S.A ENGINEERING COLLEGE, CHENNAI – 77
(An Autonomous Institution Affiliated to Anna University)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
REGULATION-2020
CHOICE BASED CREDIT SYSTEM
CURRICULUM FOR B.E ELECTRICAL & ELECTRONICS ENGINEERING

Educational Objectives

Bachelor of Electrical and Electronics Engineering curriculum is designed to prepare the graduates having attitude and knowledge to

1. To practice the students for their fruitful career in Electrical and Electronics, Allied fields and stimulate them for Higher Education and Research.
2. To provide strong foundation in Basic Science, Mathematics, Circuit Theory, Field Theory, Control Theory, Signals and Systems, Power System in Electrical Power Gadgets and Basic Electronics to Power Electronics – necessary to formulate, solve and analyze Electrical and Electronics problems.
3. To foster student cognizance for all-time learning and instill professional ethics.
4. To adapt evolving technologies and stay contemporary with their profession.

Programme Outcomes

The graduates will have the ability to

a. Apply the Mathematical knowledge and the basics of Science and Engineering to solve the problems pertaining to Electronics and Instrumentation Engineering.
b. Identify and formulate Electrical and Electronics Engineering problems from research literature and be ability to analyze the problem using first principles of Mathematics and Engineering Sciences.
c. Come out with solutions for the complex problems and to design system components or process that fulfill the particular needs taking into account public health and safety and the social, cultural and environmental issues.
d. Draw well-founded conclusions applying the knowledge acquired from research and research methods including design of experiments, analysis and interpretation of data and synthesis of information and to arrive at significant conclusion.
e. Form, select and apply relevant techniques, resources and Engineering and IT tools for Engineering activities like electronic prototyping, modeling and control of systems and also being conscious of the limitations.
f. Understand the role and responsibility of the Professional Electrical and Electronics Engineer and to assess societal, health, safety issues based on the reasoning received from the contextual knowledge.
g. Be aware of the impact of professional Engineering solutions in societal and environmental contexts and exhibit the knowledge and the need for

Sustainable Development.

h. Apply the principles of Professional Ethics to adhere to the norms of the engineering practice and to discharge ethical responsibilities.
i. Function actively and efficiently as an individual or a member/leader of different teams and multidisciplinary projects.
j. Communicate efficiently the engineering facts with a wide range of engineering community and others, to understand and prepare reports and design documents; to make effective presentations and to frame and follow instructions.
k. Demonstrate the acquisition of the body of engineering knowledge and insight and Management Principles and to apply them as member / leader in teams and multidisciplinary environments.
l. Recognize the need for self and life-long learning, keeping pace with technological challenges in the broadest sense.

PEO \PO	a	b	c	d	e	f	g	h	i	j	k	l
1	√	√	√	√	√	√	√					√
2	√	√	√	√	√	√	√	√		√		

PROGRAMME SPECIFIC OUTCOMES (PSOs)
Students will be able to:

1. Utilize coherent theoretical and practical methodologies to design and implement Electrical and Electronics systems.
2. Assimilate facts of basic Electronics to Power Electronics, power systems and recent embedded technologies for governing, consistent and workable Electrical and Electronics Systems.
3. Apply computing platform and developing software for power grids and hybridizing the new renewable energy to overcome the power demand.

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B.E ELECTRICAL & ELECTRONICS ENGINEERING
CURRICULUM AND SYLLABUS FROM I TO IV SEMESTER

SEMESTER –I

SL. NO.	SUBJECT CODE	SUBJECT	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY:								
1.	**HS1101**	Technical English	**HS**	**3**	**3**	**0**	**0**	**3**
2.	**MA1101**	Calculus And Its Applications	**BS**	**4**	**3**	**1**	**0**	**4**
3.	**PH1101**	Applied Physics	**BS**	**3**	**3**	**0**	**0**	**3**
4.	**CY1101**	Engineering Chemistry	**BS**	**3**	**3**	**0**	**0**	**3**
5.	**CS1101**	Problem Solving And Python Programming	**ES**	**3**	**3**	**0**	**0**	**3**
6.	**ME1101**	Engineering Graphics	**ES**	**4**	**2**	**0**	**2**	**3**
7.	**IC1101**	Indian Constitution	**MC**	**2**	**2**	**0**	**0**	**0**
PRACTICALS:								
8.	**BS1101**	Physics and Chemistry Laboratory	**BS**	**4**	**0**	**0**	**4**	**2**
9.	**CS1102**	Problem Solving and Python Programming Laboratory	**ES**	**4**	**0**	**0**	**4**	**2**
			TOTAL	**30**	**19**	**1**	**10**	**23**

SEMESTER –II

SL. NO.	SUBJECT CODE	SUBJECT	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY:								
1.	**HS1201**	English for Communication	**HS**	**3**	**3**	**0**	**0**	**3**
2.	**MA1201**	Complex Variables and Transforms	**BS**	**4**	**3**	**1**	**0**	**4**
3.	**PH1201**	Materials Science	**BS**	**3**	**3**	**0**	**0**	**3**
4.	**ME1201**	Basic Civil and Mechanical Engineering	**ES**	**3**	**3**	**0**	**0**	**3**
5.	**CS1201**	Programming in C	**ES**	**3**	**3**	**0**	**0**	**3**
6.	**EE1205**	Circuit Theory	**PC**	**6**	**2**	**2**	**2**	**4**
7.	**CY1201**	Environmental Science and Engineering	**MC**	**2**	**2**	**0**	**0**	**0**
PRACTICALS:								
8.	**CS1203**	Programming in C Laboratory	**ES**	**4**	**0**	**0**	**4**	**2**

9.	**GE1201**	Engineering Practices Laboratory	**ES**	**4**	**0**	**0**	**4**	**2**
			TOTAL	**32**	**19**	**3**	**10**	**24**

SEMESTER –III

SL. NO.	SUBJECT CODE	SUBJECT	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY:								
1.	**MA1302**	Transforms and Partial Differential Equations	**BS**	**4**	**3**	**1**	**0**	**4**
2.	**EE1301**	Electrical Machines – I	**PC**	**3**	**3**	**0**	**0**	**3**
3.	**EE1302**	Electromagnetic Theory	**PC**	**3**	**3**	**0**	**0**	**3**
4.	**EE1303**	Electron Devices and Circuits	**PC**	**3**	**3**	**0**	**0**	**3**
5.	**EE1304**	Digital Logic Circuits	**PC**	**5**	**3**	**0**	**2**	**4**
6.	**EE1305**	Measurements and Instrumentation	**PC**	**3**	**3**	**0**	**0**	**3**
PRACTICALS:								
7.	**EE1306**	Electron Devices and Circuits Laboratory	**PC**	**2**	**0**	**0**	**2**	**1**
8.	**EE1307**	Electrical Machines Laboratory - I	**PC**	**4**	**0**	**0**	**4**	**2**
			TOTAL	**27**	**18**	**1**	**8**	**23**

SEMESTER –IV

SL. NO.	SUBJECT CODE	SUBJECT	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY:								
1.	**MA1402**	Numerical Methods	**BS**	**4**	**3**	**1**	**0**	**4**
2.	**EE1401**	Electrical Machines – II	**PC**	**3**	**2**	**1**	**0**	**3**
3.	**EE1402**	Transmission and Distribution	**PC**	**3**	**3**	**0**	**0**	**3**
4.	**EE1403**	Linear Integrated Circuits and Applications	**PC**	**5**	**3**	**0**	**2**	**4**
5.	**EE1404**	Control Systems	**PC**	**3**	**2**	**1**	**0**	**3**
6.	**HV1401**	Universal Human values	**HS**	**3**	**2**	**1**	**0**	**3**
PRACTICALS :								
7.	**EE1405**	Electrical Machines Laboratory II	**PC**	**4**	**0**	**0**	**4**	**2**
8.	**EE1406**	Control and Instrumentation Laboratory	**PC**	**4**	**0**	**0**	**4**	**2**
			TOTAL	**29**	**15**	**4**	**10**	**24**

SEMESTER-I

HS1101 TECHNICAL ENGLISH

L	T	P	C
3	0	0	3

PREREQUISITE SUBJECTS:

- Basic Language Proficiency.

COURSE OBJECTIVES:

- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Nurture their ability in technical writing like to prepare professional job applications and effective reports.
- Develop their speaking skills by participating in various speaking activities.
- Strengthen their listening skill to comprehend lectures and talks in their areas of specialization. Improve their ability to explicit their excellence in all modes of technical communication

UNIT I **9**

Reading- Reading short texts Listening- Listening to different formal / informal conversations Writing- Instructions, Jumbled sentences Speaking- Self introduction Language development- Parts of speech, Prepositions Vocabulary development- Word formation- root words from foreign language and their use in English.

UNIT II **9**

Reading-Skimming and Scanning to find specific information Listening- Listening to INK talks Writing- Job Application – cover letter, resume writing Speaking- Asking and Giving directions Language development- Conjunctions, Types of Nouns Vocabulary development- Prefixes and Suffixes.

UNIT III **9**

Reading- Reading for predicting the content Listening- Listening to situational short talks Writing- Types of paragraphs- Descriptive/Analytical/ compare and contrast Speaking- Mini presentations, Expressing greeting and thanks Language development- Adjectives, Numerical Adjectives, Conditional Clauses Vocabulary development- Homophones, Homonyms.

UNIT IV **9**

Reading- Practice in speed reading Listening- Listening to short texts and fill the data Writing- Interpretation of Graphics / Information, Note making Speaking-Contributing for Group Discussion Language development- Active, Passive, Impersonal passive voice Vocabulary development- Definitions, Nominal Compounds.

UNIT V **9**

Reading- Reading short stories Listening- Listening for note taking Writing- Report writing, E-mail Writing Speaking- Picture descriptions, Speaking in familiar situations Language development- Tenses Vocabulary development- British and American Vocabulary

Total Periods: 45 hours

OUTCOMES:

The Students will be able to

- Read technical texts and write area- specific texts effortlessly.
- Listen and comprehend lectures and talks in their area of specialization successfully.
- Speak appropriately and effectively in varied formal and informal contexts.
- Write correctly, clearly and concisely with coherence and cohesion.
- Prepare job applications and resume in an inspiring manner

Extensive Reading

1. Khera, Shiv. You can Win, Macmillan, 2000.

Reference

1. Bailey, Stephen. Academic Writing: A practical guide for students. New York:Rutledge,2011.
2. Comfort, Jeremy, et al. Speaking Effectively : Developing Speaking Skills for Business English. Cambridge University Press, Cambridge: Reprint2011
3. Darlene Smith-Worthington,Sue Jefferson, Technical writing for Success, South-Western Cengage Learning,USA-2011
4. Means, L. Thomas and Elaine Langlois, English & Communication For Colleges. Cengage Learning, USA:2007
5. Raman, Meenakshi and Sharma, Sangeetha- Technical Communication Principles and Practice.Oxford University Press: New Delhi, 2014
6. Swan Michael, Practical English Usage. Oxford University Press, Eighth impression2002.

Recommended Websites

bbc.co.uk/1learning english oxfordonlineenglish.com/
cambridgeenglish.org
inktalks.com/talks/ manageyourwriting.com

MA1101 CALCULUS AND ITS APPLICATIONS

L	T	P	C
3	1	0	4

COURSE OBJECTIVES:

- To understand the concepts of limits, continuity, differentiation and use it to find maxima and minima of functions of one variable.
- To make the student acquire sound knowledge of techniques in solving ordinary differential equations of first and second order that model in various engineering problems.
- To familiarize the student with functions of several variables that is needed in many branches of engineering.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I **12**

Representation of functions – Limit of a function – Continuity – Derivatives – Differentiation rules – Maxima and Minima of functions of one variable.

UNIT II **12**

Basic concepts- Separable differential equations - Exact differential equations - Integrating factors - Linear differential equations - Bernoulli's equation - Geometric Applications- Orthogonal trajectories - Physical Applications - Simple electronic circuits-Newton law of cooling-Heat flow-Rate of decay of radioactive materials-Chemical reaction and solutions.

