in water by Flame photometry.
11. Determination of Flash and Fire point of lubricating oil
12. Determination of Cloud and Pour point of lubricating oil
13. Determination of relative and kinematic viscosities of lubricating oil at different temperatures
14. Determination of corrosion rate on mild steel by Weight loss method
15. Morphological studies of corrosion on mild steel by microscopic techniques

Theory: 45	**Tutorial: 0**	**Practical: 30**	**Project: 0**	**Total: 75 Hours**

REFERENCES

1. Jeffery G.H., Bassett J., Mendham J. and Denny R.C., Vogel's Text Book of Quantitative Chemical Analysis, Oxford, ELBS, London,2012.
2. Shoemaker D.P. and C.W. Garland., Experiments in Physical Chemistry, Tata McGraw-Hill Pub. Co., Ltd., London,2003.

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U18EEI1202 **Electrical Machines and Drives**

L	T	P	J	C
3	0	2	0	4

Course Outcomes

Upon completion of the course, the student should be able to:

CO1: Describe the working principle and applications of DC machines (K2).
CO2: Analyze the working principle and characteristics of the transformers (K4).
CO3: Explain the working principle and applications of AC machines (K2).
CO4: Choose suitable special electrical motors for desired application (K3).
CO5: Select an appropriate electric drive for a given application by considering various parameters (K3).

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	S				W									
CO2	S	M												
CO3	M													
CO4		M		M										
CO5	M				W									

Course Assessment Methods

DIRECT
Continuous Assessment Test I, II Assignment End Semester Examination
INDIRECT
Course-end survey

DC MACHINES **9Hours**

Construction, working principle and operation of DC generators – Types – EMF equation – working principle and operation of DC motor – Types–Torque equation –Applications.

TRANSFORMER **9Hours**

Construction, working principle and operation of Single phase power transformer –Types - EMF equation of a transformer - Transformation ratio –Transformer losses and efficiency- Applications.

INDUCTION MACHINES **9 Hours**

Construction, working principle and operation of Three-phase induction motors – speed- torque characteristic- Construction, working principle and operation of Single- phase induction motors – types – applications

SPECIAL MACHINES **9 Hours**

Stepper motor- Types of stepper motor- Permanent Magnet DC motor- Brushless DC motor - Servo motor- Selection of motors for automotive and robotics applications.

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ELECTRIC DRIVES **9 Hours**

Basic Elements–Types of Electric Drives – factors influencing the choice of electrical drives- Loading conditions and classes of duty - short time, continuous and intermittent duty.

Laboratory Experiments

1. Open circuit and load characteristics of DC shunt generator
2. Load characteristics of DC shunt motor
3. Load characteristics of DC series motor
4. Load test on single-phase transformer
5. Load Test on Three Phase Induction Motor
6. Load Test on Single Phase Induction Motor
7. Open circuit and short circuit test on single phase transformer
8. Control of Stepper Motor
9. Control of Servo motors
10. Control of BLDC motor

REFERENCES

1. IJ. Nagarathand Kothari DP, "Electrical Machines, McGraw-Hill Education", 4thEdition, 2010.
2. Gopal K. Dubey, "Fundamentals of Electric Drives", 2nd Edition, Narosa Publishing House, New Delhi, 2015.
3. Thereja .B.L, –Fundamentals of Electrical Engineering and Electronics, S Chand & Co Ltd, 2008.
4. J.B.Gupta, –Theory and Performance of Electrical Machines, 14th Edition, S.K.Kataria and Sons, 2010, New Delhi.
5. S.K. Pillai, "A First Course on Electrical Drives", 3rd Edition, New Age International Publishers, New Delhi, 2014.

Theory: 45	**Tutorial: 0**	**Practical: 30**	**Project: 0**	**Total: 75 Hours**

Signature of BOS chairman, ECE

U18CSI1202PROBLEM SOLVING AND PROGRAMMING USING C

L	T	P	J	C
2	0	2	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Acquire knowledge on different problem solving techniques.
CO2: Use appropriate data types and control structures for solving a given problem.
CO3: Execute different array and string operations.
CO4: Experiment with the usage of pointers and functions.
CO5: Organize data using structures and unions.

Pre-requisites :-

CO/PO MAPPING
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	S	M							W					
CO2	S	M							W	W				
CO3	S	W			W	W			W	W		W		
CO4	M	W	M	W	W	W			W	W		M		
CO5	M	W	M	W	W	W			W	W		M		

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II (Theory Component) 2. Assignment (Theory Component) 3. Group Presentation (Theory Component) 4. Pre/Post - experiment Test/Viva; Experimental Report for each experiment (lab component) 5. Model examination (lab component) 6. End Semester Examination (Theory and lab component)
INDIRECT
1. Course-end survey

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THEORY COMPONENT CONTENTS

STRUCTURED PROGRAMMING **6 Hours**

Algorithms, building blocks of algorithms (instructions/statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration). Introduction to C Programming – Operators and Expressions – Data Input and Output – Control Statements.

ARRAYS AND STRINGS **6 Hours**

Defining an array – Processing an array –Multidimensional Arrays Character Arithmetic – Defining a string – Initialization of Strings – Reading and Writing Strings – Processing Strings – Searching and Sorting of Strings

FUNCTIONS, STORAGE CLASSES **6 Hours**

Defining a function – Accessing a function – Function prototypes – Passing arguments to a function – Passing arrays to functions – Function with string - Recursion – Storage classes

POINTERS **7 Hours**

Pointer Fundamentals – Pointer Declaration – Passing Pointers to a Function – Pointers and one dimensional arrays – operations on pointers– Dynamic memory allocation.

STRUCTURES AND UNIONS **5 Hours**

Structures and Unions: Defining a Structure – Processing a Structure – User defined data types (Typedef) – Unions

REFERENCES

1. Byron S Gottfried and Jitendar Kumar Chhabra, "Programming with C", Tata McGraw Hill Publishing Company, Third Edition, New Delhi, 2011.
2. Pradip Dey and Manas Ghosh, "Programming in C", Second Edition, Oxford University Press, 2011.
3. Kernighan,B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2006
4. Ashok N. Kamthane, "Computer programming", Pearson Education, 2007.
5. Reema Thareja, "Programming in C", Second Edition, Oxford University Press, 2011.

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LAB COMPONENT CONTENTS

LIST OF EXPERIMENTS **30 Hours**

1. Writing algorithms, flowcharts and pseudo codes for simple problems.
2. Programs on expressions and conversions
3. Programs using if, if-else, switch and nested if statements
4. Programs using while, do-while, for loops
5. Programs on one dimensional arrays, passing arrays to functions and array operations
6. Programs using two dimensional arrays, passing 2D arrays to functions
7. Programs using String functions
8. Programs using function calls, recursion, call by value
9. Programs on pointer operators, call by reference, pointers with arrays
10. Programs using structures and unions.

Theory: 30	Tutorial: 0	Practical: 30	Project: 0	Total: 60 Hours

REFERENCES

1. Byron S Gottfried and Jitendar Kumar Chhabra, "Programming with C", Tata McGraw Hill Publishing Company, Third Edition, New Delhi, 2011.
2. Pradip Dey and Manas Ghosh, "Programming in C", Second Edition, Oxford University Press, 2011.
3. Kernighan,B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2006
4. Ashok N. Kamthane, "Computer programming", Pearson Education, 2007.

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U18INI1600 ENGINEERING CLINIC - I

L	T	P	J	C
0	0	4	2	3

Course objectives

- To help the students look into the functioning of simple to complex devices and systems
- To enable the students to design and build simple systems on their own
- To help experiment with innovative ideas in design and team work
- To create an engaging and challenging environment in the engineering lab

Course Outcomes

After successful completion of this course, the students should be able to:

CO1: Identify a practical problems and find a solution
CO2: Understand the project management techniques
CO3: Demonstrate their technical report writing and presentation skills

Pre-requisite: -

CO/PO MAPPING

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	S	S	S	S	S	M	W		S			S		
CO2											S			
CO3										S				

Course Assessment methods:

Direct	Indirect
1. Project reviews 50%	1. Course Exit Survey
2. Workbook report 10%	
3. Demonstration & Viva-voce 40%	

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Content:

The course will offer the students with an opportunity to gain a basic understanding of computer controlled electronic devices and apply the concepts to design and build simple to complex devices. As a practical project based embedded course, the students will be taught the concepts using a variety of reference material available in the public domain. While the course will start with formal instruction on hardware, programming and applications, the major portion of the course will provide the students with ample opportunity to be innovative in designing and building a range of products from toys to robots and flying machines.

In the I semester, students will focus primarily on IOT with C programming using Arduino

GUIDELINES:

1. Practical based learning carrying credits.
2. Multi-disciplinary/ Multi-focus group of 5-6 students.
3. Groups can select to work on a specific tasks, or projects related to real world problems.
4. Each group has a faculty coordinator/Instructor who will guide/evaluate the overall group as well as individual students.
5. The students have to display their model in the 'Engineering Clinics Expo' at the end of semester.
6. The progress of the course is evaluated based on reviews and final demonstration of prototype.

Theory: 0	**Tutorial: 0**	**Practical: 60**	**Project:30**	**Total: 90 Hours**

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U18VEP1501 **PERSONAL VALUES**
(Mandatory)

L	T	P	J	C
0	0	2	0	0

Course Outcomes

After successful completion of this course, the students should be able to

CO 1: Become an individual in knowing the self
CO 2: Acquire and express Gratitude, Truthfulness, Punctuality, Cleanliness &fitness.
CO 3: Practice simple physical exercise and breathing techniques
CO 4: Practice Yoga asana which will enhance the quality of life.
CO 5: Practice Meditation and get benefited.
CO 6: Procure Self Healing techniques for propagating healthy society

Pre-requisites :-

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1												M		
CO2										S				
CO3						M								
CO4						S			M					
CO5										M				
CO6								W				S		

Course Assessment methods

Direct
1. Group Activity / Individual performance and assignment 2. Assessment on Value work sheet / Test
Indirect
1. Mini project on values / Goodwill Recognition

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Values through practical activities:

1.Knowing the self : Introduction to value education - Need & importance of Value education – Knowing the self – realization of human life – animal instinct vs sixth sense.

2. Mental Health : Evolution of senses – functioning steps of human mind – Body and Mind coordination - Analysis of thoughts – moralization of desires– autosuggestions – power of positive affirmations. – Meditation and its benefits.

3.Physical Health: Physical body constitution– Types of food - effects of food on body and mind – healthy eating habits – food as medicine– self healing techniques.

4.Core value :Self love&Self care Gratitude - Happiness - Optimistic –Enthusiasm – Simplicity – Punctual - Self Control - Cleanliness & personal hygiene - Freedom from belief systems.

5.Fitness: Simplified physical exercises – Sun salutation - Lung strengthening practices: Naadisuddhi pranayama – Silent sitting and listening to nature – Meditation.