UNIT III **12**

Higher order linear differential equations with constant coefficients - Method of variation of parameters – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients - Method of undetermined coefficients.

UNIT IV **12**

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT V **12**

Double integrals – Change of order of integration – Double integrals in polar co-ordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.

Total Periods: 60 hours

OUTCOMES:

After completing this course, students should demonstrate competency in the following skills:

- Use both the limit definition and rules of differentiation to differentiate functions. Apply differentiation to solve maxima and minima problems.
- The subject helps the students to develop the fundamentals and basic concepts in ODE
- Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables.

TEXTBOOKS:

1. Grewal, B.S., Higher Engineering Mathematics, 43rd Edition, Khanna Publishers,2016.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, Inc.,2016.

REFERENCE BOOKS:

1. Bali,N.P. ,Goyal,M.,Watkins,C.,Advanced Engineering Mathematics, Laxmi Publications Pvt. Limited,2007.
2. Boyce,W.E.,and DiPrima,R.C.,Elementary Differential Equations and Boundary Value Problems, Wiley India,2012.
3. O'Neil. P. V., "Advanced Engineering Mathematics", 7th Edition, Cengage Learning India Pvt., Ltd, New Delhi, 2011.
4. T.Veerarajan , Engineering Mathematics , McGrawhill Publications , New Delhi2017

PH1101 APPLIED PHYSICS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

UNIT I **9**

Elasticity- plasticity – Different Types of Stress and Strain- concept of stress-strain diagram and its application - three types of modulus of elasticity- Poisson's Ratio – Bending of beams- Expression for bending moment –- young's modulus uniform and Non uniform bending : Theory and Experiment – I Shape girders – **Torsional oscillation Theory and Experiment**- Application of Elastic Materials.

UNIT II **9**

Laser:characteristicsoflaser-Principleofspontaneousemissionandstimulatedemission–Laseraction– Einstein A & B coefficients - Population inversion - Pumping – Basic requirement of laser – Types of laser : Nd-YAG and CO_2 – Applications : Welding , Drilling & Cutting – Medicalfield

Fiber optics: **Introduction**- Principle and propagation of light – Numerical aperture and acceptance angle – classification of optical fibers – **Losses in optical fibers(Qualitative) –** Fiber optics communication system (Block Diagram) – Advantages with fiber optic communication system.

UNIT III **9**

Modes of heat transfer- thermal conduction, convection and radiation – Specific heat capacity- thermal conductivity- Newton's law of cooling - **Searle's** and Lee's disc methods: theory and experiment - conduction through compound media (series and parallel) – **thermal expansion of solids, liquids and gases** - Applications: heat exchangers, refrigerators and solar water heaters.

UNIT IV **9**

Inadequacy of Classical Mechanics - Development of quantum theory- **Planck's Black body radiation and Distribution Laws(Qualitative) – Compton Effect (Derivation)** - De Broglie wavelength – properties of matter waves – Experimental Verification (G.P Thomson experiment) – Heisenberg's uncertainty principle - Schrodinger's wave equation – time dependent – time independent wave equations – physical significance of Wave function – applications: particle in a one dimensional potential box.

UNIT V **9**

Single crystalline, polycrystalline and amorphous materials Lattice - unit cell- Crystal systems-Bravais lattices- Lattice planes- Miller indices- Interplanar- d- Spacing in cubic Lattice- calculation of number of atoms per unit cell – atomic radius – packing factor for SC, BCC, FCC and HCP structures- **Crystal Defects – types.**

Total Periods: 45 hours

OUTCOMES:

At the end of this course,

- The students will gain knowledge on the basics of properties of matter and its applications
- Use the concepts of waves and optical devices and their applications in Laser and fiber optics
- The students will understand the properties of thermal materials and its applications
- The students will get knowledge on advanced physics concepts of quantum theory and its

application in one dimensional box.

- The students will understand the different types of crystals structures and different crystal growth techniques

TEXTBOOKS:

1. Gupta S.L. and Sanjeev Gupta, Modern Engineering Physics, Dhanpat Rai Publishers, 2015.
2. R. K. Gaur and S.C. Gupta, Engineering Physics, Dhanpat Rai Publication(P) Ltd, New Delhi, 2014.
3. Bhattacharya, D.K. and Poona, T. Engineering Physics, Oxford University Press, 2015.

REFERENCE BOOKS:

1. C. Kittel ,Introduction to Solid State Physics 8thEdition , Wiley Eastern Ltd,2004.
2. Halliday, D., Resnick,R. and Walker, J. Principles of Physics. Wiley, 2015.
3. Tipler, P.A. and Mosca, G. Physics for Scientists and Engineers withModern Physics, W.H.Freeman,2007.
4. Einstein coefficient calculation,https://youtu.be/TvfiZHXUtXg(Videolecture)
5. Lattice structures, https://youtu.be/Rm-i1c7zr6Q(Videolecture)

CY1101 ENGINEERING CHEMISTRY

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
- To develop an understanding of the basic concepts of phase rule and its applications to single and two component systems and appreciate the purpose and significance of alloys.
- It enables the students to gain information about Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells
- It deals with the information about the types of fuels, calorific value calculations and manufacture of solid, liquid and gaseous fuels.
- To impart knowledge about the nonmaterial's synthesis, properties and applications.

UNIT I **9**

Introduction – characteristics, Water quality parameters -hardness– types, Determination-EDTA method, Alkalinity ,boiler feed water requirements-boiler troubles – scale & sludge - Caustic Embrittlement , boiler explosion -softening of hard water - external treatment process - demineralization and zeolite, internal treatment - boiler compounds (phosphate, calgon, carbonate and colloidal conditioning methods) – desalination of brackish water –reverse osmosis.

UNIT II **9**

Phase rule: Introduction, definition of terms with examples, One Component System- water system,Sulphur,CO_2 system, Thermal Analysis and cooling curves, Reduced phase rule - Two Component Systems- classification – lead-silver system-problems. Alloys: Introduction- Definition- Properties of alloys- Significance of alloying, Functions and effect of alloying elements- Ferrous alloys- Nichrome and Stainless steel – heat treatment of steel.

UNIT III **9**

Energy – Types – Non-renewable energy - Nuclear energy -renewable energy - solar energy conversion - solar cells. Introduction to Electrochemistry, Nernst Equation-Electrochemical cells – reversible and irreversible cells –Cell construction and representation - Batteries -types of batteries – characteristics – construction and working of primary battery (dry cell) - secondary battery (lithium-ion-battery) - fuel cells (H_2-O_2).

UNIT IV **9**

Fuel: Introduction- classification of fuels- calorific value- higher and lower calorific values- coal-analysis of coal (proximate and ultimate)- carbonization- manufacture of metallurgical coke (Otto Hoffmann method) –petroleum- manufacture of synthetic petrol (Bergius process)- knocking- octane number – dieseloil-cetanenumber–naturalgas-compressednaturalgas(CNG)-liquefiedpetroleumgases(LPG)-producer gas- water gas. Power alcohol and bio diesel. Combustion of fuels: introduction- theoretical calculation of calorific value- ignition temperature- explosive range – flue gas analysis (ORSAT Method).

UNIT V **9**

Basics - distinction between nanoparticles and bulk materials; size-dependent properties.,nano cluster, nano rod, nanotube(CNT)-Types of CNT and nanowire. Synthesis: precipitation, thermolysis, chemical vapour deposition, Properties, Characterizations and applications.

Total Periods: 45 hours

OUTCOMES:

- The knowledge gained on water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.
- With the help of phase rule, they could understand the various phase diagrams and able to predict the low melting alloys.
- Students can get knowledge about various fuels and its applications based on its calorific value.
- It provides the students to understand about conventional and non-conventional energy sources and its applications
  Students gain an insight about the recent trends in nanomaterials.

TEXTBOOKS:

1. Jain P.C. and Monica Jain, “Engineering Chemistry”, DhanpatRai Publishing Company (P) Ltd., New Delhi, 2010

REFERENCE BOOKS:

1. Dara S.S, Umare S.S, “Engineering Chemistry”, S. Chand & Company Ltd., New Delhi2010
2. Sivasankar B., “Engineering Chemistry”, Tata McGraw-Hill Publishing Company, Ltd., New Delhi, 2008.
3. Ozin G. A. and Arsenault A. C., “Nano chemistry: A Chemical Approach to Nanomaterials”, RSC Publishing, 2005.

CS1101 PROBLEM SOLVING AND PYTHON PROGRAMMING

L	T	P	C
3	0	0	3

OBJECTIVES:

- To know the basics of algorithmic problem solving
- To read and write simple Python programs.
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures –- lists, tuples,dictionaries.
- To do input/output with files in Python.

UNIT I **9**

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT II **9**

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points

UNIT III **9**

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV **9**

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples:tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, merge sort, histogram.

UNIT V **9**

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file- **Case study: Simple Graphics using Turtle**: Draw a Random Pattern of Circle, Square and Rectangle; Draw a Pattern of Straight Lines, **Plotting Graphs in Python**: Menu Driven Program to Create Mathematical 3D Objects.

Total Periods: 45 hours

OUTCOMES:

Upon completion of the course, students will be able to

- Develop algorithmic solutions to simple computational problems.

- Read, write, execute by hand simple Python programs.
- Structure simple Python programs for solving problems.
- Decompose a Python program into functions.
- Represent compound data using Python lists, tuples, and dictionaries.
- Read and write data from/to files in Python Programs

TEXTBOOKS:

1.Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, UpdatedforPython3,Shroff/O'ReillyPublishers,2016(http://greenteapress.com/wp/thinkpython/

2. ReemaThareja, Problem Solving and Programming with python, 2nd edition, Oxford University press,2019.

3.Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network TheoryLtd.,2011.

REFERENCE BOOKS :

1. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley IndiaEdition,2013.
2. John V Guttag, "Introduction to Computation and Programming Using Python'', Revised and expanded Edition, MIT Press,2013.
3. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGELearning,2012.
4. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition,PragmaticProgrammers,LLC,2013.
5. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt.Ltd.,2016.
6. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) PrivateLtd.,,2015

ME1101 ENGINEERING GRAPHICS

L	T	P	C
2	0	2	3

OBJECTIVES:

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products.
- To expose them to existing national standards related to technical drawings.
- **CONCEPTS AND CONVENTIONS (Not for Examination)** **1**
- Importance of graphics in engineering applications –Use of drafting instruments – BIS conventions and specifications – Size and layout of drawing sheets – Lettering and dimensioning.

UNIT I **12**

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization principles – Layout of views- Orthographic projection of multiple views(Free Hand Sketching) from pictorial views of objects-Principal planes-Projection of points-Demo using CAD software for above topics.

UNIT II **12**

Orthographic projections-principles-Principal planes-First angle projection-Projection of points- Projection of straight lines (only First angle projections) inclined to one of the principal planes - Determination of true lengths and true inclinations - Projection of planes (polygonal and circular surfaces) inclined to one of the principal planes - Demo using CAD software for above topics.

UNIT III **12**

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method-Demo using CAD software for above topics.

UNIT IV **12**

Sectioning of above solids in simple vertical position - the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones-Demo using CAD software for above topics.

UNIT V **12**

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions – Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method-Demo using CAD software for above topics

Total Periods: 61 hours

COURSE OUTCOMES:

On successful completion of this course, the student will be able to

- familiarize with the fundamentals and standards of Engineering graphics
- Perform freehand sketching of basic geometrical constructions and multiple views of objects.
- Project orthographic projections of lines and plane surfaces.
- Draw projections of solids and development of surfaces.
- Visualize and to project isometric and perspective sections of simple solids.

TEXTBOOKS:

1. NatrajanK.V., “A text book of Engineering Graphics”, DhanalakshmiPublishers,Chennai,2009.
2. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited,2008.