Workshop mode

REFERENCES

1. KNOW YOURSELF — SOCRATES – PDF format at www.au.af.mil/au/awc/awcgate/army/rotc_self-aware.pdf

2. STEPS TO KNOWLEDGE: The Book of Inner Knowing – PDF format at www.newmessage.org/wp-content/uploads/pdfs/books/STK_NKL_v1.5.pdf

3. PROMOTING MENTAL HEALTH - World Health Organization – PDF format at www.who.int/mental_health/evidence/MH_Promotion_Book.pdf

4. LEARNING TO BE: A HOLISTIC AND INTEGRATED APPROACH TO VALUES – UNESCO PDF format at www.unesdoc.unesco.org/images/0012/001279/127914e.pdf

5. PERSONALITY DEVELOPMENT By SWAMI VIVEKANANDA www.estudantedavedanta.net/Personality-Development.pdf

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SEMESTER II

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L	T	P	J	C
2	0	2	0	3

U18ENI2201 – FUNDAMENTALS OF COMMUNICATION – II

(Common to all branches of II Semester B.E/B/Tech Programmes)

Course Objectives:

1. To effectively use the basic language skills to imbibe technical language skills.
2. To hone written and spoken competencies leading to effective communication.
3. To comprehend, use and explain technical data and information.

Course Outcomes:

After the course the student will be able to:

CO1: Read, understand, and interpret material on technology.

CO2: Communicate knowledge and information through oral and written medium.

CO3: Compare, collate and present technical information according to the audience and purpose.

Assessment Methods

Direct
1. Continuous Assessment of Skills 2. Assignment 3. Written Test 4. End Semester Examination
Indirect
1. Course-end survey

CO/PO Mapping:

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		W		S					S	S		S		
CO2				S					S	S		W		
CO3				M					S	S		S		

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No	TOPIC	
	MODULE I	**12 Hrs**
1.1	Introduction to Technical Writing Technical Definitions	2
1.2	Writing Instructions / Instruction Manual	2
1.3	Writing Recommendations	2
1.4	Speaking Activity I	6
	MODULE II	**12 Hrs**
2.1	Process Writing	2
2.2	Review Writing I - Product	2
2.3	Review Writing II – Article	2
2.4	Speaking Activity II	6
	MODULE III	**12 Hrs**
3.1	Interpreting and Transcoding Graphics	2
3.2	Types of Report / Writing a Report	2
3.3	Reading & Responding to texts	2
3.4	Speaking Activity III	6
	MODULE IV	**12 Hrs**
4.1	Drafting a project proposal	2
4.2	Listening to technical talks	2
4.3	Preparing a survey Questionnaire	2
4.4	Speaking Activity IV	6
	MODULE V	**12 Hrs**
5.1	Writing Memos, Circulars, Notices	2
5.2	Writing Agenda and Minutes	2
5.3	Inferential Reading	2
5.4	Speaking Activity V	6
	Total	**60**

Reference Books:

1. Technical English Workbook, VRB Publishers Pvt. Ltd (Prof. Jewelcy Jawahar, Dr.P.Ratna)
2. Effective Technical Communication, Tata McGraw Hills Publications (Ashraf Rizvi)
3. Technical Communication – English Skills for Engineers, Oxford Higher Education (Meenakshi Raman, Sangeeta Sharma)

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U18MAI2201 ADVANCED CALCULUS AND LAPLACE TRANSFORMS

L	T	P	J	C
3	0	2	0	4

(Common to All branches)

COURSE OUTCOMES

After successful completion of this course, the students should be able to

CO1: Evaluate double and triple integrals in Cartesian coordinates and apply them to calculate area and volume.

CO2: Apply various integral theorems for solving engineering problems involving cubes and rectangular parallelepipeds.

CO3: Construct analytic functions of complex variables and transform functions from z-plane to w-plane and vice-versa, using conformal mappings.

CO4: Apply the techniques of complex integration to evaluate real and complex integrals over suitable closed paths or contours.

CO5: Solve linear differential equations using Laplace transform technique.

CO6: Determine multiple integrals, vector differentials, vector integrals and Laplace transforms using MATLAB.

Pre-requisites: -

CO/PO MAPPING
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	S	S			M				M	M		M	M	
CO2	S	S			M				M	M		M	M	
CO3	S	S			M				M	M		M	M	
CO4	S	S			M				M	M		M	M	
CO5	S	S			M				M	M		M	M	
CO6	S	S			M				M	M		M	M	

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II (Theory component) 2. Open book test; Cooperative learning report, Assignment; Journal paper review, Group Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc (as applicable) (Theory component) 3. Pre/Post - experiment Test/Viva; Experimental Report for each experiment (lab component) 4. Model examination (lab component) 5. End Semester Examination (Theory and lab component)
INDIRECT
1. Course-end survey

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THEORY COMPONENT

MULTIPLE INTEGRALS **9 Hours**

Double integration – Cartesian coordinates – Change of order of integration - Triple integration in Cartesian coordinates – Applications: Area as double integral and Volume as triple integral.

VECTOR CALCULUS **9 Hours**

Gradient, divergence and curl – Directional derivative – Irrotational and Solenoidal vector fields - Green's theorem in a plane, Gauss divergence theorem and Stoke's theorem (excluding proofs) – Verification of theorem and simple applications.

ANALYTIC FUNCTIONS **9 Hours**

Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy- Riemann equations in Cartesian coordinates and sufficient conditions (excluding proofs)– Properties of analytic function – Construction of analytic function by Milne Thomson method – Conformal mapping : $w = z + c$, cz , $1/z$ – Bilinear Transformation

COMPLEX INTEGRATION **9 Hours**

Cauchy's integral theorem – Cauchy's integral formula –Taylor's and Laurent's series – Singularities –Residues –Residue theorem –Application of residue theorem for evaluation of real integrals – Contour Integration (excluding poles on the real axis).

LAPLACE TRANSFORMS **9 Hours**

Definition - Properties: Superposition, Shift in t or Time Delay, Shift in s, Time Derivatives, Time Integral-Initial Value Theorem - Final Value Theorem - Transform of periodic functions - Inverse transforms - Convolution theorem – Applications: Solution of linear ordinary differential equations of second order with constant coefficients.

REFERENCES

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 41st Edition, 2011.
2. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., New Delhi, 11th Reprint, 2010.
3. Veerarajan T., Engineering Mathematics (for First Year), Tata McGraw Hill Pub. Co. Ltd., New Delhi, Revised Edition, 2007.
4. Kandasamy P., Thilagavathy K., and Gunavathy K., "Engineering Mathematics", S. Chand & Co., New Delhi, (Reprint) 2008.
5. Kreyzig E., "Advanced Engineering Mathematics", Tenth Edition, John Wiley and sons, 2011.
6. Venkataraman M.K., "Engineering Mathematics", The National Pub. Co., Chennai, 2003.
7. Weir, MD, Hass J, Giordano FR: Thomas' Calculus Pearson education 12th ED, 2015.

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LAB COMPONENT **30 Hours**

List of MATLAB Programmes:

1. Evaluating double integral with constant and variable limits.
2. Area as double integral
3. Evaluating triple integral with constant and variable limits
4. Volume as triple integral
5. Evaluating gradient, divergence and curl
6. Evaluating line integrals and work done
7. Verifying Green's theorem in the plane
8. Evaluating Laplace transforms and inverse Laplace transforms of functions including impulse.
9. Heaviside functions and applying convolution.
10. Applying the technique of Laplace transform to solve differential equations.

Theory: 45	Tutorial: 0	Practical: 30	Project: 0	Total: 75 Hours

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U18 PHI2201 **Engineering Physics**
(Common to AU, ECE, CE, MEC, ME)

L	T	P	J	C
3	0	2	0	4

Course Outcomes

After successful completion of this course, the students should be able to

CO1: Understand the principles of motion and rotation of a rigid body in the plane.

CO2: Enhance the fundamental knowledge in properties of matter and its applications relevant to various streams of engineering and technology.

CO3: To introduce the phenomenon of heat and account for the consequence of heat transfer in engineering systems.

CO4: Toapply the concepts of electrostatics and dielectrics for various engineering applications.

CO5: To understand the basics of magnetostatics.

CO6: To introduce and provide a broad view of the smart materials and Nano science to undergraduates.

Pre-requisites:

High School Education

CO PO Mapping

COs	Programme Outcomes (POs)												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	S		M									M	M	
CO2	S		M									M	M	
CO3	S		M									M	M	
CO4	S		M									M		M
CO5	S		M									M		M
CO6	S		M	M								M		M

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Course Assessment methods

Direct
1. Continuous Assessment Test I, II (Theory component) 2. Cooperative learning report, Assignment; Group Presentation, Project report, Poster preparation, 3. Pre/Post - experiment Test/Viva; Experimental Report for each experiment (lab component) 4. Model examination (lab component) 5. End Semester Examination (Theory and lab component)
Indirect
1. Course-end survey

Theory Component contents

KINEMATICS & RIGID BODY MOTION **9 Hours**

Definition and motion of a rigid body in the plane; Rotation in the plane; Kinematics in a coordinate system rotating and translating in the plane; Angular momentum about a point of a rigid body in planar motion; Euler's laws of motion, their independence from Newton's laws, and their necessity in describing rigid body motion; Examples.

PROPERTIES OF MATTER **9 Hours**

Hooke's Law Stress - Strain Diagram - Elastic moduli - Relation between elastic constants - Poisson's Ratio - Expression for bending moment and depression - Cantilever - Expression for Young's modulus by Non-uniform bending and its experimental determination.

HEAT **9 Hours**

Specific heat capacity, thermal capacity. Temperature rise. Coefficient of linear thermal expansion. Methods of measurement of thermal expansion. Thermal stresses in composite structures due to non-homogeneous thermal expansion. Applications -The bimetallic strip. Expansion gaps and rollers in engineering structures. Thermal conductivity: differential equation of heat flow. Lee's disc apparatus for determination of thermal conductivity. Thermal Insulation. Convection and radiation. Applications to refrigeration and power electronic devices.

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ELECTROSTATICS & MAGNETOSTATICS **9 Hours**

ELECTROSTATICS : Maxwell's equation for electrostatics – E due to straight conductors, circular loop, infinite sheet of current - electric field intensity (D) - Electric potential - dielectrics - dielectric polarization - internal field – Clasious - Mosotti equation - dielectric strength - applications.

MAGNETOSTATICS: Maxwell's equation for magnetostatics - B in straight conductors, circular loop, infinite sheet of current - Lorentz force, magnetic field intensity (H) – Biot–Savart's Law – Ampere's Circuit Law –Magnetic flux density (B).

NEW ENGINEERING MATERIALS AND NANO TECHNOLOGY **9 Hours**

New Engineering Materials: Metallic glasses – preparation, properties and applications – Shape memory alloys (SMA) – characteristics, properties of NiTi alloy applications - advantages and disadvantages of SMA.