REFERENCE BOOKS

1. BhattN.D.andPanchalV.M.,“EngineeringDrawing”,Charotar Publishing House,50th Edition,2010.
2. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, NewDelhi,2008.
3. Gopalakrishna K.R.,“Engineering Drawing”(Vol.I&II combined),SubhasStores,Bangalore,2007.
4. Luzzader, Warren.J. and Duff,John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, NewDelhi,2005.
5. N S Parthasarathy and Vela Murali, “Engineering Graphics”, Oxford University, Press, NewDelhi,2015.
6. Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson,2nd Edition,2009.

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.

2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation–Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings –Projection Methods.

Special points applicable to University Examinations on Engineering Graphics:

1. There will be five questions, each of either-or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each makingatotalof100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solutionwithinA3size.
4. The examination will be conducted in appropriate sessions on the same day

CS1102	PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To study python programs with conditionals and loops
- To use functions for python structured programs.
- Use strings for structuring Python programs.
- Represent compound data using Python lists, tuples, and dictionaries.
- To read and write data from and to files in python.

LIST OF EXPERIMENTS:

1. Write a program to display the largest number among three numbers.
2. Write a program to display the Fibonacci series by using looping constructs.
3. Write a function to compute the GCD of two numbers.
4. Explore String Functions
5. With the help of strings, array or list, display a simple calendar in python program without using the calendar module.
6. With the help of list perform Linear search and Binary search.
7. Write a program to perform Selection sort, Insertion sort, Merge sort
8. Create a text file using python file I/O. Read the content of the file and change them from lower to upper case characters.
9. Programs that take command line arguments (word count)
10. Find the most frequent words in a text read from a file
11. Simulate bouncing ball using Pygame

Total Periods: 60 hours

OUTCOMES:

- Design simple programs using conditionals and loops.
- Write functions to solve mathematical problems
- Use strings for structuring Python programs.
- Represent compound data using Python lists, tuples, dictionaries.
- Identify to read and write data from and to files in python.

BS1101 PHYSICS AND CHEMISTRY LABORATORY

L	T	P	C
0	0	4	2

PHYSICS LABORATORY

COURSE OBJECTIVES:

- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter and liquids.

LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 5 Experiments)

1. Determination of rigidity modulus – Torsion pendulum
2. Determination of Young's modulus by non-uniform bending method
3. (a) Determination of wavelength, and particle size using Laser
   (b) Determination of acceptance angle in an optical fiber.
4. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
5. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer
6. Determination of wavelength of mercury spectrum – spectrometer grating
7. Determination of band gap of a semiconductor
8. Determination of thickness of a thin wire – Air wedge method

Total Periods: 30 hours

OUTCOMES:

- Upon completion of the course, the students will be able to apply principles of elasticity, optics and thermal properties for engineering applications.

CHEMISTRY LABORATORY

COURSE OBJECTIVES:

To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.

LIST OF EXPERIMENTS (Any seven experiments to be conducted):

1. Estimation of HCl using Na_2CO_3 as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of TDS of water sample.
5. Determination of strength of acids in a mixture of acids using conductivity meter.
6. Estimation of iron content of the given solution using potentiometer.
7. Estimation of iron content of the water sample using spectrophotometer (1, 10- Phenanthroline / thiocyanate method).
8. Determination of molecular weight of polyvinyl alcohol using Ostwaldviscometer.
9. Conductometric titration of strong acid vs strong base.

Total Periods: 30 hours

OUTCOMES:

- The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.

CI1101 INDIAN CONSTITUTION

L	T	P	C
2	0	0	0

PREREQUISITES:

- Basic Law

The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the "basic structure" of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of "Constitutionalism" – a modern and progressive concept historically developed by the thinkers of "liberalism" – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of "constitutionalism" in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India's legacy of "diversity". It has been said that Indian constitution reflects ideals of its freedom movement; however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be "static" and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it "as one of the strongest court in the world".

Course content

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India

11. Emergency Provisions: National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article19
15. Scope of the Right to Life and Personal Liberty under Article21

SEMESTER-II

HS1201 ENGLISH FOR COMMUNICATION

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

The Course enables the second semester Engineering and Technology students to:

- Improve their language ability to improve the four basic skills of communication (LSRW).
- Enhance the skills and methods to enrich their reading and comprehending ability.
- Strengthen their skills to listen to the lectures and talks related to their fields of studies.
- Foster their ability to write effectively in all contexts.
- Cultivate their oral presentation skills through technical presentations and contribution in group discussions.

UNIT– 1 **9**

Reading- Reading for detailed comparison **Listening**- Listening to interviews **Writing**- Developing hints, summarizing **Speaking**- Talk about future plans, arrangements intensions **Language development**- Sentence structures **Vocabulary development**- Synonyms, Antonyms, Adverbs

UNIT– 2 **9**

Reading-Extended reading **Listening**- Listening to telephonic conversations **Writing**- Formal Letter Writing - Letters for bona fide certificate - to the principal for permission for in plant training, industrial visit, paper presentations, inter college events, Letter to the Editor, Recommendations **Speaking**- Formal conversation **Language development**-Use of Punctuation, Modal verbs **Vocabulary development**- One word substitutes, Common Phrasal verbs

UNIT– 3 **9**

Reading- Identify topic sentences by reading a short story **Listening**- Listening to TED talks **Writing**- Process/product description **Speaking**- Formal Conversations **Language development**- Relative Clauses, Concord, Error correction **Vocabulary development**- Idioms & Phrases, Minimal pairs.

UNIT IV **9**

Reading- Reading newspaper articles **Listening**- Listening to inspirational speeches **Writing**- Essays, Checklist **Speaking**- Technical Presentations **Language development**- Degrees of Comparison **Vocabulary development**- Articles, Cause and Effect Expressions

UNIT V **9**

Reading- Close reading **Listening**- Listening for summarizing **Writing**- Dialogue conversations **Speaking**- Movie/ Book Review **Language development**- Wh Questions, Yes/ no Questions **Vocabulary**

development- Foreign Expressions and its applications, Reference words.

Total Periods: 45 hours

OUTCOMES:

At the end of the course the students will be able to:

- Read for comprehending and responding in general and professional settings.
- Demonstrate the communication skills (LSRW) in academic, professional and social Environment.
- Participate effectively in formal and informal conversations and express findings and opinions with proper language ability.
- Comprehend conversations and short talks delivered in English.
- Use the language effectively to write with clarity and accuracy in general and technical contexts.

Extensive Reading:

Kalam, Abdul Dr.A.P.J. - The Wings of Fire, Universities press:1999

Reference:

1. Booth-L. Diana, Project Work, Oxford University Press, Oxford:2014
2. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford:2007
3. Kumar, Suresh. E. Engineering English. Orient Blackswan:Hyderabad,2015
4. Dutt P. Kiranmai and RajeevanGeeta. Basic Communication Skills, Foundation Books: 2013
5. Means,L. Thomas and Elaine Langlois. English & CommunicationFor Colleges.CengageLearning ,USA:2007.

Recommended websites:

- TED.com
- learningenglish.voanews.com
- islcollective.com
- examenglish.com
- englishclass101.com

MA1201 COMPLEX VARIABLES AND TRANSFORMS

L	T	P	C
3	1	0	4

COURSE OBJECTIVES:

- Understand the concept of Divergence and curl and use it in evaluating Line, Surface and Volume integrals.
- Understand C-R equations and use it in the construction of Analytic Functions.
- Understand the methods of Complex Integration using Cauchy's Integral Formula and Cauchy Residue theorem, finding Taylor's and Laurent's Series expansions.
- Find the Laplace Transforms of standard Functions and to find the Inverse Laplace Transform of a function and use it in solving Differential Equations.
- To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems

UNIT I VECTOR CALCULUS **12**

Gradient and directional derivative – Divergence and curl – Vector identities – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral – Area of a curved surface – Volume integral – Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals-simple applications involving cubes and rectangular parallelopipeds.

UNIT II ANALYTIC FUNCTIONS **12**

Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates – Properties – Harmonic conjugates – Construction of analytic function – Conformal mapping–Mappingbyfunctions($w = 1z, w = z^2, w = e^z, w = \sin hz, w = \cos hz$)–Bilinear transformation.

UNIT III COMPLEX INTEGRATION **12**

Line integral – 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 – Use of circular contour and semicircular contour.

UNITIV LAPLACE TRANSFORMS **12**

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem –Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constant coefficients.

UNIT V Z - TRANSFORMS AND DIFFERENCE EQUATIONS **12**

Z-transforms - Elementary properties – Inverse Z-transform (using partial fraction and residues) – Initial and final value theorems - Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transform.

Total Periods: 60 hours

OUTCOMES

On successful completion of this course, the student will be able to

- Solve problems using divergence and curl and evaluate line, Surface and Volume integrals.
- Solve problems in Analytic functions and construction of analytic functions using C-R Equations.
- Evaluate problems using Cauchy's integral formula and Cauchy residue theorem and find Taylor's and Laurent's series expansion of a given function.
- Obtain the Laplace Transforms of standard functions.
- Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.

TEXTBOOKS

1. Grewal, B.S., Higher Engineering Mathematics, 43rd Edition, Khanna Publishers,2016.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, Inc.,2016.

REFERENCE BOOKS

1. Bali,N.P.,Goyal,M.,Watkins,C.,Advanced Engineering Mathematics,Laxmi Publications Pvt. Limited,2007.

2. Boyce,W.E.,andDiPrima,R.C.,ElementaryDifferentialEquationsandBoundaryValue Problems, Wiley India,2012.
3. O'Neil. P. V. "Advanced Engineering Mathematics", 7th Edition, Cengage LearningIndia Pvt., Ltd, New Delhi,2011.
4.T. Veerarajan, Engineering Mathematics, Tata Mcgraw Hill publications co. ltd, New Delhi.2017.

PH1201 MATERIALS SCIENCE

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To enrich the understanding of various types of materials and their applications in engineering and technology.

UNIT I CONDUCTING MATERIALS 9

Conductors – classical free electron theory of metals – Electrical and thermal conductivity –Wiedemann – Franz law – Lorentz number – Draw backs of classical theory – Quantum theory –Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states –carrier concentration in metals.

UNIT II SEMICONDUCTING MATERIALS 9

Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination –Elemental and Compound Semiconductors – **N-type and P-type semiconductor (Qualitative)** – Hall effect –Determination of Hall coefficient –Applications.

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS 9

Origin of magnetic moment – Bohr magneton – comparison of Dia, Para and Ferro magnetism –Domain theory – Hysteresis – soft and hard magnetic materials – antiferromagnetic materials –Ferrites and its applications. **Electro static Discharge (ESD)-**Superconductivity: properties – Type I and Type II superconductors–BCS theory of superconductivity (Qualitative) - High Tc superconductors – Electrical, medical, magnetic and computer application of superconductors.

UNIT IV DIELECTRIC MATERIALS 9

Electrical susceptibility – dielectric constant – electronic, ionic, orientation and space charge polarization – frequency and temperature dependence of polarisation – **Clausiusmosotti relation -** dielectric loss – dielectric breakdown – uses of dielectric materials (capacitor and transformer).

UNITV ADVANCED ENGINEERINGMATERIALS 9

Metallic glasses - melt spinning process, applications - shape memory alloys: Ni-Ti alloy, applications – nanomaterials: preparation (bottom up and top down approaches), properties and applications- Bio materials – introduction- properties of bio materials-examples- medical applications- Ophthalmology- bio sensors-characteristics.

Total Periods: 45 hours

OUTCOMES:

At the end of this course,

- The students will gain knowledge of conducting materials and variation of its properties with temperature.
- Acquire knowledge on basics of semiconductor physics and its applications in various devices.
- Get knowledge on magnetic and superconducting materials properties and their various applications.
- The students will understand the basics of dielectric materials, properties and applications of dielectric materials.
- The students will get knowledge about new engineering materials and its applications in social applications.

TEXT BOOKS:

1. S.Mohan, Principles of Materials Science, MJP Publishers,2018.
2. Jasprit Singh, Semiconductor Devices, Basic Principles, Wiley2012.
3. Umesh K Mishra and Jasprit Singh, Semiconductor Device Physics and Design‖, Springer,2008.

REFERENCES:

1. Wahab, M.A. Solid State Physics: Structure and Properties of Materials‖, Narosa Publishing House,2009.
2. William D.CallisterJr, David G. Rethwisch, Materials Science and Engineering, An Introduction,Wiley India (P) Ltd., 8th Edition,2009.
3. Pillai S.O., Solid State Physics, New Age International (P) Ltd., Publishers,2009.
4. Semiconductor Introduction, https://youtu.be/k6ZxP9Yr02E(Videolecture)
5. Superconductivity, https://youtu.be/D-9M3GWOBrw(Videolecture)

ME1201 BASIC CIVIL AND MECHANICAL ENGINEERING

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To impart basic knowledge on Civil and Mechanical Engineering.
- To familiarize the materials and measurements used in Civil Engineering.
- To provide the exposure on the fundamental elements of civil engineering structures.
- To enable the students to distinguish the components and working principle of power plant units, IC engines, and R & AC system.

CIVIL ENGINEERING

UNIT I SURVEYING AND CIVILENGINEERING MATERIALS 9

Surveying: Objects – classification – principles – measurements of distances – angles – leveling – determination of areas– contours – Introduction to astronomical & hydrographic surveying – Modern equipments. Civil Engineering Materials: Bricks – stones – sand – cement – concrete – steel - timber – modern materials.

UNIT II BUILDING COMPONENTSANDSTRUCTURES 9

Foundations: Types of foundations-Bearing capacity and settlement–Requirement of good foundations. Civil Engineering Structures: Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring plastering – floor area, carpet area and floor space index - Types of Bridges and Dams – water supply - sources and quality of water - Rain water harvesting - introduction to highway and railway.

MECHANICAL ENGINEERING

UNIT III POWER PLANTSANDBOILERS 9

Classification of Power Plants-Working principle of steam, Gas, Diesel, Hydro - electric and Nuclear Power plants -Classification of boilers- working principle of Water Tube Boilers, Fire Tube Boilers and Turbines.

UNIT IV I.C. ENGINESANDPUMPS 9

Internal combustion engines – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines. Classification of Pumps - Working Principle of Reciprocating Pumps (single acting and double acting) and Centrifugal Pumps.

UNIT V REFRIGERATIONANDAIRCONDITIONINGSYSTEM 9

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system–Layout of typical domestic refrigerator–Window and Split type room Air conditioner.

Total Periods: 45 hours

OUTCOMES:

On successful completion of this course, the student will be able to

- appreciate the Civil and Mechanical Engineering components of Projects.
- explain the usage of construction material and proper selection of construction materials.
- measure distances and area by surveying
- identify the components used in power plant cycle.
- demonstrate working principles of petrol and diesel engine.
- elaborate the components of refrigeration and Air conditioning cycle.

TEXTBOOKS:

1.Shanmugam G and Palanichamy M S, “Basic Civil and Mechanical Engineering”, Tata McGraw HillPublishingCo., NewDelhi,1996.

REFERENCES:

1. Ramamrutham S., “Basic Civil Engineering”, DhanpatRai Publishing Co.(P)Ltd.1999.
2. SeetharamanS.,“BasicCivilEngineering”,AnuradhaAgencies,2005.
3. ShanthaKumar SRJ., “Basic Mechanical Engineering”, Hi-tech Publications, Mayiladuthurai, 2000.
4. Venugopal K.and Prahu Raja V., “Basic Mechanical Engineering”, Anuradha Publishers,Kumbakonam,2000.

CS1201 PROGRAMMING IN C

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To develop C Programs using basic programming constructs.
- To develop C programs using arrays and strings.
- To develop applications in C using functions and functions.
- To develop applications in C using structures.
- To do input/output and file handling in C.

UNIT I BASICS OF C PROGRAMMING 9

Introduction to programming paradigms - Structure of C program - C programming: Identifiers-Keywords-Data Types - Variables - Constants. Operators: Precedence and Associativity –Expressions - Input/ Output statements - Decision making statements - Switch statement - Looping statements - Pre-processor directives - Compilation process

UNIT II ARRAYS AND STRINGS 8

Introduction to Arrays: Declaration, Initialization - One dimensional array - Example Program: Computing Mean, Median and Mode - Two dimensional arrays - Example Program: Matrix Operations (Addition, Scaling, Determinant and Transpose) - String- String operations – String Arrays

UNIT III FUNCTIONS AND POINTERS 10

Introduction to functions: Function prototype, function definition, function call, Built-in functions (string functions, math functions) - Recursion-Types of Recursion - Example Program: Computation of Sine series, Scientific calculator using built-in functions, Binary Search using recursive functions-Storage Classes - Pointers - Pointer operators - Null Pointers- Pointer arithmetic - Arrays and pointers - Array of pointers - Example Program: Sorting of names – Parameter passing: Pass by value, Pass by reference-Example Program :Swapping of two number sand changing the value of a variable using pass by reference

UNIT IV STRUCTURES 9

Structures-Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure – Passing structures to functions – Array of structures – Pointers to structures – Union - Programs using structures and Unions, Enumerated data type-Dynamic Memory Allocation

UNIT V FILE PROCESSING 9

Files- Types of file processing: Sequential access, Random access- Sequential access file-Example Program: Finding average of numbers stored in sequential access file - Random access file - Example Program: Payroll System and Transaction processing using random access files - Command line arguments

Total Periods: 45 hours

OUTCOMES:

Upon completion of the course, the students will be able to

- Develop simple applications in C using basic constructs
- Design and implement applications using arrays and strings
- Develop and implement applications in C using functions and pointers.
- Develop applications in C using structures.

- Design applications using sequential and random access file Processing.

TEXTBOOKS:

1. Reema Thareja,"Programming in C", Oxford University Press, Second Edition,2016.
2. Kernighan,B. Wand Ritchie,D.M,"The C Programming language ",Second Edition, Pearson Education,2006

REFERENCES:

1. PaulDeitelandHarveyDeitel,"CHowtoProgram",Seventhedition,Pearson Publication
2. Juneja,B.LandAnitaSeth,"ProgramminginC",CENGAGELearningIndiapvt.Ltd.,2011
3. Pradip Dey, Manas Ghosh," Fundamentals of Computing and Programming in C", First Edition, Oxford UniversityPress,2009.
4. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling
5. Kindersley(India)Pvt.Ltd.,PearsonEducationinSouthAsia,2011.
6. ByronS.Gottfried,"Schaum's Outline of Theory and Problems of Programming with C", McGraw-HillEducation,1996.

EE1205 CIRCUIT THEORY

L	T	P	C
2	2	2	4

COURSE OBJECTIVES:

- To introduce electric circuits and its analysis
- To impart knowledge on solving circuit equations using network theorems
- To introduce the phenomenon of resonance in coupled circuits.
- To educate on obtaining the transient response of circuits.
- To introduce Phasor diagrams and analysis of three phase circuits.

UNIT I BASICS OFCIRCUITANALYSIS **12**

Ohm's Law – Kirchhoff's laws –Resistors, Inductors and Capacitors in series and parallel circuits-Mesh current and node voltage method of analysis for D.C and A.C. circuits. Simulation and Experimental verification of KCL and KVL.

UNIT II NETWORK REDUCTIONANDTHEOREMS **12**

Network reduction: voltage and current division, source transformation – star delta conversion. Thevenin's and Norton's Theorem – Superposition Theorem – Maximum power transfer theorem – Reciprocity theorem for dc and ac circuits. Simulation and Experimental verification of basic Theorems.

UNIT III TRANSIENTRESPONSE ANALYSIS **12**

L and C elements -Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. sinusoidal input. Simulation and Experimental validation of R-C Transients.

UNIT IV THREE PHASE CIRCUITS **12**

A.C. circuits – Average and RMS value - Phasor Diagram – Power, Power Factor and Energy.- Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced– phasor diagram of voltages and currents – power measurement in three phase circuits. Simulation of Three phase balanced circuit.

UNIT V RESONANCE AND COUPLED CIRCUITS **12**

Series and parallel resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits. Design and simulation of series and parallel resonance circuits.

Total Periods: 45 hours

OUTCOMES:

- Ability to analyse electrical circuits.
- Ability to apply circuit theorems.
- Ability to analyse transients.
- Solve 3 phase circuits under balanced condition using phasor diagrams.
- Study resonance phenomenon in electrical circuits and understand the effect of magnetic coupling between windings.

TEXT BOOKS:

1. William H. HaytJr, Jack E. Kemmerly and Steven M. Durbin, "EngineeringCircuits Analysis", McGraw Hill publishers, edition, New Delhi,2013.
2. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of ElectricCircuits", Second Edition, McGraw Hill,2013.
3. Allan H. Robbins, Wilhelm C. Miller, "Circuit Analysis Theory and Practice",Cengage Learning India,2013.

REFERENCES:

1. Chakrabarti A, "Circuits Theory (Analysis and synthesis), DhanpathRai& Sons, New Delhi,1999.
2. Jegatheesan, R., "Analysis of Electric Circuits," McGraw Hill,2015.
3. Joseph A. Edminister, MahmoodNahri, "Electric circuits", Schaum's series, McGraw- Hill, New Delhi, 2010.
4. M E Van Valkenburg, "Network Analysis",Prentice-Hall of India Pvt Ltd, NewDelhi,2015.
5. Mahadevan, K., Chitra, C., "Electric Circuits Analysis," Prentice-Hall of India PvtLtd, New Delhi,2015.
6. Richard C. Dorf and James A. Svoboda, "Introduction to Electric Circuits", 7th Edition, John Wiley & Sons, Inc.2015.
7. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", McGraw Hill,2015.

CY1201 ENVIRONMENTAL SCIENCE AND ENGINEERING

L	T	P	C
2	0	0	0

COURSE OBJECTIVES:

- To understand nature and the facts about the environment.
- To find and implement scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth's interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management

UNIT I ENVIRONMENT, ECO SYSTEMS AND BIO DIVERSITY 14

Definition, scope and importance of environment – need for public awareness – concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of major ecosystem – Introduction to biodiversity definition: genetic, species and ecosystem diversity – value of biodiversity – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

UNIT II ENVIRONMENTAL POLLUTION 8

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.

UNIT III NATURAL RESOURCES 10

Forest resources: Use and over-exploitation, deforestation, case studies- dams and their effects on forests and tribal people – Water resources: Use and over- utilization of surface and ground water – Mineral resources: environmental effects of extracting and using mineral resources, case studies – Food resources: changes caused by agriculture and overgrazing, effects of modern agriculture, case studies – Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soilerosion and desertification – 12 Principles of Green chemistry, role of an individual in conservation of natural resources – Equitable use of resources for sustainable life styles.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies – environment protection act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act –- central and state pollution control boards.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health.

Total Periods: 45 hours

OUTCOMES:

- Students will be able to understand the functions of ecosystems and appreciate the biodiversity.
- Students will be able to know the measures to control environmental pollution.
- Students will be able to understand the usage as well as the effects of over exploitation of

natural resources.

- Students will have knowledge about finding technological, economic and political solutions to environmental problems with various Environmental Protection Act in mind.
- Students will be able to understand the interrelationship between population explosion and the environment and also role of IT in environment and human health.
- Students will be able to understand that Environmental problems can only be solved by Public participation in all aspects and cannot be solved by mere laws.

TEXT BOOKS:

1. Environmental Science and Engineering by Anubha Kaushik and C.P.Kaushik-New Age International Publishers. New Delhi, 2017.

REFERENCES:

1.Benny Joseph , Environmental Studies, Tata mcgraw-Hill Publishing Company, Ltd., New Delhi,2006.
2.Dr.B.S.Chauhan,. Environmental Studies , University Science Press, New Delhi,2011

CS1203 PROGRAMMING IN C LABORATORY

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:

- To develop programs in C using basic constructs.
- To develop programs in C using control statements.
- To develop applications in C using arrays, strings, pointers.
- To develop applications in C using functions, structures.
- To develop applications in C using file processing

LIST OF EXPERIMENTS:

1.Input and Output statements

.Control statements – Branching &Looping

a) Write a C program to generate Pascal's triangle.

b) Write a C program, which takes two integer operands and one operator form the user, performs the operation and then prints the result. (Consider the operators +,-,*,/,% and use Switch Statement)

c) Write a C program to find the sum of individual digits of a positive integer.

d) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.

e) Write a C program to generate all the prime numbers between 1 and n, where n is a value Supplied by the user.

f) Write a C program to swap Numbers Using Temporary Variables.