Nano Materials: synthesis - Ball milling - Sol-gel - Electro deposition — properties of nano particles and applications. – Carbon Nano Tubes – fabrication by Chemical Vapour Deposition - structure, properties & applications.

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. Essential University Physics, Vols. 1 and 2., Richard Wolfson, Pearson Education, Singapore, 2011.
2. Engineering Mechanics (2nd ed.), Harbola M. K., Cengage publications, New Delhi, 2009.
3. Concepts of Physics, H. C. Verma vol 1 and 2, Bharati Bhawan Publishers & Distributors; First edition (2017).
4. Engineering Electromagnetics, W. H. Hayt and John A. Buck, 6th Edition, Tata McGraw Hill, New Delhi, 2014.
5. Theory and Problems of Electromagnetic Schaum's Outline Series, 5th Edition, Joseph A. Edminister, Tata McGraw Hill Inc., New Delhi, 2010.
6. Engineering Physics, Rajendran V., Tata McGraw-Hill Education Pvt. Ltd., 2010
7. Nano – the Essentials, Pradeep T., McGraw-Hill Education, Pvt. Ltd., 2007.

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Lab component:

LIST OF EXPERIMENTS

1. Non-uniform bending – Determination of Young's modulus
2. Compound Pendulum – Determination of acceleration due to gravity
3. Spectrometer – Determination of wavelength of mercury source using grating
4. Air wedge - Determination of thickness of thin sheet
5. Semiconductor Laser:
    a. Determination of wavelength of laser
    b. Determination acceptance angle and numerical aperture of an optialfibre.
    c. Determination of particle size
6. Melde's string – Determination of frequency of a turing fork
7. Determination of band gap of a semiconductor
8. Ultrasonic interferometer – Determination of velocity of sound and compressibility of a liquid
9. Luxmeter – Determination of efficiency of solar cell
10. Lee's disc – Determination of thermal conductivity of a bad conductor

Experiments for Demonstration:

1. Hall effect
2. Hardness Test
3. Four probe experiment
4. Hysteresis curve

Theory: 0	**Tutorial: 0**	**Practical: 30**	**Project: 0**	**Total: 30 Hours**

REFERENCES

1. Laboratory Manual of Engineering Physics, Dr. Y. Aparna & Dr. K. Venkateswara Rao, V.G.S Publishers.
2. Practical Physics, G.L. Squires, Cambridge University Press, Cambridge, 1985.
3. Great Experiments in Physics, M.H. Shamos, Holt, Rinehart and Winston Inc., 1959.
4. Experiments in Modern Physics, A.C. Melissinos, Academic Press, N.Y., 1966.

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U18MEI2201 ENGINEERING GRAPHICS
(Common to ECE & FT)

L	T	P	J	C
2	0	2	0	3

Course outcome

At the end of the course, the student will be able to:

CO1: Construct various plane curves.

CO2: Construct projection of points and projection of lines.

CO3: Develop projection of surfaces and solids.

CO4: Solve problems in sections of solids and development of surfaces.

CO5: Apply free hand sketching and concepts of isometric in engineering practice.

CO6: Draw engineering drawing in AutoCAD with dimensions.

Pre-requisites: -

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	S	M												
CO2	S	S									W			
CO3	S	S									M			
CO4	S	S												
CO5	S	S												
C06	S													

DIRECT
1. Continuous Assessment Test I, II (Theory component) 2. Open Book Test, Assignment, Group Presentation 3. Viva, Experimental Report for each Experiment (lab Component) 4. Model Examination (lab component) 5. End Semester Examination (Theory and lab components)
INDIRECT
1. Course-end survey

PLANE CURVES, PROJECTION OF POINTS, LINES AND PLANES 10 Hours

Importance of graphics in design process, visualization, communication, documentation and drafting tools, Construction of curves - ellipse, parabola, and hyperbola by eccentricity method only. Orthographic projection of points.

Projections of straight lines located in first quadrant - determination of true length and true inclinations.

Projections of plane surfaces - polygonal lamina and circular lamina, located in first quadrant and inclined to one reference plane.

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PROJECTION AND SECTION OF SOLIDS **10 Hours**

Projection of simple solids - prism, pyramid, cylinder and cone. Drawing views when the axis of the solid is inclined to one reference plane.

Sectioning of simple solids - prisms, pyramids, cylinder and cone. Obtaining sectional views and true shape when the axis of the solid is vertical and cutting plane inclined to one reference plane.

DEVELOPMENT OF SURFACES, ISOMETRIC PROJECTIONS AND FREE-HAND SKETCHING **10 Hours**

Development of lateral surfaces of truncated prisms, pyramids, cylinders and cones.

Isometric projection, Isometric scale, Isometric views of simple solids, truncated prisms, pyramids, cylinders and cones.

Free hand sketching techniques, sketching of orthographic views from given pictorial views of objects, including free-hand dimensioning.

INTRODUCTION TO AUTOCAD **15 Hours**

Introduction to Drafting Software (AutoCAD) & its Basic Commands. Introduction to coordinate systems, object selection methods, selection of units and precession. sketching – line, circle, arc, polygon, rectangle and ellipse. Working with object snaps, layers and object properties. Editing the objects – copy, move, trim, extend, working with arrays, mirror, scale, hatch, fillet and chamfer.

ISOMETRIC VIEWS WITH AUTOCAD **15 Hours**

Building drawings – Single and double bed room house (sectional Top view only). Introduction to Motion path animation. Isometric views of simple solid blocks.

Theory: 30	**Tutorial: 0**	**Practical:30**	**Project: 0**	**Total : 60 Hours**

REFERENCES

1. Basant Agrawal and CM Agrawal, Engineering Drawing, McGraw-Hill, New Delhi, First Edition, 2008.
2. Venugopal K. and Prabhu Raja V., Engineering Graphics, New Age International (P) Limited, New Delhi, 2008.
3. Nataraajan K.V., Engineering Drawing and Graphics, Dhanalakshmi Publisher, Chennai, 2005.
4. Warren J. Luzadder and Jon. M. Duff, Fundamentals of Engineering Drawing, Prentice Hall of India Pvt. Ltd., New Delhi, Eleventh Edition, 2005.
5. Gopalakirishna K.R., Engineering Drawing (Vol. I & II), Subhas Publications, 2001.
6. James Leach, AutoCAD 2017 Instructor, SDC Publications, 2016.

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U18CSI2201 **PYTHON PROGRAMMING**

(Common to All Branches)

L	T	P	J	C
2	0	2	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO:

CO1:	Classify and make use of python programming elements to solve and debug simple logical problems.(K4,S3)
CO2:	Experiment with the various control statements in Python.(K3,S2)
CO3:	Develop Python programs using functions and strings.(K3,S2)
CO4:	Analyze a problem and use appropriate data structures to solve it.(K4,S3)
CO5:	Develop python programs to implement various file operations and exception handling.(K3,S2)

Pre-requisites :-

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		S			M					M		M		
CO2			M							M		M		
CO3			M							M		M		M
CO4	S	S	M		M					M		M	M	M
CO5			M							M		M		

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COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II (Theory component) 2. Open Book Test, Assignment 3. Viva, Experimental Report for each Experiment (lab Component) 4. Model Examination (lab component) 5. End Semester Examination (Theory and lab components)
INDIRECT
2. Course-end survey

THEORY COMPONENT CONTENTS

BASICS OF PYTHON PROGRAMMING 6 Hours

Introduction-Python Interpreter-Interactive and script mode -Values and types, operators, expressions, statements, precedence of operators, Multiple assignments, comments.

CONTROL STATEMENTS AND FUNCTIONS IN PYTHON 6 Hours

Conditional (if), alternative (if-else), chained conditional (if-elif-else)-Iteration-while, for, break, continue, pass – Functions - Introduction, inbuilt functions, user defined functions, passing parameters, return values, recursion, Lambda functions.

DATA STRUCTURES: STRINGS, LISTS and SETS 7 Hours

Strings-String slices, immutability, string methods and operations -Lists-creating lists, list operations, list methods, mutability, aliasing, cloning lists, list and strings, list and functions-list processing-list comprehension, searching and sorting, Sets-creating sets, set operations.

DATA STRUCTURES: TUPLES, DICTIONARIES5 Hours

Tuples-Tuple assignment, Operations on Tuples, lists and tuples, Tuple as return value-Dictionaries-operations and methods, Nested Dictionaries.

FILES, MODULES, PACKAGES 6 Hours

Files and Exception-Text files, reading and writing files, format Operator-Modules-Python Modules-Creating own Python Modules-packages, Introduction to exception handling.

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REFERENCES

1. Ashok NamdevKamthane, Amit Ashok Kamthane, "Programming and Problem Solving with Python" , Mc-Graw Hill Education,2018.
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Second edition, Updated for Python 3, Shroff / O'Reilly Publishers, 2016.
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt. Ltd., 2016.
4. Timothy A. Budd," Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.
5. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
6. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem Solving Focus", Wiley India Edition, 2013.

E BOOKS AND ONLINE LEARNING MATERIALS

7. www.mhhe.com/kamthane/python
8. Allen B. Downey, Think Python: How to Think Like a Computer Scientist, Second edition, Updated for Python 3, Shroff / O'Reilly Publishers, 2016
9. (http://greenteapress.com/wp/think-python/)

LAB COMPONENT CONTENTS **30 Hours**

LIST OF EXPERIMENTS

1. Implement simple python programs using interactive and script mode.
2. Develop python programs using id() and type() functions
3. Implement range() function in python
4. Implement various control statements in python.
5. Develop python programs to perform various string operations like concatenation, slicing, Indexing.
6. Demonstrate string functions using python.
7. Implement user defined functions using python.
8. Develop python programs to perform operations on list
9. Implement dictionary and set in python
10. Develop programs to work with Tuples.
11. Create programs to solve problems using various data structures in python.
12. Implement python program to perform file operations.
13. Implement python programs using modules and packages.

Theory:30	Tutorial: 0	Practical: 30	Project: 0	Total: 60 Hours

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ONLINE COURSES AND VIDEO LECTURES:

http://nptel.ac.in

https://www.edx.org/course/introduction-to-python-fundamentals-1

https://www.edx.org/course/computing-in-python-ii-control-structures-0

https://www.edx.org/course?search_query=Computing+in+Python+III%3A+Data+Structures

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U18INI2600 **ENGINEERING CLINIC -II**

L	T	P	J	C
0	0	4	2	3

Course objectives

- To help the students look into the functioning of simple to complex devices and systems
- To enable the students to design and build simple systems on their own
- To help experiment with innovative ideas in design and team work
- To create an engaging and challenging environment in the engineering lab

Course Outcomes

After successful completion of this course, the students should be able to:
CO1: Identify a practical problem and find a solution
CO2: Understand the project management techniques
CO3: Demonstrate their technical report writing and presentation skills

Pre-requisite:

1. **U18INI1600Engineering Clinic I**

CO/PO MAPPING
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	S	S	S	S	S	M	W		S			S		
CO2											S			
CO3										S				

Course Assessment methods:

Direct	Indirect
1. Project reviews 50%	1. Course Exit Survey
2. Workbook report 10%	
3. Demonstration & Viva-voce 40%	

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Content:

The course will offer the students with an opportunity to gain a basic understanding of computer controlled electronic devices and apply the concepts to design and build simple to complex devices. As a practical project based embedded course, the students will be taught the concepts using a variety of reference material available in the public domain. While the course will start with formal instruction on hardware, programming and applications, the major portion of the course will provide the students with ample opportunity to be innovative in designing and building a range of products from toys to robots and flying machines.