3. Arrays

a) Write a C program to search an array element using linear search.

b) Write a C program to find both the larges and smallest number in a list of integers.

c) Write a C program that uses functions to perform the following:

i)Addition of Two Matrices ii)Multiplication of Two Matrices

d) Write a C program to implement Bubble sort.

4.Strings

a)Write a C program that uses functions to perform the following operations:

i) To insert a sub-string in to given main string from a given position.

ii) To delete n Characters from a given position in a given string.

b) Write a C program to determine if the given string is a palindrome or not

5.Functions &Pointers:

Write C programs that use recursive functions

i) To find factorial of given number.

ii) To solve Towers of Hanoi Problem.

iii) To swap the variables using call by value and call by reference.

6. a) Generate mark sheet of students using structures.

b) Compute salary slip for five employees using structures and functions.

7. Insert, Update, delete and append telephone details of an individual or a company into a telephone directory using random access file.

Total Periods: 60 hours

OUTCOMES:

Upon completion of the course, the students will be able to

- Develop C programs for simple applications making use of basic constructs.
- Develop C programs for control statements.

- Develop C programs involving arrays, strings and pointers.
- Develop C programs involving functions, and structures.
- Design applications using sequential and random access file processing

GE1201 ENGINEERING PRACTICES LABORATORY

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:

- To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

LIST OF EXPERIMENTS:

GROUP A (CIVIL & MECHANICAL)

I CIVILENGINEERINGPRACTICE **13**

Buildings:

(a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:

(a) Study of pipeline joints, its location and functions: valves, taps, couplings, Unions, reducers, elbows in household fittings.

(b) Study of pipe connections requirements for pumps and turbines.

(c) Preparation of plumbing line sketches for water supply and sewage works.
(d) Hands-on-exercise: Basic pipe connections – Mixed pipe material connection – pipe connections with different joining components.
(e) Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:
(a) Study of the joints in roofs, doors, windows and furniture.
(b) Hands-on-exercise: Wood work, joints by sawing, planing and cutting.

II MECHANICALENGINEERINGPRACTICE **18**

Welding:
(a) Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.
(b) Gas welding

practice Basic Machining:
(a) Simple Turning and Taperturning
(b) Drilling Practice Sheet

Metal Work:
(a) Forming &Bending:
(b) Model making – Trays andfunnels.
(c) Different type of joints.

Assembly practice:
(a) Study of centrifugal pump
(b) Study of air conditioner

Demonstration on:
(a) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.
(b) Foundry operations like mould preparation for gear and step conepulley.
(c) Fitting – Exercises – Preparation of square fitting and V – fitting models.

GROUP -B (ELECTRICAL & ELECTRONICS)

III ELECTRICAL ENGINEERING PRACTICE **13**

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of electrical equipment.

ELECTRONICSENGINEERINGPRACTICE **16**

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC Signal parameter (peak-peak, rms period, frequency) using CRO.
2. Study of logic gates AND, OR, EX-OR and NOT.

3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

Total Periods: 60 hours

OUTCOMES:

On successful completion of this course, the student will be able to

- Fabricate carpentry components and pipe connections including plumbing works.
- Use welding equipments to join the structures.
- Carry out the basic machining operations
- Make the models using sheet metal works
- Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundry and fittings
- Carry out basic home electrical works and appliances
- Measure the electrical quantities
- Elaborate on the components, gates, soldering practices.

SEMESTER-III

MA1302 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	L	T	P	C
	3	1	0	4

COURSE OBJECTIVES:

- To introduce the basic concepts of PDE for solving standard partial differential equations.
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- To acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.
- To acquaint the student with Fourier transform techniques used in wide variety of situations.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS-I **12**

Formation of partial differential equations – Singular integrals - Solutions of standard types of first order partial differential equations - Lagrange's linear equation –Integral surface passing through a curve-surface orthogonal to a system of surface-Non linear partial differential equation –Charpit's method-special methods of solution applicable to certain standard forms- Jacobi's Method

UNIT II PARTIAL DIFFERENTIAL EQUATIONS-II **12**

Homogenous Linear partial differential equations of second and higher order with constant coefficients –Non homogeneous Linear partial differential equations of second and higher order with constant coefficients- Partial differential equation reducible to equation with constant coefficients-partial differential equation of order two with variable coefficients

UNIT III FOURIER SERIES **12**

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier series – Parseval's identity – Harmonic analysis.

UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS **12**

Classification of PDE – Method of separation of variables - Fourier Series Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction.

UNIT V FOURIER TRANSFORMS 12

Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

Total Periods: 45 hours

OUTCOMES :

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

- Understand how to solve the given standard partial differential equations.
- Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.
- Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.
- Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.

TEXT BOOKS :

1. Grewal B.S., "Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, New Delhi, 2014.
2.Narayanan S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.

REFERENCES :

1.Andrews, L.C and Shivamoggi, B, "Integral Transforms for Engineers" SPIE Press, 1999.
2.Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 9th Edition, Laxmi Publications Pvt. Ltd, 2014.
3.Erwin Kreyszig, "Advanced Engineering Mathematics ", 10th Edition, John Wiley, India, 2016.
James, G., "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2007.
4.Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
5.Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

EE1301 ELECTRICAL MACHINES –I

L	T	P	C
3	0	0	3

PREREQUEST SUBJECTS:

- Circuit Theory
- Basic Civil & Mechanical Engineering

COURSE OBJECTIVES:

- To study the magnetic circuit analysis and understand the basic concepts in rotating machines.
- To understand the Working principles of DC Generator, types, determination of their noload/load

characteristics,

- To analyze the speed-torque characteristics of DC motors and understand the starting and methods of speed control of DC motors.
- To understand the Constructional details, the principle of operation of single phase and three phase transformers.
- To study the different testing methods of DC machines & Transformers.

UNIT I ELECTRO MAGNETIC INDUCTION AND BASIC CONCEPTS IN ROTATING MACHINES 9

Introduction to Magnetic Circuits – Magnetically Induced EMF and Force – AC Operation of Magnetic Circuits –. Energy in Magnetic Systems – Field Energy & Mechanical Force – Single and Multiple Excited Systems. MMF of Distributed Windings – Magnetic Fields in Rotating Machines

UNIT II – DC GENERATORS 9

Constructional features of DC machine – Principle of operation of DC generator – EMF equation – Types of excitation – No load and Load Characteristics of DC generators – Commutation – Armature Reaction – Parallel operation of DC generators

UNIT III – DC MOTORS 9

Principle of operation of DC motors-Back EMF – Torque equation –Types of DC motors-Speed – Torque characteristics of DC motors – Starting of DC motors: 2 point starter, 3 point starter, 4 point starter – Speed control: Field control, Armature control, voltage control – Losses and efficiency –Applications

UNIT IV– TRANSFORMERS 9

Principle of operation – Constructional features of single phase and three phase transformers – EMF equation – Transformer on No load and Load –Phasor diagram - Equivalent Circuit – Regulation - Three Phase Transformer Connections-Parallel Operation of single phase and three phase transformer- Auto transformers.

UNIT V– TESTING OF DC MACHINES & TRANSFORMERS 9

Losses and efficiency –Condition for maximum efficiency – Testing of DC machines: Brake test, Swinburne's test, Retardation test, Hopkinson's test- Testing of transformer: Polarity Test, load test(single phase and three phase transformers), Open Circuit and Short Circuit test, Sumpner's test – All day efficiency.

Total Periods: 45 hours

OUTCOMES:

- Ability to analyze the magnetic-circuits and understand the concepts of electromechanical energy conversion.
- Ability to acquire the knowledge in working principles of DC Generator
- Ability to acquire the knowledge in working principles of DC Motor and various losses taking place in it.
- Ability to acquire the knowledge in constructional details and working principle of transformers and parallel operation of 3Phase transformers.
- Ability to understand the test methods to analyze the DC machines and Transformers.

TEXT BOOKS:

1.Kothari.D.P and Nagrath.I.J., "Electrical Machines", Tata McGraw Hill Publishing Co.Ltd, New Delhi, 5th edition 2017.

2.Bimbhra.P.S, “Electrical Machines”, Khanna Publishing; Second edition 2017.

REFERENCES:

1.Dr. MurugeshKumar.K. “DC Machines & Transformers”, Vikas Publishing House Pvt Ltd.,2nd edition 2017.
2.Fitgerald, A.E., Charles Kingsely Jr. Stephen D.Umans, “Electric Machinery” McGraw Hill Books Company,6th edition 2002.
3.Hill Stephen, Chapman.J, “Electric Machinery Fundamentals”, McGraw Hill Book Co., New Delhi, 4th edition 2017.
4.Albert E Clayton and Hancock.N.N, “The performance and design of direct current Machines”, Oxford and IBH publishing company Pvt. Ltd., New Delhi 1990

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EE1302 ELECTROMAGNETIC THEORY

L	T	P	C
3	0	0	3

PREREQUEST SUBJECTS:

- Circuit Theory

COURSE OBJECTIVES:

To impart knowledge on the concepts of

- the basic mathematical concepts related to electromagnetic vector fields
- Electrostatic fields, electrical potential, energy density and their applications.
- Magneto static fields, magnetic flux density, vector potential and its applications.
- Different methods of emf generation and Maxwell’s equations
  Electromagnetic waves and characterizing parameters

UNIT I ELECTROSTATICS – I **9**

Electromagnetic spectrum - Sources and effects of electromagnetic fields – Coordinate Systems: Cartessian, Cylindrical and Spherical system– Transformations of Vector fields –Gradient, Divergence, Curl – Divergence and stokes theorems and its applications – Coulomb’s Law – Electric field intensity – Field due to discrete and continuous charges(line, circular ring, infinite sheet of charge) – Gauss’s law and applications.

UNIT II ELECTROSTATICS – II **9**

Electric potential, potential due to circular coil –Electric dipole, Electric field and equipotential plots, Uniform and Non-Uniform field,Utilization factor – Electric field in free space, conductors, dielectrics – Dielectric polarization –Dielectric strength – Electric field in multiple dielectrics – Boundary conditions, Poisson’s and Laplace’s equations, Capacitance, Energy density,Applications.

UNIT III MAGNETOSTATICS **9**

Lorentz force, magnetic field intensity (H) – Biot–Savart’s Law – Ampere’s Circuit Law – H due to straight conductors, circular loop, infinite sheet of current, Magnetic flux density (B) – B in freespace, conductor, magnetic materials – Magnetization, Magnetic field in multiple media – Boundary conditions, scalar and vector potential, Poisson’s Equation, Inductance, Energy density, Applications.

UNIT IV ELECTRODYNAMIC FIELDS **9**

Magnetic Circuits – Faraday's law – Transformer and motional EMF – Displacement current –Maxwell's equations (differential and integral form) – Magnetic force, Torque - Relation between field theory and circuit theory – Applications.

UNIT V ELECTROMAGNETIC WAVES **9**

Electromagnetic wave generation and equations – Wave parameters: velocity, intrinsic impedance, propagation constant, attenuation constant and Phase constant- Waves in free space, conductor, lossy and lossless dielectrics, conductors- skin depth – Poynting vector and Poynting theorem– Plane wave reflection and refraction-Brewsters angle.