In the II semester, students will focus primarily on Raspberry pi based controllers with Python programming

GUIDELINES:

1. Practical based learning carrying credits.
2. Multi-disciplinary/ Multi-focus group of 5-6 students.
3. Groups can select to work on a specific tasks, or projects related to real world problems.
4. Each group has a faculty coordinator/Instructor who will guide/evaluate the overall group as well as individual students.
5. The students have to display their model in the 'Engineering Clinics Expo' at the end of semester.
6. The progress of the course is evaluated based on reviews and final demonstration of prototype.

Theory: 0	**Tutorial: 0**	**Practical: 60**	**Project: 30**	**Total: 90 Hours**

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U18VEP2502 **INTERPERSONAL VALUES**
(Mandatory)

L	T	P	J	C
0	0	2	0	0

Course Outcomes

After successful completion of this course, the students should be able to

CO 1: Develop a healthy relationship & harmony with others
CO 2: Practice respecting every human being
CO 3: Practice to eradicate negative temperaments
CO 4: Acquire Respect, Honesty, Empathy, Forgiveness and Equality
CO 5: Practice Exercises and Meditation to lead a healthy life
CO 6: Manage the cognitive abilities of an Individual

Pre-requisites :
1. U18VEP1501 / PERSONAL VALUES

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1										S				
CO2									S					
CO3											M	S		
CO4						M								
CO5												M		
CO6											M			

Course Assessment methods

Direct
1.Group Activity / Individual performance and assignment 2.Assessment on Value work sheet / Test
Indirect
1. Mini project on values / Goodwill Recognition

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Values through Practical activities:

1. Introduction: Introduction to interpersonal values – Developing harmony with others – Healthy relationship – Need & importance of interpersonal values for dealing with others and team - Effective communication with others.

2. Maneuvering the temperaments: From Greed To Contentment - Anger To Tolerance - Miserliness To Charity – Ego To Equality - Vengeance To Forgiveness.

3. Core value :**Truthfulness -** Honesty –Helping–Friendship – Brotherhood – Tolerance – Caring & Sharing – Forgiveness – Charity –Sympathy — Generosity – Brotherhood - Adaptability.

4.Pathway to Blissful life :

Signs of anger – Root cause – Chain reaction – Evil effects on Body and Mind – Analyzing roots of worries – Techniques to eradicate worries.

5.Therapeutic measures: Spine strengthening exercises - Nero muscular breathing exercises - Laughing therapy - Mindfulness meditation.

Workshop mode

REFERENCES

1. INTERPERSONAL SKILLS Tutorial (PDF Version) - TutorialsPoint www.tutorialspoint.com/interpersonal_skills/interpersonal_skills_tutorial.pdf
2. INTERPERSONAL RELATIONSHIPS AT WORK - KI Open Archive - Karolinska www. publications.ki.se/xmlui/bitstream/handle/10616/39545/thesis.pdf?sequence=1
3. VALUES EDUCATION FOR PEACE, HUMAN RIGHTS, DEMOCRACY – UNESCO www.unesdoc.unesco.org/images/0011/001143/114357eo.pdf
4. MANEUVERING OF SIX TEMPERAMENTS - Vethathiri Maharishi www.ijhssi.org/papers/v5(5)/F0505034036.pdf
5. THE BLISS OF INNER FIRE: HEART PRACTICE OF THE SIX ... - Wisdom Publications - www.wisdompubs.org/sites/.../Bliss%20of%20Inner%20Fire%20Book%20Preview.pd...

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SEMESTER III

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U18ECT3101 **SIGNALS AND SYSTEMS**

L	T	P	J	C
3	1	0	0	4

Course Outcomes (COs):
After successful completion of this course, the students should be able to

CO1:	Distinguish different types of signals and systems (K4).
CO2:	Analyze periodic signals using Fourier series (K4).
CO3:	Evaluate Continuous Time signals and system by using Fourier Transform (K4).
CO4:	Explain sampling of continuous time signals (K2).
CO5:	Analyze Discrete Time signals and systems by using DTFT and Z Transform (K4).

Pre-requisites:-

CO/PO Mapping:
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	S	M												M
CO2	S	M												M
CO3	S	S	M	M										S
CO4	S	S												S
CO5	S	S	M	M										S

Course Assessment Methods

DIRECT
Continuous Assessment Test I, II Assignment End Semester Examination
INDIRECT
Course-end survey

CONTINUOUS AND DISCRETE TIME SIGNALS AND SYSTEMS **17 Hours**

Continuous Time (CT) &Discrete Time (DT) signals- Classification - standard signals – basic operations on signals - Continuous time and discrete time systems - properties - Linear Time Invariant (LTI) systems- Stability- Causality- Continuous and discrete convolution.

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FOURIER ANALYSIS OF CT SIGNALS AND SYSTEMS **12 Hours**

Fourier series analysis of periodic signals- spectrum - Properties of Continuous Time Fourier Series (CTFS) - Convergence of CTFS - Representation of aperiodic signals by Continuous Time Fourier Transform(CTFT)- spectrum - Properties of CTFT - Convergence of CTFT - CT system representation by differential equation - Frequency response of systems characterized by differential equations.

SAMPLING **06 hours**

Representation of continuous time signals by its samples - Sampling theorem – Reconstruction of a signal from its samples, aliasing-bandpass sampling.

FOURIER ANALYSIS OF DT SIGNALS AND SYSTEMS **12 Hours**

Discrete Time Fourier Series (DTFS)-spectrum- –properties – Discrete Time Fourier Transform (DTFT) – Properties – discrete time system representation by difference equations – Frequency response of systems characterized by difference equations.

Z TRANSFORM ANALYSIS OF SIGNALS AND SYSTEMS **13 Hours**

Z transform – RoC –Forward and Inverse Transform use Residue, long Division, Partial Fraction methods - Properties of Z transform – Pole-zero plot- Analysis and characterization of LTI system using Z transform- frequency response of DT systems

Theory: 45	Tutorial: 15	Practical: 0	Project: 0	Total: 60 Hours

REFERENCES:

1. Alan V. Oppenheim, Alan S. Willsky ,S.HamidNawab, "Signals and Systems", Pearson Education, 2nd Edition, 2015.
2. Simon Haykin, Barry Van Veen, "Signals and Systems",John Wiley & Sons, 3rd Edition, 2012.
3. H. P. Hsu, "Signals and Systems" Schaum'sOutline Series, McGraw Hill Professional, 3rd Edition, 2013
4. John G Proakis and Manolakis, "Digital Signal Processing Principles, Algorithms and Applications", Pearson Education, 4th Edition, 2014.
5. M. J. Roberts, "Signals and Systems Analysis using Transform method and MATLAB",McGraw-Hill Education, Second Edition, 2011.
6. K. Lindner, "Signals and Systems", McGraw Hill International,1999

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U18ECT3202 ELECTRON DEVICES AND CIRCUITS

L	T	P	J	C
3	0	2	0	4

Course Outcomes (COs):
After successful completion of this course, the students should be able to

CO1:	Analyze the characteristics of semiconductor devices. (K4,S3).
CO2:	Design and analyze amplifier circuits(K4)
CO3:	Explore and verify the frequency responsecharacteristics of amplifier(K3,S3).
CO4:	Apply and verify the concepts of Power amplifiers and tuned amplifiers (K3,S3).
CO5:	Apply the concepts of devices to design DC power supplies(K3)

Pre-requisites: -

CO/PO Mapping:
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	M		S										M	
CO2	S												M	
CO3	M		M										M	
CO4	M		S										M	
CO5	M		S										M	

Course Assessment Methods

DIRECT
Continuous Assessment Test I, II Assignment End Semester Examination
INDIRECT
Course-end survey

SEMICONDUCTOR DIODES AND SPECIAL PURPOSE DIODES 09 Hours

Formation of PN junction – working principle – VI characteristics – PN diode currents – diode current equation – diode resistance – transition and diffusion capacitance – diode models – voltage breakdown in diodes.

Special purpose diodes : Zener diode – Varactor diode – Tunnel diode– Schottky diode, PNPN diode - Thyristors– RF diode.

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BIPOLAR TRANSISTORS **12Hours**

Construction – working – transistor currents – transistor configurations and input-output characteristics – Early effect (base-width modulation) – Ebers Moll model -Field-Effect Transistors : construction, working and VI characteristics of JFET.

MOSFET – enhancement MOSFET, depletion MOSFET, their working principle and VI characteristics, CMOS, MESFET, CCD.

Various biasing methods of BJT and stability factors-JFET & MOSFET biasing.

SMALL-SIGNAL AMPLIFIERS - ANALYSIS AND FREQUENCY RESPONSE **11 Hours**

Small signal model of BJT, BJT amplifiers : CE, CB and CC amplifiers – multistage amplifiers - differential amplifier – designing BJT amplifier (analysis using hybrid –π model)

FET amplifiers : CS, CG and CD amplifiers –designing FET amplifier.

Frequency response: Low frequency response of BJT and FET amplifiers – Miller effect capacitance – high frequency response of BJT and FET amplifiers.

POWER AMPLIFIERS AND TUNED AMPLIFIERS **07 Hours**

Power amplifiers : definitions and amplifier types –Class A amplifier – Class B and Class AB push-pull amplifiers – Class C amplifiers- heat sink – designing power amplifier circuits.

Tuned amplifiers– single tuned – double tuned –staggered tuned amplifiers-design of basic tuned amplifier..

DC POWER SUPPLIES **06 Hours**

Rectifiers and Filters : HWR, FWR, full-wave bridge rectifier, power supply filters (ripple factor and efficiency analysis), bleeder resistor.

Voltage regulators: voltage regulation, Zener diode shunt regulator, transistor series regulator, transistor shunt regulator, switching regulators, design of complete DC power supply circuit.

REFERENCES:

1. Jacob Millman, Christos C Halkias, Satyabrata Jit, "Electron Devices and Circuits", Tata McGraw Hill, 4th Edition ,2015
2. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education,11th Edition, 2015.
3. Thomas L. Floyd, "Electronic Devices", 9th edition, Pearson Education, 2012.
4. David A Bell, "Fundamentals of Electronic Devices and Circuits", Fifth edition Oxford Press, 2009.