Total Periods:45 hours

COURSE OUTCOMES:

- Ability to understand the basic mathematical concepts related to electromagnetic vectorfields.
- Ability to understand the basic concepts about electrostatic fields, electrical potential,energy density and their applications.
- Ability to acquire the knowledge in magneto static fields, magnetic flux density, vectorpotential and its applications.
- Ability to understand the different methods of emf generation and Maxwell's equations
- Ability to understand the basic concepts electromagnetic waves and characterizingparameters
- Ability to understand and compute Electromagnetic fields and apply them for design andanalysis of electrical equipment and systems

TEXT BOOKS:

1. Mathew N. O. Sadiku, 'Principles of Electromagnetics', 6th Edition, Oxford University Press Inc. Asian edition, 2015.
2. William H. Hayt and John A. Buck, 'Engineering Electromagnetics', McGraw Hill Special Indian edition, 2017.
3. Kraus and Fleish, 'Electromagnetics with Applications', McGraw Hill International Editions, Fifth Edition, July 2017.

REFERENCES

1. V.V.Sarwate, 'Electromagnetic fields and waves', First Edition, Newage Publishers, June 2018
2. J.P.Tewari, 'Engineering Electromagnetics - Theory, Problems and Applications', Second Edition, Khanna Publishers.
3. Joseph. A.Edminister, 'Schaum's Outline of Electromagnetics, Third Edition (Schaum's Outline Series), McGraw Hill, 2013.
4. S.P.Ghosh, LipikaDatta, 'Electromagnetic Field Theory', First Edition, McGraw Hill Education(India) Private Limited, 2017.

EE1303 ELECTRON DEVICES AND CIRCUITS

L	T	P	C
3	0	0	3

PREREQUEST SUBJECTS:

- Materials Science
- Circuit Theory

COURSE OBJECTIVES:

The student should be made to:

- Understand the structure of basic electronic devices and applications of electronic devices.
- Be exposed to active and passive circuit elements.
- Familiarize the operation and applications of transistors and thyristors.
- Explore the characteristics of amplifier gain and frequency response.
- Learn the required functionality of positive and negative feedback systems.

UNIT I PN JUNCTION DEVICES 9

PN junction diode –structure, operation and V-I characteristics, diffusion and transition capacitance - Rectifiers – Half Wave and Full Wave Rectifier- clippers and clamper (qualitative treatment)-Zener Diode-operation and characteristics , Zener as regulator-Display devices- Basic operation of LED, Laser diodes, Photo diode and Phototransistor .

UNIT II TRANSISTORS AND THYRISTORS 9

Bipolar Junction Transistors-structure, operation and characteristics of BJT in CB, CE and CC configurations- Biasing- Fixed, emitter feedback and Voltage divider bias- JFET, MOSFET- structure, Operation, Characteristics and JFET as a voltage controlled resistor –FET Biasing-Self bias and Voltage divider bias - UJT- structure, operation ,characteristics and UJT as saw tooth oscillator. Introduction to thyristors and IGBT - Structure and characteristics.

UNIT III AMPLIFIERS 9

BJT small signal model – Analysis of CE, CB, CC amplifiers- Gain and frequency response –MOSFET small signal model– Analysis of CS and Source follower – Gain and frequency response- High frequency analysis.

UNIT IV MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER 9

BIMOS cascade amplifier, Differential amplifier – Common mode and Difference mode analysis using BJT – Differential amplifier using FET– Single tuned amplifiers– Gain and frequency response – Neutralization methods, power amplifiers –Types (Qualitative analysis).

UNIT V FEEDBACK AMPLIFIERS AND OSCILLATORS 9

Feedback concept-Advantages of negative feedback – voltage / current, series and Shunt feedback –positive feedback – Condition for oscillations, phase shift ,Wien bridge, Hartley, Colpitts and Crystal oscillators.

Total Periods: 45 hours

OUTCOMES:

Upon Completion of the course, the students will be ability to:

- Explain the structure and working operation of basic electronic devices.
- Able to identify and differentiate both active and passive elements
- Analyze the characteristics of different electronic devices such as diodes, Transistors and Thyristors.
- Choose and adapt the required components to construct an amplifier circuit.

Employ the acquired knowledge in design and analysis of oscillators

TEXT BOOKS:

1. David A. Bell ,"Electronic devices and circuits", Oxford University higher education, 5th edition 2010.
2. Sedra and smith, "Microelectronic circuits",7thEd., Oxford University Press

REFERENCES:

1. Balbir Kumar, Shail.B.Jain, "Electronic devices and circuits" PHI learning private limited, 2nd edition2014.
2. Thomas L.Floyd, "Electronic devices" Conventional current version, Pearson prentice hall, 10th Edition, 2017.
3. Millman J, Halkias.C.andSathyabrada Jit, Electronic Devices and Circuits, 4th Edition, Mc Graw Hill Education (India) Private Ltd., 2015
4. Robert L. Boylestad and Louis Nasheresky, ―Electronic Devices and Circuit Theory‖, 11th Edition, Pearson Education, 2013

EE1304 DIGITAL LOGIC CIRCUITS

L	T	P	C
3	0	2	4

COURSE OBJECTIVES:

- To study various number systems and simplify the logical expressions using Boolean Functions
- To study combinational circuits
- To design various synchronous and asynchronous circuits.
- To introduce asynchronous sequential circuits and PLDs
- To introduce digital simulation for development of application oriented logic circuits.

UNIT I NUMBER SYSTEMS AND DIGITAL LOGIC FAMILIES 9

Review of number systems, binary codes, error detection and correction codes (Parity and Hamming code) - Digital Logic Families -comparison of RTL, DTL, TTL, ECL and MOS families -operation, characteristics of digital logic family.

UNIT II COMBINATIONAL CIRCUITS 9

Combinational logic - representation of logic functions-SOP and POS forms, K-map representations - minimization using K maps -simplification and implementation of combinational logic – multiplexers and de multiplexers - code converters, adders, subtractors, Encoders and Decoders-Experimental verification of combinational circuits.

UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS 9

Sequential logic- SR, JK, D and T flip flops - level triggering and edge triggering - counters - asynchronous and synchronous type - Modulo counters - Shift registers - design of synchronous sequential circuits – Moore and Melay models- Counters, state diagram; state reduction; state assignment - Experimental verification of sequential circuits.

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS AND PROGRAMMABILITY LOGIC

DEVICES **9**

Asynchronous sequential logic circuits-Transition tability, flow tability-race conditions, hazards&errors in digital circuits; analysis of asynchronous sequential logic circuits: - Introduction to Programmability Logic Devices: PROM – PLA –PAL, CPLD-FPGA .

UNIT V VHDL **9**

RTL Design – combinational logic – Sequential circuit – Operators – Introduction to Packages – Subprograms – Test bench. (VHDL Simulation: adders, counters, flip flops, Multiplexers & De multiplexers).

Total Periods: 45(T)+30(P)=75 hours

LIST OF EXPERIMENTS:

1. Implementation of Boolean Functions, Adder and Subtractor circuits.
2. Code converters: Excess-3 to BCD and Binary to Gray code converter and vice-versa
3. Parity generator and parity checking
4. Encoders and Decoders
5. Sequential Logic: Study of Flip-Flop, Counters (synchronous and asynchronous), Shift Registers using suitability IC's.
6. Study of multiplexer and de multiplexer
7. Analysis of Digital circuits using simulation software

OUTCOMES:

- Ability to study various number systems and simplify the logical expressions using Boolean functions
- Ability to design combinational and sequential Circuits
- Ability to design various synchronous and asynchronous circuits.
- Ability to introduce asynchronous sequential circuits and PLDs
- Ability to introduce digital simulation for development of application oriented logic Circuits.

TEXT BOOKS:

1. James W. Bignel, Digital Electronics, Cengage learning, 5th Edition, 2007.
2. M. Morris Mano, 'Digital Design with an introduction to the VHDL', Pearson Education, 2013.

REFERENCES

1. Comer "Digital Logic & State Machine Design, Oxford, 2012.
2. Mandal, "Digital Electronics Principles & Application, McGraw Hill Edu, 2013.
3. William Keitz, Digital Electronics-A Practical Approach with VHDL, Pearson, 2013.
4. Thomas L.Floyd, 'Digital Fundamentals', 11th edition, Pearson Education, 2015.
5. Charles H.Roth, Jr, LizyLizy Kurian John, 'Digital System Design using VHDL, Cengage,2013.
6. Gaganpreet Kaur, VHDL Basics to Programming, Pearson, 2013.

EE1305 MEASUREMENTS AND INSTRUMENTATION

L	T	P	C
3	0	0	3

PREREQUEST SUBJECTS:

- Circuit Theory

COURSE OBJECTIVES:

To impart knowledge on the following Topics

- Basic functional elements of instrumentation and their characteristics.
- Fundamentals of electrical and electronic instruments
- D.C and A.C. bridges
- Various transducers
- Various storage and display devices and the data acquisition systems

UNIT I INTRODUCTION **9**

Principle of measurement – absolute, comparative, direct reading and null balance methods. Functional elements of an instrument – Static and dynamic characteristics – Errors in measurement – Statistical evaluation of measurement data – Standards and calibration -Principle and types of analog and digital voltmeters, ammeters.

UNIT II ELECTRICAL AND ELECTRONIC INSTRUMENTS **9**

Principle and types of multi meters – Single and three phase watt meters and energy meters – Magnetic measurements – Determination of B-H curve and measurements of iron loss – Instrument transformers – Instruments for measurement of frequency and phase.

UNIT III D.C AND A.C BRIDGES **9**

D.C potentiometers, D.C (Wheat stone, Kelvin and Kelvin Double bridge) & A.C bridges (Maxwell, Anderson and Schering bridges), transformer ratio bridges, self-balancing bridges.

UNIT IV TRANSDUCERS **9**

Classification of transducers – Selection of transducers – Resistive, capacitive & inductive Transducers – Piezoelectric, Hall effect, optical and digital transducers -Biomedical Transducers

UNIT V STORAGE, DISPLAYAND DATA ACQUISITION SYSTEMS **9**

SSD, Digital storage oscilloscope, Digital plotters and printers, CRT display, digital CRO, LED, LCD– Data Loggers- Hologram-Elements of data acquisition system –Smart sensors(Level, Temperature, Pressure, Infrared, Proximity sensor) - Thermal Imagers- Block diagram of PC based measurements.

Total Periods: 45 hours

OURSE OUTCOMES:

- To acquire knowledge on Basic functional elements of instrumentation
- To understand the concepts of different types of electrical and electronic instruments
- Ability to compare between various measurement techniques and their application.
- To understand the concepts Various transducers and the data acquisition systems
- To acquire knowledge on Various storage and display devices along with their uses.
- Ability to model and analyze the electrical and electronic Instruments.

TEXT BOOKS:

1. A.K. Sawhney, 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, JAN 2015
2. J. B. Gupta, 'A Course in Electronic and Electrical Measurements', S. K. Kataria& Sons, Delhi, 2013.
3. Doebelin E.O. and Manik D.N., Measurement Systems – Applications and Design, Special Indian Edition, McGraw Hill Education Pvt. Ltd., 2007.

REFERENCES

1. H.S. Kalsi, 'Electronic Instrumentation', McGraw Hill, III Edition 2010.
2. D.V.S. Murthy, 'Transducers and Instrumentation', Prentice Hall of India Pvt Ltd, 2015.
3. David Bell, ' Electronic Instrumentation & Measurements', Oxford University Press,2013.
4. Martin Reissland, 'Electrical Measurements', New Age International (P) Ltd., Delhi, 2001.
5. Alan. S. Morris, Principles of Measurements and Instrumentation, 2nd Edition, Prentice Hall of India, 2003.

EE1306 ELECTRON DEVICES AND CIRCUITS LABORATORY

L	T	P	C
0	0	2	1

PREREQUEST SUBJECTS:

- Engineering Practice Lab
- Circuit Theory

COURSE OBJECTIVES:

- To enability the students to understand the behavior of semiconductor device based on Experimentation and Simulation.