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5. Adel .S. Sedra, Kenneth C. Smith, Micro Electronic circuits, 6th Edition, Oxford University Press, 2010.

LAB COMPONENT:

LIST OF EXPERIMENTS:

1. Characteristics of PN Junction diode and Zener diode& Regulator using Zener diode
2. Common Emitter/ Common base/Common Collector input-outputCharacteristics.
3. Characteristics of FET
4. Transfer characteristics of MOSFET
5. Frequency response of single-stage BJT & FET amplifiers.
6. Design of power and tuned amplifier
7. Verifications Of KVL & KCL
8. Verifications of Theorems
9. Development of power supply circuits using devices in PCB

Theory: 45	Tutorial: 0	Practical: 30	Project: 0	Total: 75 Hours

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L	T	P	J	C
3	0	2	0	4

U18ECI3203 DIGITAL SYSTEM DESIGN

Course Outcomes (COs):
After successful completion of this course, the students should be able to

CO1: Apply Boolean algebra, Karnaugh map and Tabulation method to design combinational logic circuits (K3).
CO2: Design and verify sequential logic circuits using flipflops (K4).
CO3: Apply state machine models to design sequential logic circuits (K4).
CO4: Explain different logic families based on performance (K2).
CO5: Design combinational circuits using programmable logic devices (K3).

Pre-requisites: -

CO/PO Mapping:
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	S	M												
CO2	S	M	W											
CO3	S	M											M	
CO4	S													
CO5	S	M	W											

Course Assessment Methods

DIRECT
Continuous Assessment Test I, II (Theory Component) Assignment (Theory Component) Group Presentation (Theory Component) Pre/Post - experiment Test/Viva; Experimental Report for each experiment (lab component) Model examination (lab component) End Semester Examination (Theory and lab component)
INDIRECT
Course-end survey

THEORY COMPONENT CONTENTS

BASIC CONCEPTS OF DIGITAL SYSTEMS **09 Hours**

Review of Number systems, Number Representation, Binary Arithmetic and Logic gates, Boolean algebra, Boolean postulates and laws - De-Morgan's Theorem - Principle of Duality, Simplification using Boolean algebra, Canonical forms - Sum of product and Product of sum - Minimization using Karnaugh map and Tabulation method.

COMBINATIONAL CIRCUITS **09 Hours**

Realization of combinational logic using gates , Design of combinational circuits : Adder , Subtractor, Parallel adder / Subtractor, Carry look ahead adder, Magnitude Comparator, Parity generator and checker, Encoder, Decoder, Multiplexer, Demultiplexer - Function realization using Multiplexer, Decoder - Code converters.

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SYNCHRONOUS SEQUENTIAL CIRCUITS **09 Hours**

Flip-flops - SR, JK, D and T- Master-Slave – Triggering - Analysis of clocked sequential circuits - State reduction and assignment - Excitation table – Design procedure - Shift registers - Universal shift registers – Ripple counters - Synchronous counters – Ring counter – Johnson Counter.

ASYNCHRONOUS SEQUENTIAL CIRCUITS **09 Hours**

Algorithmic State Machines (ASM) - Asynchronous sequential logic - Analysis procedure – Circuits with latches – Design procedure – Reduction of State and Flow tables – Race free state assignments – Hazards.

LOGIC FAMILIES AND PROGRAMMABLE DEVICES **09 Hours**

Introduction to Logic families – ECL, TTL &CMOS - Programmable Logic Devices – Programmable Logic Array (PLA) - Programmable Array Logic (PAL) – Implementation of combinational logic circuits using PLA, PAL.

REFERENCES:

1. M. Morris Mano, "Digital Logic and Computer Design", Pearson Education, 4th Edition, 2016.
2. Donald D.Givone, "Digital Principles and Design", Tata Mc-Graw Hill Publishing company limited, New Delhi, 2003.
3. Thomas L. Floyd, "Digital Fundamentals", 10th Edition, Pearson Education, NewDelhi, **2009.**
4. Leach D, Malvino A P & Saha, "Digital Principles and Applications" 8th Edition, Tata McGraw-Hill Publishing Company, 2014.
5. W H Gothman, "Digital Electronics: An introduction to theory and practice", 2nd Edition, Prentice Hall of India, 2000.
6. John.M Yarbrough, "Digital Logic Applications and Design", Thomson – Vikas Publishing House, New Delhi, 2002.

LAB COMPONENT CONTENTS

LIST OF EXPERIMENTS

Design and implementation of:

1. Combinational logic functions
2. Adders and Subtractors
3. Magnitude Comparator
4. Multiplexer and De-multiplexer / Encoders and Decoders
5. Synchronous Counters / Asynchronous Counters

Design, Implementation& Testing of:

6. Op-amp characteristics & Applications
7. Comparator and Schmitt Trigger using Op-amp
8. Waveform generation using Op-amp
9. Active Filters
10. IC555 Timer, ADC and DAC

Theory: 45	Tutorial: 0	Practical: 30	Project: 0	Total: 75 Hours

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U18ECT3004 ELECTROMAGNETIC FIELDS

L	T	P	J	C
3	0	0	0	3

Course Outcomes (COs):
After successful completion of this course, the students should be able to

CO1:	Describe the fundamental concepts of static electric field (K2).
CO2:	Explain the fundamental concepts of static magnetic field (K2).
CO3:	Solve electrostatic and magneto static boundary problems (K3).
CO4:	Analyze the effect of static electric and magnetic fields under various configurations (K4).
CO5:	Analyze the significance of Maxwell's equations for time varying field (K4).
CO6:	Apply Maxwell's equations to analyze wave propagation in various mediums (K3).

Pre-requisites:-

CO/PO Mapping:
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	S													M
CO2	S													M
CO3	S	M												S
CO4	S	M	M											S
CO5	S	M	M											S
CO6	S	M	M											S

Course Assessment Methods

DIRECT
Continuous Assessment Test I, II Assignment End Semester Examination
INDIRECT
Course-end survey

STATIC ELECTRIC FIELD **09 Hours**

Co-ordinate Systems – Gradient , Divergence ,Curl – Divergence theorem, Stokes theorem - Coulomb's Law– Electric Field Intensity – Electric Field due to discrete charges, charges distributed uniformly on an infinite line, finite line and infinite sheet.
Electric Scalar Potential – Electric Flux Density – Gauss Law and its applications.

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STATIC MAGNETIC FIELD **09 Hours**

Biot-Savart's Law– Magnetic Field intensity due to infinite and finite wire carrying current I – Ampere's circuital law. Magnetic flux density –Lorentz force equation – Force on a wire carrying a current placed in a magnetic field – Torque on a loop carrying a current – Magnetic moment – Magnetic Vector Potential

ELECTRIC AND MAGNETIC FIELDS IN MATERIALS **09 Hours**

Poisson's and Laplace's equation – Electric Polarization - Capacitance – Capacitance of parallel plate capacitor and coaxial cable – Capacitance of parallel plate capacitor with two dielectrics – Electrostatic energy - Energy density – Boundary conditions for electric fields – Electric current – Current density – Point form of ohm's law – Continuity equation for current. Inductance – Inductance of loops and solenoids – Mutual inductance –Energy density in magnetic fields – Magnetization and Permeability - Magnetic boundary conditions.

TIME VARYING ELECTRIC AND MAGNETIC FIELDS **09 Hours**

Faraday's law – Transformer and Motional electromotive forces - Displacement current – Maxwell's equations in integral form and differential form –Maxwell's equation in Phasor form - Poynting Vector and the flow of power – Poynting theorem.
Introduction to field computation methods-FDM, FEM, MOM.

ELECTROMAGNETIC WAVES **09 Hours**

Wave equations for conducting and non-conducting media - Wave equations in Phasor form –Uniform plane waves in perfect dielectrics, conductors and free space - Skin effect- Introduction to EM Shielding
Case Study: Biological Effects of Electromagnetic Waves

Theory: 45 Hours	Tutorial: 0	Practical: 0	Project: 0	Total: 45 Hours

REFERENCES:

1. William H.Hayt, J A Buck, "Engineering Electromagnetics" Tata McGraw Hill Education Private Limited, Seventh Edition, 2012.
2. E.C. Jordan & K.G. Balmain, "Electromagnetic Waves and Radiating Systems," Prentice Hall of India, Second Edition, 2011.
3. S.Ramo, J.R.Whinnery and T.VanDuzer: "Fields and Waves in Communications Electronics" John Wiley & Sons, Third edition, 2003.
4. M.N.O.Sadiku, "Elements of Engineering Electromagnetics", Oxford University Press, Fourth Edition, 2006.
5. Clayton.R.Paul, Keith W.Whites, Syed.A.Nasar "Introduction to Electro Magnetic Fields", WCB/McGraw-Hill, Third Edition, 2007.
6. David K.Cheng "Field and Wave Electromagnetics" Second Edition, Pearson Education Limited, 2014

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U18ECT3105 **NETWORK THEORY**

L	T	P	J	C
3	1	0	0	4

Course Outcomes (COs):
After successful completion of this course, the students should be able to

CO1:	Illustrate various components of circuit and perform analysis of the electrical networks.(K2)
CO2:	Apply circuit theory concepts / theorems to compute DC circuit parameters.(K3)
CO3:	Apply circuit theory concepts / theorems to compute AC circuit parameters. (K3)
CO4:	Classify the different two port network parameters. (K2)
CO5:	Interpret the transient response of RL, RC & RLC circuits. (K2)
CO6:	Demonstrate the frequency response of resonance circuits. (K3)

Pre-requisites: -

COs	**PROGRAMME OUTCOMES**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	S	M							S				M	
CO2	S	M							S				M	
CO3	S	M							S				M	
CO4	S	M							S				M	
CO5	S	M							S				M	
CO6	S	M							S				M	

Course Assessment Methods

DIRECT
Continuous Assessment Test I, II Assignment End Semester Examination
INDIRECT
Course-end survey

DC CIRCUITS ANALYSIS **11 Hours**

Basic Definitions: Charge, Current, Voltage and Power, Circuit elements: Resistors, Inductors, capacitors, Voltage and Current Sources - Ohm's Law, Kirchhoff's Current Law, Kirchhoff's Voltage Law, Circuit elements (R, L, C, Voltage and Current Sources) in Series and Parallel, Voltage and Current Division, Source Transformation, Delta-Star and Star- Delta transformation, Mesh Analysis, super mesh, Nodal analysis, Super node.

NETWORK THEOREMS **10Hours**

Superposition Theorem, The venin's Theorem and Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem, Verification of Theorems.

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SINUSOIDAL STEADY STATE ANALYSIS **10 Hours**

Sinusoids, Phasors, Phasor representation of R, L and C, Phasor Diagrams, Impedance, Admittance, Susceptance, Conductance and Reactance-Two port networks-Impedance Parameters-Admittance Parameters- Hybrid Parameters-Transmission Parameters, Relation between parameters-

AC CIRCUIT POWER ANALYSIS **08 Hours**

Instantaneous Power, Average Power, RMS Power, Apparent Power and Power Factor, Complex Power, Mesh Analysis & Nodal Analysis, Verification of Maximum Power Transfer theorem.

FIRST ORDER AND SECOND ORDER CIRCUITS **11 Hours**

Basic RL and RC Circuits: The Source-Free RL Circuit, the Source-Free RC Circuit, The Unit Step Function, Driven RL Circuits, Driven RC Circuits- Source free series and parallel RLC circuits.

RESONANCE AND COUPLED CIRCUITS **10 Hours**

Frequency Response of Parallel and Series Resonance circuits-determination of Resonant Frequency, Q – Factor and Bandwidth. Magnetically Coupled Circuits - Self Inductance, Mutual Inductance, Coefficient of Coupling, Energy in a coupled circuit, Linear Transformer, Ideal Transformer.

Theory: 45	Tutorial: 15	Practical: 0	Project: 0	Total: 60 Hours

REFERENCES:

1. Charles K. Alexander and Mathew N.O. Sadiku, “Fundamentals of Electric Circuits”, 3rd edition, McGraw-Hill, 2008.
2. David E. Johnson, Johny R. Johnson and John L. Hilburn, “Electric Circuit Analysis”, 2nd edition, Prentice-Hall Int.
3. Murthy K.V.V., Kamath M.S., “Basic Circuit Analysis”, Jaico Publishing House, 1999.
4. Norman Balabanian, “Electric Circuits”, Int. Edition, McGraw-Hill, 1994.
5. Decarlo R.A. and Lin P.M.,” Linear circuit analysis - The time domain, Phasor and Laplace transform approach”, Oxford press, 2nd edition, 2003.
6. William H. Hayt, Jr Jack E. Kemmerly and Steven M. Durbin, “Engineering Circuit Analysis”, 7 th edition, Tata MC GrawHill, 2010
7. Joseph Edministor and Nahvi (Mohmood),” Theory & Problems of Electric Circuits”, 5th edition, MC Graw Hill, 2011.

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U18INI3600 **ENGINEERING CLINIC -III**

L	T	P	J	C
0	0	4	2	3

Course objectives

- To help the students look into the functioning of simple to complex devices and systems
- To enable the students to design and build simple systems on their own
- To help experiment with innovative ideas in design and team work
- To create an engaging and challenging environment in the engineering lab

Course Outcomes

After successful completion of this course, the students should be able to:
CO1: Identify a practical problem and find a solution
CO2: Understand the project management techniques
CO3: Demonstrate their technical report writing and presentation skills

Pre-requisite:

1.U18INI2600 Engineering Clinic II

CO/PO MAPPING
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	S	S	S	S	S	M	W		S			S		
CO2											S			
CO3										S				

Course Assessment methods:

Direct	Indirect
1.Project reviews 50%	1. Course Exit Survey
2. Workbook report 10%	
3. Demonstration & Viva-voce 40%	

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Content:

The course will offer the students with an opportunity to gain a basic understanding of computer controlled electronic devices and apply the concepts to design and build simple to complex devices. As a practical project based embedded course, the students will be taught the concepts using a variety of reference material available in the public domain. While the course will start with formal instruction on hardware, programming and applications, the major portion of the course will provide the students with ample opportunity to be innovative in designing and building a range of products from toys to robots and flying machines.

In the III semester, students will focus primarily on Design project combining concepts learnt

in Engineering clinics I and II

GUIDELINES:

1. Practical based learning carrying credits.
2. Multi-disciplinary/ Multi-focus group of 5-6 students.
3. Groups can select to work on a specific tasks, or projects related to real world problems.
4. Each group has a faculty coordinator/Instructor who will guide/evaluate the overall group as well as individual students.
5. The students have to display their model in the 'Engineering Clinics Expo' at the end of semester.
6. The progress of the course is evaluated based on reviews and final demonstration of prototype.

Theory: 0	**Tutorial: 0**	**Practical: 60**	**Project: 30**	**Total: 90 Hours**

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U18VEP3503 **FAMILY VALUES** (Mandatory)

L	T	P	J	C
0	0	2	0	0

Course Outcomes

After successful completion of this course, the students should be able to

CO 1: Develop skills in maintaining the harmony in the family.
CO 2: Create impulsive activities for healthy family
CO 3: Be receptive to troubled Individuals
CO 4: Gain healthy life by practicing Kundalini Yoga &Kayakalpa
CO 5: Possess Empathy among family members.
CO 6: Reason the life and its significance

Pre-requisites :

1. U18VEP1501 / PERSONAL VALUES
2. U18VEP2502 / INTERPERSONAL VALUES

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1									S					
CO2							M							
CO3										M				
CO4												S		
CO5						S								
CO6								M						

Course Assessment methods

Direct
1.Group Activity / Individual performance and assignment 2.Assessment on Value work sheet / Test
Indirect
1. Mini project on values / Goodwill Recognition

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Values through Practical activities:

1. Family system: Introduction to Family Values – elements of family values - Adjustment, Tolerance, Sacrifice - Family structure in different society – work life balance.
2. Peace in Family : Family members and their responsibility - Roles of parents, children, grant parents -. Respectable women hood
3. Core value: Empathy: Unconditional love - Respect - Compassion - sacrifice–Care &share - helping – emotional support- hospitality – cleanliness
4. Blessing: Blessing - methods - Vibration effect - Benefits - Reason for misunderstanding in the Family and resolution through blessings.
5. Healthy Family: Good relationship with neighbors - Counseling - Simplified Kundalini Yoga - Kaya Kalpa Yoga

Workshop mode

REFERENCES

1. FAMILY - www.download.nos.org/331courseE/L-13%20FAMILY.pdf

2. FRAMEWORK FOR ACTION ON VALUES EDUCATION IN EARLY CHILDHOOD – UNESCO – PDF –www.unesdoc.unesco.org/images/0012/001287/128712e.pdf

3. TRUE FAMILY VALUES Third Edition - Tparents Home www.tparents.org/Library/Unification/Books/TFV3/_TFV3.pdf

4. FAMILY VALUES IN A HISTORICAL PERSPECTIVE - The Tanner Lectures on www.tannerlectures.utah.edu/_documents/a-to-z/s/Stone95.pdf

5. PROBLEMS OF INDIA'S CHANGING FAMILY AND STATE ... - the United Nations - www.un.org/esa/socdev/family/docs/egm09/Singh.pdf

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U18CHT3000 **Environmental Science and Engineering (Common to All branches)**

L	T	P	J	C
3	0	0	0	0

Course Outcomes

After successful completion of this course, the students would be able to

CO 1: Analyze the impact of engineering solutions in a global and societal context.

CO 2: Discuss contemporary issues that results in environmental degradation and would attempt to provide solutions to overcome those problems.

CO 3: Highlight the importance of ecosystem and biodiversity.

CO 4: Consider issues of environment and sustainable development in his/her personal and professional undertakings.

CO 5: Paraphrase the importance of conservation of resources.

CO 6: Play an important role in transferring a healthy environment for future generations.

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		M					S		M					
CO2						M				M				
CO3							M							
CO4						M	S							
CO5							S							
CO6			W				S					M		

Course Assessment methods

Direct	Indirect
1. Internal Test I 2. Internal Test II 3. Assignment 4. Group presentation	Course end survey

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INTRODUCTION TO ENVIRONMENTAL STUDIES ANDNATURAL RESOURCES **14 Hours**

Definition, scope and importance – Need for public awareness – Forest resources: Use and over-exploitation, deforestation, case studies – Timber extraction, mining, dams and their effects on forests and tribal people.

Water resources: Use and overutilization of surface and ground water, conflicts over water, dams – benefits and problems – Water conservation, rain water harvesting, watershed management.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, case studies.

Energy resources: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources, case studies.

Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification, Wasteland reclamation – Role of an individual in conservation of natural resources.

ECOSYSTEMS AND BIODIVERSITY **9 Hours**

ECOSYSTEM: Concept of an ecosystem – Structure and function of an ecosystem: Producers, consumers and decomposers, Food chain, Food web, Energy flow in the ecosystem and Ecological pyramids – Ecological succession – Introduction, types, characteristic features, structure and function of the (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

BIODIVERSITY: Introduction to Biodiversity – Definition: genetic, species and ecosystem diversity – Bio geographical classification of India – Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic values – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

ENVIRONMENTAL POLLUTION **8 Hours**

Definition – Causes, effects and control measures of: (a) Air pollution – Organic and inorganic pollution – cyclone separator, electrostatic precipitator (b) Water pollution (c) Heavy metal pollution (d) Noise pollution (e) Thermal pollution (f) Nuclear hazards – Role of an individual in prevention of pollution – Pollution case studies – Solid waste and hazardous Management: Causes, effects and control measures from factories, small scale and large scale industries – Waste minimization – Disaster management: floods, earthquake, cyclone and landslides.

SOCIAL ISSUES AND THE ENVIRONMENT **7 Hours**

From Unsustainable to Sustainable development – Urban problems related to energy – Resettlement and rehabilitation of people; its problems and concerns, case studies – Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion – Environment Production Act – Air (Prevention and Control of Pollution) Act – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Human Rights.

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HUMAN POPULATION AND THE ENVIRONMENT **7 Hours**

Population growth and explosion – Welfare Program – Environment and human health – Communicable disease – Role of Information Technology in Environment and human health – Case studies.

Theory: 45 Hours **Total: 45 Hours**

REFERENCES

1. G. Tyler Miller and Scott Spoolman, 'Environmental Science', Fourteenth Edition, Brooks Cole, 2012.
2. Gilbert M. Masters and Wendell P. Ela, 'Introduction to Environmental Engineering and Science', Third Edition, Pearson Education, 2013.
3. BharuchaErach, 'The Biodiversity of India', Mapin Publishing Pvt. Ltd., Ahmedabad, 2002.
4. Trivedi R.K and P.K.Goel, 'Introduction to Air Pollution', Techno-Science Publications, 2003.
5. Trivedi R.K., 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media, 1996.
6. Cunningham, W.P.Cooper and T.H.Gorhani, 'Environmental Encyclopedia', Jaico Publication House, Mumbai, 2001.
7. Wager K.D., 'Environmental Management', W.B. Saunders Co., Philadelphia, USA, 1998.
8. Colin R. Townsend, Michael Begon and John L. Harper, 'Essentials of Ecology', Third Edition, Blackwell Publishing, 2008.

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SEMESTER IV

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U18ECI4201 **DIGITAL SIGNAL PROCESSING**

L	T	P	J	C
3	0	2	0	4

Course Outcomes (COs):
After successful completion of this course, the students should be able to

CO1: Apply DFT algorithm for signal analysis (K4).
CO2: Design, implement and analyze IIR filter for the given specification (K4).
CO3: Design, implement and analyze FIR filter for the given specification (K4).
CO4: Compare different structures for filter implementations (K4).
CO5: Analyze the effect of finite word length (K3).
CO6: Compare DSP Processor Architectures (K2).