LIST OF EXPERIMENTS:

1. Study of CRO and DSO -Frequency and phase measurements
2. Zener diode
   a) Characteristics
   b) Voltage regulator
3. Clipper and Clamper using diode.
4. Characteristics of photo diode & photo transistor, Study of light activated relay circuit
5. Characteristics of JFET and determination of parameters.
6. Characteristics of UJT and generation of saw tooth waveforms.
7. Design and Frequency response of a Common Emitter amplifier (Fixed and Voltage divider Bias).
8. Differential amplifiers using FET.
9. Design and testing of Current series and Voltage shunt feedback amplifiers.
10. Design and testing of RC phase shift and LC oscillators.
11. Design of regulated power supply.
12. Realization of passive filters
13. Analysis of basic electronic circuits using simulation software (PSPICE/Ngspice)

Total Periods: 30 hours

OUTCOMES:

- Ability to understand and analyse electronic circuits.

- Ability to analyse the electronic circuits using simulation tools.

EE1307 ELECTRICAL MACHINES LABORATORY –I

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:

- To Rig up circuits for testing a given machine.
- To Obtain the performance characteristics of machines.

LIST OF EXPERIMENTS:

CYCLE I

1. Open circuit characteristics of DC generator (Self and Separately Excited)
2. Load test on DC generators.
3. Speed Control of DC Motor: Field control, Armature control.
4. Load test on DC motors.
5. Swinburne's test.
6. Hopkinson's test.

CYCLE II

1. Open circuit & Short circuit test on single phase transformer.
2. Parallel operation of single phase transformers.
3. Separation of no-load losses in single phase transformer.
4. Load test on single phase transformer.
5. Sumpner's test on 1-phase transformers.
6. 3-phase transformer connections.
7. Load test on 3-phase phase transformer.

Total Periods: 60 hours

OUTCOMES:

- Ability to understand and analyze DC Motor
- Ability to understand and analyze Transformers**.**

SEMESTER IV

MA1402 NUMERICAL METHODS

L	T	P	C
3	1	0	4

COURSE OBJECTIVES:

- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals in real life situations.
- To acquaint the student with understanding of numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- To acquaint the knowledge of various techniques and methods of solving ordinary differential

equations.

- To understand the knowledge of various techniques and methods of solving various types of partial differential equations.

UNIT I SOLUTION OF LINEAR ALGEBRAIC EQUATIONS AND EIGEN VALUE PROBLEMS 12

Solution of algebraic and transcendental equations –Bisection method-Regular Falsi method-Fixed point iteration method – Newton Raphson method - Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Eigenvalues of a matrix by Power method ,Jacobi's method and Householder's method

UNIT II INTERPOLATION AND APPROXIMATION 12

Interpolation with unequal intervals - Lagrange's interpolation – Newton's divided difference interpolation – Piecewise interpolation and spline interpolation-Bivariate Interpolation- Difference operators and relations - Interpolation with equal intervals - Newton's forward and backward difference formulae-Least square approximation.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 12

Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson's 1/3 rule, Simpson's 3/8 rule – Romberg's Method - Two point and three point Gaussian quadrature formulae- Evaluation of double integrals by Trapezoidal and Simpson's 1/3rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 12

Single step methods - Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge - Kutta method for solving first order equations - Multi step methods - Milne's and Adams - Bash forth predictor corrector methods for solving first order equations.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 12

Initial value problem method-shooting method -Finite difference methods for solving second order two - point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method.

Total Periods: 60 hours

OUTCOMES :

- Upon successful completion of the course, students should be able to:
- Understand the basic concepts and techniques of solving algebraic and transcendental equations.
- Appreciate the numerical techniques of interpolation and error approximations in various intervals in real life situations.
- Apply the numerical techniques of differentiation and integration for engineering problems.
- Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.
- Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.

TEXTBOOKS :

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning,2016.
2. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna

Publishers, 10th Edition, New Delhi,2015.

REFERENCES :

1. Brian Bradie, "A Friendly Introduction to Numerical Analysis", Pearson Education, Asia, New Delhi,2007.
2. Gerald. C. F. and Wheatley. P. O., "Applied Numerical Analysis", Pearson Education, Asia, 6th Edition, New Delhi,2006.
3. Mathews, J.H. "Numerical Methods for Mathematics, Science and Engineering", 2nd Edition, Prentice Hall,1992.
4. Sankara Rao. K., "Numerical Methods for Scientists and Engineers", Prentice Hall of India Pvt. Ltd, 3rd Edition, New Delhi, 2007.
5. Sastry, S.S, "Introductory Methods of Numerical Analysis", PHI Learning Pvt. Ltd, 5th Edition, 2015.

EE1401 ELECTRICAL MACHINES – II

L	T	P	C
2	1	0	3

PREREQUEST SUBJECTS:

- Electrical Machines – I
- Electromagnetic Theory

COURSE OBJECTIVES:

To impart knowledge on the following Topics

- Construction and performance of salient and non – salient type synchronous generators.
- Principle of operation and performance of synchronous motor.
- Construction, principle of operation and performance of induction machines.
- Starting and speed control of three-phase induction motors.
- Construction, principle of operation and performance of single phase induction motors and special machines.

UNIT I SYNCHRONOUS GENERATOR **12**

Constructional details – Types of rotors –winding factors- emf equation – Synchronous reactance – Armature reaction – Phasor diagrams of non salient pole synchronous generator connected to infinite bus--Synchronizing and parallel operation – Synchronizing torque -Change of excitation and mechanical input-Voltage regulation – EMF, MMF, ZPF and A.S.A methods – steady state power- angle characteristics– Two reaction theory –slip test -short circuit transients - Capability Curves – Introduction to sequence impedance of alternators.

UNIT II SYNCHRONOUS MOTOR **12**

Principle of operation – Torque equation – Operation on infinite bus bars - V and Inverted V curves – Equivalent circuit and phasor diagram-Power input and power developed equations – Starting methods – Current loci for constant power input, constant excitation and constant power developed-Hunting – synchronous condenser.

UNIT III THREE PHASE INDUCTION MOTOR **12**

Constructional details – Types of rotors –- Principle of operation – Slip –cogging and crawling- Equivalent

circuit – Torque-Slip characteristics - Condition for maximum torque – Losses and efficiency – Load test - No load and blocked rotor tests - Circle diagram – Separation of losses – Double cage induction motors – Induction generators – Synchronous induction motor.

UNIT IV STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR **12**

Need for starting – Types of starters – DOL, Rotor resistance, Autotransformer and Star Delta starters – Speed control – Voltage control, Frequency control and pole changing – Cascaded connection-V/f control – Slip power recovery scheme using conventional method -Braking of three phase induction motor: Plugging, dynamic braking and regenerative braking.

UNIT V SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES **12**

Constructional details of single phase induction motor – Double field revolving theory and operation – Equivalent circuit – No load and blocked rotor test – Performance analysis – Types of single-phase induction motors – applications- Special Machines - Shaded pole induction motor - Linear induction motor – Repulsion motor -Hysteresis motor - AC series motor- Stepper motors –PMBLDC Motor – Permanent Magnet Synchronous Motor – Introduction to Magnetic levitation systems.

Total Periods: 60 hours

OUTCOMES:

- Ability to understand the construction and working principle of Synchronous Generator
- Ability to predetermine the performance characteristics of Synchronous Machines.
- Ability to acquire knowledge on Synchronous motor.
- Ability to understand the construction and working principle of Three phase Induction Motor.
- Ability to understand the various starting and speed control methods of Three Phase Induction motors.
- Ability to understand the construction and working principle of Single phase Induction motors and Special Machines.

TEXT BOOKS:

1. A.E. Fitzgerald, Charles Kingsley, Stephen. D. Umans, 'Electric Machinery', Mc Graw Hill publishing Company Ltd, 2017.
2. Vincent Del Toro, 'Basic Electric Machines' Pearson India Education, 2016.
3. Stephen J. Chapman, 'Electric Machinery Fundamentals'4th edition, McGraw Hill Education Pvt. Ltd, 2017.

REFERENCES:

1. D.P. Kothari and I.J. Nagrath, 'Electric Machines', McGraw Hill Publishing Company Ltd, 2017.
2. P.S. Bhimbhra, 'Electrical Machinery', Khanna Publishers, 2017.
3. M.N. Bandyopadhyay, Electrical Machines Theory and Practice, PHI Learning PVT LTD., New Delhi, 2009.
4. B.R.Gupta, 'Fundamental of Electric Machines' New age International Publishers,3rd Edition ,Reprint 2015.
5. Murugesh Kumar, 'Electric Machines', Vikas Publishing House Pvt. Ltd, 2016.
6. A textbook of Electrical Technology – AC and DC machines – Volume II by B.L.Theraja, A.K.Theraja, S. Chand, New Delhi,2020

EE1402 TRANSMISSION AND DISTRIBUTION

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To study the structure of electric power system and to develop expressions for the computation of transmission line parameters.
- To obtain the equivalent circuits for the transmission lines based on distance and to determine voltage regulation and efficiency.
- To understand the mechanical design of transmission lines and to analyze the voltage distribution in insulator strings to improve the efficiency.
- To study the types, construction of cables and methods to improve the efficiency.
- To study about distribution systems, types of substations, methods of grounding, EHVAC, HVDC and FACTS.

UNIT I TRANSMISSION LINE PARAMETERS 9

Structure of Power System –Comparison of D.C. and A.C. Transmission -Parameters of single and three phase transmission lines with single and double circuits -Resistance, inductance and capacitance of solid, stranded and bundled conductors, Symmetrical and unsymmetrical spacing and transposition - application of self and mutual GMD; skin and proximity effects -Typical configurations, conductor types and electrical parameters of EHV lines.

UNIT II MODELLING AND PERFORMANCE OF TRANSMISSION LINES 9

Performance of Transmission lines - short line, medium line and long line - equivalent circuits, phasor diagram, attenuation constant, phase constant, surge impedance transmission efficiency and voltage regulation, real and reactive power flow in lines - Power Circle diagrams - methods of voltage control, Ferranti effect-Formation of Corona – Critical Voltages – Effect on Line Performance.

UNIT III MECHANICAL DESIGN OF LINES 9

Mechanical design of OH lines – Line Supports –Types of towers – Stress and Sag Calculation – Effects of Wind and Ice loading. Insulators: Types, voltage distribution in insulator string, improvement of string efficiency, testing of insulators.

UNIT IV UNDER GROUND CABLES 9

Underground cables - Types of cables – Construction of single core and 3 core Cables Insulation Resistance – Potential Gradient - Capacitance of Single-core and 3 core cables - Grading of cables - DC cables.

UNIT V DISTRIBUTION SYSTEMS 9

Distribution Systems – General Aspects – Kelvin's Law – AC and DC distributions-distributed and concentrated loads-Types of Substations -Methods of Grounding – Trends in Transmission and Distribution: EHVAC, HVDC and FACTS (Qualitative treatment only).

Total Periods: 45 hours

OUTCOMES:

- To understand the importance and the functioning of transmission line parameters.
- To understand the concepts of Lines and Insulators.
- To acquire knowledge on the performance of Transmission lines.

- To understand the importance of distribution of the electric power in power system.
- To acquire knowledge on Underground Cabilitys
- To become familiar with the function of different components used in Transmission and Distribution levels of power system and modelling of these components.

TEXT BOOKS:

1. D.P.Kothari, I.J. Nagarath, 'Power System Engineering', Mc Graw-Hill Publishing Company limited, New Delhi, Second Edition, 2008.
2. C.L.Wadhwa, 'Electrical Power Systems', New Academic Science Ltd, 2009.
3. S.N. Singh, 'Electric Power Generation, Transmission and Distribution', Prentice Hall of India Pvt. Ltd, New Delhi, Second Edition, 2011.

REFERENCES

1. B.R.Gupta, 'Power System Analysis and Design' S. Chand, New Delhi, Fifth Edition, 2008.
2. LucesM.Fualken berry, Walter Coffer, 'Electrical Power Distribution and Transmission', Pearson Education, 2007.
3. ArunIngole, "power transmission and distribution" Pearson Education, 2017
4. J.Brian, Hardy and Colin R.Bayliss 'Transmission and Distribution in Electrical Engineering', Newnes; Fourth Edition, 2012.
5. G.Ramamurthy, "Handbook of Electrical power Distribution," Universities Press, 2013.
6. V.K.Mehta, Rohit Mehta, 'Principles of power system', S. Chand & Company Ltd, New Delhi, 2013.