Pre-requisites:
1.U18ECT3101 Signals and Systems

CO/PO Mapping:
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	S	S	M		S				M	M				S
CO2	S	S	M		S				M	M				S
CO3	S	S	M		S				M	M				S
CO4	S	M												S
CO5	S	M												S
CO6	S	M			M									S

Course Assessment Methods

DIRECT
Continuous Assessment Test I, II (Theory Component) Assignment (Theory Component) Pre/Post - experiment Test/Viva; Experimental Report for each experiment (Lab component) Model examination (lab component) End Semester Examination (Theory and lab component)
INDIRECT
Course-end survey

DISCRETE FOURIER TRANSFORM **09 Hours**
DFT and its properties, Relation between DTFT and DFT, Radix-2 FFT algorithms –DFT computation using Decimation in time and Decimation in frequency algorithms, Overlap-add and save Methods.

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INFINITE IMPULSE RESPONSE DIGITAL FILTERS **12 Hours**

Design of analog Butterworth and Chebyshev Filters – Frequency transformation in analog domain – Design of IIR digital filters - Impulse invariance techniques, Bilinear transform – Prewarping – Realization of IIR filters - Direct, cascade and parallel forms, Lattice structure.

FINITE IMPULSE RESPONSE DIGITAL FILTERS **12 Hours**

Linear phase FIR filters – Design using Rectangular, Hamming, Hanning and Blackmann Windows – Frequency sampling method – Realization of FIR filters – Direct form and Lattice structure

FINITE WORD LENGTH EFFECTS **06 Hours**

Representation of numbers, Quantization of filter coefficients in IIR and FIR filters, Round off effects in digital filters –Limit cycle Oscillations, Scaling, Quantization effect in fixed point realization of digital filters.

DSP ARCHITECTURE **06 Hours**

Comparison of Von-Neumann and Harvard architecture - Architecture of TMS320C67XX Processors- Addressing modes- Memory organization - Program Control – Pipelining- On-Chip Peripherals- Interrupts.

REFERENCES:

1. John G Proakis and Manolakis, "Digital Signal Processing Principles, Algorithms and Applications", Pearson, Fourth Edition, 2014.
2. Venkataramani B, and Bhaskar M, "Digital Signal Processors: Architecture, Programming & Applications", Tata McGraw Hill, New Delhi, 2011.
3. Monson H.Hayes, "Digital Signal Processing "Schaum's Outline Series, McGraw Hill Professional, 2nd Edition,2011
4. Johny R. Johnson, "Introduction to Digital Signal Processing", PHI, 2006.
5. S.K. Mitra, "Digital Signal Processing, A Computer Based approach", Tata McGrawHill,, 4th Edition, 2013.
6. E.C. Ifeachor and B.W. Jervis, "Digital signal processing – A Practical approach", Second edition, Pearson, 2002.

LAB COMPONENT

LIST OF EXPERIMENTS

1. Generate and perform operations on signals
2. Pole Zero plot and stability analysis of systems.
3. Convolution and correlation.
4. Implementation of algorithms for DFT/IDFT.
5. Spectral analysis of Sampled signal
6. Design of FIR filters.
7. Design of IIR filters.

Experiments using TMS320C67XX

8. Filter implementation
9. Verify DSP concepts with real time signals.

Theory: 45	**Tutorial:0**	**Practical: 30**	**Project: 0**	**Total: 75 Hours**

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U18ECI4202 ANALOG ELECTRONICS AND INTEGRATED CIRCUITS

L	T	P	J	C
3	0	2	0	4

Course Outcomes (COs):
After successful completion of this course, the students should be able to

CO1: Design and verify feedback amplifiers, LC and RC oscillators(K3,S3)
CO2: Describe the characteristics of operational amplifiers (K2).
CO3: Develop and analyze operational amplifier application circuits (K4,S3).
CO4: Build data converters for the given specifications (K3).
CO5: Operate 555 timer circuit and generate waveforms(K3,S3)

Pre-requisites:
1.U18ECI3202 Electron Devices and circuits

COs	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	M		M										S	
CO2	M												S	
CO3	S		S	M	M								S	
CO4	M		M										S	
CO5	M												S	

Course Assessment Methods

DIRECT
Continuous Assessment Test I, II Assignment End Semester Examination
INDIRECT
Course-end survey

FEEDBACK AMPLIFIER & OSCILLATORS **09 Hours**

Feedback Concepts – gain with feedback – effect of feedback on gain stability, distortion, bandwidth, input and output impedances; topologies of feedback amplifiers – analysis of series-series, shunt-shunt and shunt-series feedback amplifiers-Oscillators: Hartleys&Colpitt‘s oscillators- phase shift&Wien bridge.

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BASICS OF OPERATIONAL AMPLIFIERS **09 Hours**

Current mirror and current sources, Current sources as active loads- BJT Differential amplifier with active loads, Ideal Operational Amplifier - General operational amplifier stages -and internal circuit diagrams of IC 741, Open and closed loop configurations, DC and AC performance characteristics, slew rate, Frequency compensation.

APPLICATIONS OF OPERATIONAL AMPLIFIERS **12 Hours**

Inverting & Non-inverting voltage amplifiers - Voltage follower - Summing, scaling & averaging amplifiers - AC amplifiers. Instrumentation Amplifiers -Differentiators and Integrators -Second order active filters Precision Rectifiers – Wave Shaping Circuits (Clipper and Clampers) – Log and Antilog Amplifiers – Analog voltage multiplier circuit and its applications –Comparators, Schimitttrigger and its applications – Sample and Hold circuit. .

WAVEFORM GENERATORS AND PLL **08 Hours**

Waveform Generators: Sine-wave Generators – Square / Triangle / Saw-tooth Wave generators. IC 555 Timer: Monostable operation and its applications – Astable operation and its applications. PLL: Operation of the Basic PLL-Closed loop analysis of PLL-Voltage Controlled Oscillator-PLL applications**.**

DATA CONVERTORS **07 Hours**

Digital to Analog Conversion: DAC Specifications – DAC circuits – Weighted Resistor DAC-R-2R Ladder Analog to Digital conversion: ADC specifications-ADC circuits-Ramp Type ADC-Successive Approximation ADC-Dual Slope ADC-Flash Type ADC.

REFERENCES:

1. Millman and Halkias. C., Integrated Electronics, Second edition TMH, 2009
2. D.Roy Choudhry, Shail Jain, ―Linear Integrated Circuits, New Age International Pvt. Ltd., Fifth Edition,2018
3. Ramakant A. Gayakwad, ―OP-AMP and Linear ICs‖, 4th Edition, Prentice Hall / Pearson Education, 2015.
4. Robert F.Coughlin, Frederick F.Driscoll,-Operational Amplifiers and Linear Integrated Circuits‖, Sixth Edition, PHI, 2001.
5. S.Salivahanan& V.S. Kanchana Bhaskaran, ―Linear Integrated Circuits‖, TMH,2nd Edition, 4th Reprint, 2016.
6. Sergio Franco, ―Design with Operational Amplifiers and Analog Integrated Circuits‖, 4th Edition, Tata Mc Graw-Hill, 2016

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LAB COMPONENT:

LIST OF EXPERIMENTS:

1. Frequency response of Feedback Amplifier.
2. Design of Oscillator circuits
3. Basic op-amp circuits inverting & non-inverting amplifiers, adders and subtractors.
4. Linear applications of op-amp: Integrator and Differentiator.
5. Non-linear application of op-amp: precision rectifiers and comparators.
6. 555 Timer – Astable and Monostable Multivibrator.
7. Design of Active Filters LPF& HPF.
8. Simulation experiments using PSPICE or Multisim.
9. Development of application circuits using IC's

Theory: 45	Tutorial:0	Practical: 30	Project: 0	Total: 75 Hours

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U18MAT4103 PROBABILITY AND RANDOM PROCESSES

L	T	P	J	C
3	1	0	0	4

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: Analyze random or unpredictable experiments and investigate important features of random experiments and analyze various distributions.(K3)

CO2: Construct probabilistic models for observed phenomena through distributions.(K3)

CO3: Analyze various random processes with practical applications.(K4)

CO4: Analyze correlation related to various random processes and establish the properties of spectral densities.(K4)

CO5: Analyze linear time invariant systems performance for random inputs.(K4)

Pre-requisites: -

CO/PO Mapping:

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	S	S												M
CO2	S	S												M
CO3	S	S	M	M										M
CO4	S	S	M	M										M
CO5	S	S	M	M										M

Course Assessment Methods

DIRECT
1. Continuous Assessment Test I, II 2. Open book test; Cooperative learning report, Assignment; Journal paper review, Group Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc. (as applicable) End Semester Examination
INDIRECT
Course-end survey

BASIC CONCEPTS OF PROBABILITY 09 Hours

Sets: Definition and Operations, Probability: Definition through Sets, Joint and Conditional Probabilities, Baye's theorem

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RANDOM VARIABLES **09 Hours**

Randomvariable – Definition, Discrete and Continuous Random Variables – Probability Density Functions, Probability Distribution Functions –Properties – Gaussian, Binominal,Poisson,Uniform,ExponentialDistributionsandtheirproperties – Operations on one random variable.

Multiple RandomVariables: - Joint Density and Distribution Functions –Marginal and conditional distributions –Properties – Operations on multiple random variables.

RANDOM PROCESSES **09 Hours**

Random Process – Stationary Process – Wide sensestationaryandErgodic processes– Gaussian Random Process – Markovprocess–Markovchain–Poissonprocess

CORRELATION AND SPECTRAL DENSITIES **09 Hours**

Correlation: Autocorrelation, Cross Correlation and their properties – Covariance– Regression – Central Limit Theorem.

Power spectraldensity and its properties – Cross power spectral density and its properties –Relationship between power spectrum and correlations – Wiener-Khintchine relation.

OPTIMUM FILTERING **09 Hours**

Linear time invariant system – System transfer function – Properties – Linearsystemswithrandominputs – Autocorrelation and Cross Correlation of inputs and outputs – Spectral Characterization – Optimum linear time invariant systems – Matched Filter – Properties.

Theory: 45	**Tutorial: 15**	**Practical: 0**	**Project: 0**	**Total: 60 Hours**

REFERENCES:

1. Peebles. P.Z., "Probability, Random Variables and Random Signal Principles", Tata McGraw Hill, 4th Edition, New Delhi, 2002.
2. Cooper. G.R., McGillem. C.D., "Probabilistic Methods of Signal and System Analysis", 3rd Indian Edition, Oxford University Press, New Delhi, 2012.
3. Miller. S.L. and Childers. D.G., "Probability and Random Processes with Applications to Signal Processing and Communications", Academic Press, 2004.
4. Stark. H, and Woods. J.W., "Probability and Random Processes with Applications to Signal Processing", 3rdEdition, Pearson Education, Asia, 2002.
5. Yates. R.D. and Goodman. D.J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.

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U18ECT4104 **TRANSMISSION LINES AND WAVEGUIDES**

L	T	P	J	C
3	1	0	0	4

Course Outcomes (COs):
After successful completion of this course, the students should be able to

CO1: Discuss the fundamental concepts of wave propagation in Transmission Lines and Wave Guides (K2).
CO2: Analyze the line parameters and various losses in transmission lines (K3).
CO3: Apply smith chart for line parameter and impedance calculations (K4).
CO4: Evaluate the characteristics of Parallel plane and Rectangular wave guides (K3).
CO5: Evaluate the characteristics of Circular wave guides and Rectangular cavity resonators (K3).

Pre-requisites:
1.U18ECT3004 Electromagnetic Fields

CO/PO Mapping:
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	S	M												
CO2	S	M												M
CO3		S	M		M									M
CO4	S	M												
CO5	S	M												

Course Assessment Methods

DIRECT
Continuous Assessment Test I, II Assignment End Semester Examination
INDIRECT
Course-end survey

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TRANSMISSION LINE THEORY **12 Hours**

Transmission lines – Line parameters - General Solution of the transmission line – Standard forms for voltage and current - The infinite line – The two standard forms for the input impedance of a transmission line. Characteristic impedance and Propagation Constant.
Waveform distortion – distortion less transmission line – Loading of transmission lines, Transfer impedance - Reflection factor, reflection loss, return loss, Insertion loss

TRANSMISSION LINE AT RADIO FREQUENCIES **12 Hours**

Standing waves and standing wave ratio on a line – Eighth wave line – Quarter wave line and the half wave line – Smith Chart – Applications of the Smith Chart –Problem solving using Smith chart– Single stub matching and Double stub matching.

GUIDED WAVES **12 Hours**

Waves between parallel planes of perfect conductors – Transverse electric and transverse magnetic waves – characteristics of TE and TM Waves – Transverse Electromagnetic waves – Velocities of propagation – component uniform plane waves between parallel planes –Wave impedance.

RECTANGULAR WAVEGUIDES **12 Hours**

Transverse Magnetic Waves in Rectangular Wave guides – Transverse Electric Waves in Rectangular Waveguides – characteristic of TE and TM Waves – Cutoff wavelength and phase velocity – Impossibility of TEM waves in waveguides – Dominant mode in rectangular waveguide – Attenuation of TE and TM modes in rectangular waveguides – Wave impedances– Excitation of modes.

CIRCULAR WAVE GUIDES AND RESONATORS **12 Hours**

Bessel functions – Solution of field equations in cylindrical co-ordinates – TM and TE waves in circular guides – Wave impedances– Dominant mode in circular waveguide – excitation of modes – Microwave cavities, Rectangular cavity resonators, Q factor of rectangular cavity resonator for TE101 mode.

Theory: 45	**Tutorial: 15**	**Practical: 0**	**Project: 0**	**Total: 60 Hours**

REFERENCES:

1. J.D.Ryder "Networks, Lines and Fields", PHI, New Delhi, 2003
2. E.C. Jordan and K.G.Balmain "Electro Magnetic Waves and Radiating System", PHI, New Delhi, 2003.
3. Mathew N. O. Sadiku "Elements of Electro Magnetics", Seventh edition, Oxford, New York, 2010.
4. Ramo, Whineery and Van Duzer: "Fields and Waves in Communication Electronics" John Wiley, 2003.
5. Clayton. R. Paul, Keith W. Whites, Syed. A. Nasar "Introduction to Electro Magnetic Fields", Third edition, WCB/McGraw-Hill, 1998.

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U18INI4600 **ENGINEERING CLINIC IV**

L	T	P	J	C
0	0	4	2	3

Course objectives

- To help the students look into the functioning of simple to complex devices and systems
- To enable the students to design and build simple systems on their own
- To help experiment with innovative ideas in design and team work
- To create an engaging and challenging environment in the engineering lab

Course Outcomes

After successful completion of this course, the students should be able to:
CO1: Identify a practical problem and find a solution
CO2: Understand the project management techniques
CO3: Demonstrate their technical report writing and presentation skills

Pre-requisite:

1.U18INI3600 Engineering Clinic III

CO/PO MAPPING
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	S	S	S	S	S	M	W		S			S		
CO2											S			
CO3										S				

Course Assessment methods:

Direct	Indirect
1.Project reviews 50%	1. Course Exit Survey
2. Workbook report 10%	
3. Demonstration & Viva-voce 40%	

Signature of BOS chairman, ECE

Content:

The course will offer the students with an opportunity to gain a basic understanding of computer controlled electronic devices and apply the concepts to design and build simple to complex devices. As a practical project based embedded course, the students will be taught the concepts using a variety of reference material available in the public domain. While the course will start with formal instruction on hardware, programming and applications, the major portion of the course will provide the students with ample opportunity to be innovative in designing and building a range of products from toys to robots and flying machines.

In the IV semester, students will focus primarily on Reverse engineering project to improveperformance of a product.

GUIDELINES:

1. Practical based learning carrying credits.
2. Multi-disciplinary/ Multi-focus group of 5-6 students.
3. Groups can select to work on a specific tasks, or projects related to real world problems.
4. Each group has a faculty coordinator/Instructor who will guide/evaluate the overall group as well as individual students.
5. The students have to display their model in the 'Engineering Clinics Expo' at the end of semester.
6. The progress of the course is evaluated based on reviews and final demonstration of prototype.

Theory: 0 Tutorial: 0	**Practical: 60**	**Project:30**	**Total: 90 Hours**

Signature of BOS chairman, ECE

U18VEP4504 **PROFESSIONAL VALUES**
(Mandatory)

L	T	P	J	C
0	0	2	0	0

Course Outcomes

After successful completion of this course, the students should be able to

CO 1: Develop the ethical values in both professional and personal life
CO 2: Develop ability to take decision to reinforce professional life
CO 3: Rational in professional skills required for diverse society
CO 4: Excel in ingenious attitude to congregate professional life
CO 5: Research into the professional stand
CO 6: Spruce an Individual with decorum to achieve professional life

Pre-requisites :

1. U18VEP1501 / PERSONAL VALUES
2. U18VEP2502 / INTERPERSONAL VALUES
3. U18VEP3503 / FAMILY VALUES

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								S						
CO2				M										
CO3			S											
CO4												S		
CO5								M						
CO6										M				

Course Assessment methods

Direct
1.Group Activity / Individual performance and assignment 2.Assessment on Value work sheet / Test
Indirect
1. Mini project on values / Goodwill Recognition

Signature of BOS chairman, ECE

Values through Practical activities:

1.Professional skills With Values: Positive Attitude, Adaptability, Responsibility, Honesty and Integrity, Self Esteem, & Self Confidence

2.Building Innovative work cultures: Creative thinking, Critical thinking, Conflict Resolution, Problem Solving, & Decision making

3.Professional Work Ethics: Types of Ethics, Etiquette, personality Grooming, Emotional quotient, Human Dignity, Safety & Role of Professional in Social Responsibility

4.Engineering Ethics: Engineering Council of India - Objectives - Code of Ethics - Social responsibility -Professional Quality - Ethical issues - Effects - Strategy – Corruption, Consequences, Cures

5.Case studies in engineering ethics: Discussion of case studies relating to Public safety, health, welfare, Quality of product, Improper conduct by management, Product responsibility, Intellectual property

Workshop mode

REFERENCES

1. LEARNING TO DO SOURCEBOOK 3 - UNESCO-UNEVOC -PDF
www.unevoc.unesco.org/fileadmin/user_upload/pubs/LearningToDo.pdf

2. DECLARATION OF PROFESSIONAL VALUES AND ETHICAL STANDARDS
www.garda.ie/Documents/User/declarationvalues.pdf

3. KARMA YOGA - SWAMI VIVEKANANDA
www.vivekananda.net/PDFBooks/KarmaYoga.pdf

4. PROFESSIONAL ETHICS IN ENGINEERING - Sasurie College of Engineering
www.sasurieengg.com/.../GE2025%20Professional%20Ethics%20in%20Engineering.

5. ENGINEERING ETHICS CASE STUDY; Challenger
www.ucc.ie/en/processeng/staff/academic/ebyrne/.../PE1006PptNotesLect7.pdf

Signature of BOS chairman, ECE

U18INT4000 **CONSTITUTION OF INDIA**

L	T	P	J	C
2	0	0	0	0

Course Outcomes:

After successful completion of this course, the students will be able to:

CO 1: Gain Knowledge about the Constitutional Law of India
CO 2: Understand the Fundamental Rights and Duties of a citizen
CO 3: Apply the concept of Federal structure of Indian Government
CO 4: Analyze the Amendments and Emergency provisions in the Constitution
CO 5: Develop a holistic approach in their life as a Citizen of India

Pre-requisites :-

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						M			W			S		
CO2						S		S				M		
CO3			S						M	S		W		
CO4								W	M			M		
CO5						M		M				S		
CO6														

Course Assessment methods

Direct
1. Group Activity / Quiz/ Debate / Case studies 2. Class test / Assignment
Indirect
Surveys

Signature of BOS chairman, ECE

THEORY COMPONENT:

Module.1: Introduction to Indian Constitution 4 hours

Meaning of the constitution law and constitutionalism - Historical perspective of the Constitution - Salient features and characteristics of the Constitution of India

Module.2:Fundamental Rights 8 hours

Scheme of the fundamental rights - Right to Equality - Fundamental Right under Article 19 - Scope of the Right to Life and Liberty - Fundamental Duties and its legal status - Directive Principles of State Policy – Its importance and implementation

Module.3:Federal Structure 8 hours

Federal structure and distribution of legislative and financial powers between the Union and the States - Parliamentary Form of Government in India - The constitutional powers and status of the President of India

Module.4: Amendment to Constitution 6 hours

Amendment of the Constitutional Powers and Procedure - The historical perspectives of the constitutional amendments in India

Module.5: Emergency Provisions 4 hours

National Emergency, President Rule, Financial Emergency
Local Self Government – Constitutional Scheme in India

Theory: 30	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 30 hours**

REFERENCES

1. Constitution of India - Ministry of Law & Justice – PDF format
awmin.nic.in/coi/coiason29july08.pdf

2. Introduction to the Constitution of India by DurgadasBasu

3. The Constitution of India – Google free material - www.constitution.org/cons/india/const.html

4. Parliament of India – PDF format
download.nos.org/srsec317newE/317EL11.pdf

5. The Role of the President of India – By Prof.Balkrishna

6. Local Government in India – E Book - Pradeep Sachdeva
https://books.google.com/books/.../Local_Government_in_In...

Signature of BOS chairman, ECE