EE1403 LINEAR INTEGRATED CIRCUITS AND APPLICATIONS

L	T	P	C
3	0	2	4

PREREQUEST SUBJECTS:

- Electron Devices and Circuits
- Electron Devices and Circuits Lab

COURSE OBJECTIVES:

To impart knowledge on the following topics

- IC fabrication procedure.
- Signal analysis using Op-amp based circuits.
- Applications of Op-amp.
- Functional blocks and the applications of special ICs like Timers and PLL circuits
- Various Voltage regulator ICs.

UNIT I IC FABRICATION **9**

IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. Realisation of monolithic ICs and packaging. Fabrication of diodes, capacitance, resistance, FETs and PV Cell.

UNIT II CHARACTERISTICS OF OPAMP **9**

Basic Concepts of OP-AMP, Ideal characteristics, DC characteristics, AC characteristics, frequency

response of OP-AMP; Basic applications of op-amp – Inverting and Non-inverting amplifiers, summer, differential amplifier ,Voltage follower, differentiator and integrator, Log and Antilog amplifiers-Schmitt trigger -V/I & I/V converters.

UNIT III APPLICATIONS OF OPAMP **9**

Instrumentation amplifier and its applications for transducer Bridge- Analog multiplier & Divider-first and second order active filters(Sallen key and Butterworth**)**, comparators ,multivibrators, waveform generators, clippers, clampers, peak detector, S/H circuit, D/A converter (R- 2R ladder and weighted resistor types), A/D converters (Successive approximation and Flash type)using opamp.

UNIT IV SPECIAL ICs **9**

Functional block, characteristics of 555 Timer its PWM applications –IC566 Voltage controlled oscillator, IC565 Phase locked loop IC and its applications (Frequency synthesizing and clock synchronisation), AD633 Analog multiplier –AD623 Instrumentation Amplifier and application as load cell weight measurement-ICL8038 function generator IC.

UNIT V Voltage Regulator ICs **9**

IC voltage regulators –LM78XX, LM79XX; Fixed voltage regulators its application as Linear power supply - LM317, 723 Variability voltage regulators, switching regulator ICs- SMPS.

Total Periods: 45 hours

OUTCOMES:

- Ability to acquire knowledge in IC fabrication procedure
- Ability to analyze the characteristics of Op-Amp
- To understand the importance of Signal analysis using Op-amp based circuits.
- To understand and acquire knowledge on the Applications of Op-amp
- Functional blocks and the applications of special ICs like Timers, PLL circuits and VCO
- To understand and acquire knowledge of voltage regulator ICs.

TEXT BOOKS:

1. David A. Bell, 'Op-amp & Linear ICs', Oxford, 2013.
2. D. Roy Choudhary, Sheil B. Jani, 'Linear Integrated Circuits', IV edition, New Age, 2018.

REFERENCES

1. RamakantA. Gayakward, 'Op-amps and Linear Integrated Circuits', IV edition, Pearson Education, Published by Pearson (February 1st 2020) - Copyright © 2000
2.Fiore,"Opamps& Linear Integrated Circuits Concepts & applications", Cengage, 2010.
3. Floyd ,Buchla,"Fundamentals of Analog Circuits, Pearson, 2013.
4. Jacob Millman, Christos C.Halkias, 'Integrated Electronics - Analog and Digital circuits system', McGraw Hill, 2003.
5. Robert F.Coughlin, Fredrick F. Driscoll, 'Op-amp and Linear ICs', Pearson, 6th edition,2012.
6. Sergio Franco, 'Design with Operational Amplifiers and Analog Integrated Circuits', McGraw Hill, 2016.

LIST OF EXPERIMENTS:

1. Design and testing of inverting and non-inverting amplifiers.
2. Design and testing of Adder, comparator.
3. Design and testing of Integrator and Differentiator.

4. Design of Schmitt trigger
5. Design and testing of Active Filters
6. Design and testing of waveform generators using Opamp((sine, triangular & square wave)
7. Design and testing of D/A converter and A/D converter
8. Design and testing of Weinbridge oscillator using Opamp
9. Timer IC application: Study of NE/SE 555 timer in Astability, Monostability operation.
10. Fixed and Variability Voltage Regulator.(using IC LM7905 and IC LM317).
11. Study of Phase Locked Loop and VCO.

Total Periods: 30 hours

OUTCOMES:

At the end of the course, the student should have the:

- Ability to acquire knowledge on Applications of Op-Amp.
- Ability to design and implement linear applications of operational amplifiers such as filters, multivibrator, waveform generators and oscillator.
- Ability to analyze the D/A and A/D converters using Op-Amp.
- To understand the PWM circuits using Timer IC.
- To understand the design and practically demonstrate the applications based on IC555 and IC566.

EE1404 CONTROL SYSTEMS

L	T	P	C
2	1	0	3

COURSE OBJECTIVES:

- To understand the use of transfer function models for analysis physical systems and introduce the control system components.
- To provide adequate knowledge in the time response of systems and steady state error analysis.
- To accord basic knowledge in obtaining the open loop and closed–loop frequency responses of systems.
- To introduce stability analysis and design of compensators.
- To introduce state variable representation of physical systems.

UNIT I SYSTEMS AND REPRESENTATION **12**

Basic elements in control systems: – Open and closed loop systems – Electrical analogy of mechanical and thermal systems – Transfer function – AC and DC servomotors – Gear Trains- Block diagram reduction techniques – Signal flow graphs.

UNIT II TIME RESPONSE **12**

Time response: – Time domain specifications – Types of test input – I and II order system response – Error coefficients – Generalized error series – Steady state error – Root locus construction- Effects of P, PI, PID modes of feedback control –Time response analysis.

UNIT III FREQUENCY RESPONSE **12**

Frequency response: – Bode plot – Polar plot – Determination of closed loop response from open loop response- Correlation between frequency domain and time domain specifications.

UNIT IV STABILITY AND COMPENSATOR DESIGN **12**

Characteristics equation – Routh Hurwitz criterion – Nyquist stability criterion- Performance criteria – Effect of Lag, lead and lag-lead compensation on frequency response-Design of Lag, lead and lag lead compensator using bode plots.

UNIT V STATE VARIABLE ANALYSIS **12**

Concept of state variables – State models for linear and time invariant Systems – Solution of state and output equation in controllable canonical form – Concepts of controllability and observability.

Total Periods (L: 45+T:15): 60 hours

COURSE OUTCOMES

At the end of the course, the student should have the :

- Ability to develop various representations of system based on the knowledge of Mathematics, Science and Engineering fundamentals.
- Ability to do time domain and frequency domain analysis of various models of linear system.
- Ability to interpret characteristics of the system to develop mathematical model.
- Ability to design appropriate compensator for the given specifications.
- Ability to come out with solution for complex control problem.
- Ability to understand use of PID controller in closed loop system.

TEXT BOOKS

1. Nagarath, I.J. and Gopal, M., "Control Systems Engineering", New Age International Publishers, 2018.
2. Benjamin C. Kuo, "Automatic Control Systems", Wiley, 2018.

REFERENCES

1. Katsuhiko Ogata, "Modern Control Engineering", Pearson, 2015.
2. Richard C.Dorf and Bishop, R.H., "Modern Control Systems", Pearson Education,2010.
3. John J.D., Azzo Constantine, H. and HoupisSttuart, N Sheldon, "Linear Control System Analysis and Design with MATLAB", CRC Taylor& Francis Reprint 2013.
4. RamesC.Panda and T. Thyagarajan, "An Introduction to Process Modelling Identification and Control of Engineers", Narosa Publishing House, 2017.
5. M.Gopal, "Control System: Principle and design", McGraw Hill Education, 2012.
6. NPTEL Video Lecture Notes on "Control Engineering "by Prof. S. D. Agashe, IIT Bombay.

HV1401	**UNIVERSAL HUMAN VALUES**	**L**	**T**	**P**	**C**
	(Common to all B.E / B.TECH Branches)	**2**	**1**	**0**	**3**

Universal Human Values : Understanding Harmony

COURSE OBJECTIVES:

The objective of the course is four fold:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence

- Strengthening of self-reflection.
- Development of commitment and courage to act.

COURSE TOPICS:

Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I
2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

Module 2: Understanding Harmony in the Human Being - Harmony in Myself!

7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
8. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of 'I' and harmony in 'I'
11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
12. Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

Module 3: Understanding Harmony in the Family and Society- Harmony in Human Human Relationship

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
14. Understanding the meaning of Trust; Difference between intention and competence
15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

Module 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

18. Understanding the harmony in the Nature
19. Interconnectedness and mutual fulfilment among the four orders of nature recyclability and self regulation in nature
20. Understanding Existence as Co-existence of mutually interacting units in all pervasive space
21. Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Module 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics
22. Natural acceptance of human values
23. Definitiveness of Ethical Human Conduct
24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
25. Competence in professional ethics:
    a. Ability to utilize the professional competence for augmenting universal human order
    b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems,
    c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
26. Case studies of typical holistic technologies, management models and production systems
27. Strategy for transition from the present state to Universal Human Order:
    a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers
    b. At the level of society: as mutually enriching institutions and organizations
28. Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Total Periods (L: 30+T:15): 45 hours

REFERENCE BOOKS :

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak,1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)13. Gandhi - Romain Rolland (English)

EE1405 ELECTRICAL MACHINES LABORATORY -II **L T P C**

0 0 4 2

PREREQUEST SUBJECTS:

- Electrical Machines – I
- Electrical Machines Lab-I

COURSE OBJECTIVES:

- To expose the students to the operation of synchronous machines and induction motors and give them experimental skill.

LIST OF EXPERIMENTS:

1. Regulation of three phase alternator by EMF and MMF methods.
2. Regulation of three phase alternator by ZPF and ASA methods.
3. Regulation of three phase salient pole alternator by slip test.
4. Measurements of negative sequence and zero sequence impedance of alternators.
5. V and Inverted V curves of Three Phase Synchronous Motor.
6. Load test on three-phase induction motor.
7. No load and blocked rotor tests on three-phase induction motor (Determination of equivalent circuit parameters).
8. Separation of No-load losses of three-phase induction motor.
9. Speed Control of Slip Ring Induction motor & Study of Induction motor Starters.
10. Load test on single-phase induction motor.
11. No load and blocked rotor test on single-phase induction motor.

Total Periods: 60 hours

OUTCOMES:

At the end of the course, the student should have the :

- Ability to understand and analyze EMF and MMF methods.
- Ability to analyze the characteristics of V and Inverted V curves.
- Ability to understand the importance of Synchronous machines.
- Ability to understand the importance of Induction Machines.
- Ability to acquire knowledge on separation of losses.

EE1407 CONTROL AND INSTRUMENTION LABORATORY

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:

- To provide knowledge on analysis and design of control system along with basics of instrumentation

LIST OF EXPERIMENTS:

CONTROLSYSTEMS:

1. P,PI and PID controllers
2. Stability Analysis(using MAT lab)
3. Modeling of Systems–Machines, Sensors and Transducers

4. Design of Lag, Lead and Lag-Lead Compensators
5. Position Control Systems
6. Synchro-Transmitter- Receiver and Characteristics
7. Simulation of Control Systems by Mathematical development tools.

INSTRUMENTATION:

8. Bridge Networks–AC and DC Bridges (To find R, L & C)
9. Dynamics of Sensors/Transducers
   a. Temperature
   b. Pressure
   c. Displacement
   d. Optical
   e. Strain
   f. Flow
10. Study of Power and Energy Measurement
11. Signal Conditioning
    a. Instrumentation Amplifier
    b. Analog–Digital and Digital–Analog converters (ADC and DACs)

Total Periods: 30 hours

Course Outcomes:

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

- Understand control theory and how to apply them over electrical engineering problems.
- Analyze the characterize of position control system and Synchro transmitter and receiver
- Ability to design compensators
- Understand the various types of bridge network and Sensors for different applications
- Understand the basics of signal conditioning circuits.
- Study the simulation packages