Revised Course Structure (first and second semester) for the B.Tech. Program to be Adopted wef 2018-19

(Mechanical Engineering, Civil Engineering, and Electronics and Instrumentation Engineering)

Semester I					
Code No.	**Course Name**	**L**	**T**	**P**	**C**
PH 101	Physics	3	1	0	4
MA 101	Mathematics I	3	1	0	4
ME 101	Engineering Mechanics	3	1	0	4
EE 101	Basic Electrical Engineering	3	1	0	4
HS 101	Communicative English	3	0	0	3
PH 111	Physics Laboratory	0	0	3	2
CE 101	Engineering Graphics & Design	1	0	3	3
EE 111	Basic Electrical Engineering Laboratory	0	0	3	2
HS 111	Language Laboratory	0	0	3	2
	Extra Academic Activities (EAA)[1]	0	0	2	0
Credits					**28**

Semester II					
Code No.	**Course Name**	**L**	**T**	**P**	**C**
CH 101	Chemistry	3	1	0	4
MA 102	Mathematics II	3	1	0	4
CS 101	Introduction to Programming	3	1	0	4
EC 101	Basic Electronics	3	1	0	4
CE 102	Environmental Science & Engineering	3	0	0	3
CH 111	Chemistry Laboratory	0	0	3	2
CS 111	Programming Laboratory	0	0	3	2
EC 111	Basic Electronics Laboratory	0	0	3	2
ME 111	Workshop Practice	0	0	3	2
	Extra Academic Activities (EAA)[1]	0	0	2	0
Credit					**27**

(Computer Science & Engineering, Electronics & Communication Engineering, and Electrical Engineering)

Semester I					
Code No.	**Course Name**	**L**	**T**	**P**	**C**
CH 101	Chemistry	3	1	0	4
MA 101	Mathematics I	3	1	0	4
CS 101	Introduction to Programming	3	1	0	4
EC 101	Basic Electronics	3	1	0	4
CE 102	Environmental Science & Engineering	3	0	0	3
CH 111	Chemistry Laboratory	0	0	3	2
CS 111	Programming Laboratory	0	0	3	2
EC 111	Basic Electronics Laboratory	0	0	3	2
ME 111	Workshop Practice	0	0	3	2
	Extra Academic Activities (EAA)[1]	0	0	2	0
Credits					**27**

Semester II					
Code No.	**Course Name**	**L**	**T**	**P**	**C**
PH 101	Physics	3	1	0	4
MA 102	Mathematics II	3	1	0	4
ME 101	Engineering Mechanics	3	1	0	4
EE 101	Basic Electrical Engineering	3	1	0	4
HS 101	Communicative English	3	0	0	3
PH 111	Physics Laboratory	0	0	3	2
CE 101	Engineering Graphics & Design	1	0	3	3
EE 111	Basic Electrical Engineering Laboratory	0	0	3	2
HS 111	Language Laboratory	0	0	3	2
	Extra Academic Activities (EAA)[1]	0	0	2	0
Credit					**28**

1 EAA consists of YOGA/Physical Training/NCC/NSS/NSO, where YOGA is compulsory as a one semester course (first or second semesters), while any one from the rest is compulsory as a one semester course. Thus, if YOGA is registered in first semester then any one from the rest four is to be opted in second semester and vice-versa.

PH 101 **Physics** **L-T-P-C**
Semester/Year : First Year **Pre-requisite - None** **3-1-0-4**

Course objectives

- To solve dynamics of damped and forced oscillating system problems.
- To know the significance of Maxwell's equations in the Engineering applications of electromagnetic waves.
- Explain Quantum Mechanics to understand wave particle dualism. Necessity of quantum mechanics to explore the behavior of sub atomic particles. Evaluate the Eigen values and Eigen functions of a particle.
- To understand the basic electronics properties of materials. To demonstrate the success of quantum free electron theory over classical free electron theory. To examine the probability of occupancy of an electron in an energy state at different temperatures

No. of Classes	**Contents for Class**
Lecture 1	Introduction to Physics course syllabus, Introducing students to the evaluation/grading procedure, Mark distribution in each examination (Class test, mid-term, end-term)
Lecture 2	Introduction to vibration and oscillation, simple harmonic oscillator: equation of motion, general solution, Characteristic of SHM: amplitude, time period, phase velocity, acceleration, total energy
Lecture 3, 4	Damped harmonic motion: damping forces, practical examples of damped oscillation, equation of motion for damped oscillation, solution at different damping conditions: weak, large and critical damping
Lecture 5	Forced oscillation of a damped harmonic oscillator, general solution to equation of motion,
Lecture 6, 7	Steady state solution for forced oscillation, low frequency, high frequency and mid frequency conditions for forced oscillation, Resonance, power of forced oscillator
Lecture 8	Coupled oscillation: equation of motion for coupled oscillation, solutions
Lecture 9	Introduction of normal modes and normal coordinate
Lecture 10	Maxwell's equation: Electrodynamics before Maxwell
Lecture 11	Displacement current, Maxwell's equation in vacuum
Lecture 12	Maxwell's equation in matter. Boundary conditions
Lecture 13	Conservation laws: Continuity equation, Poynting's theorem
Lecture 14	Electromagnetic waves: The wave equation, Sinusoidal waves, Polarization
Lecture 15, 16	EM waves in vacuum, Monochromatic plane waves, Energy in electromagnetic waves, EM waves in matter,
Lecture 17, 18	Reflection and transmission at normal incidence
Lecture 19, 20	Reflection and transmission at oblique incidence
Lecture 21	EM waves in conductors, Reflection at a conducting surface

Lecture 22	Origin and history of quantum mechanics, particle aspect of the wave and vice-versa, matrix and wave mechanics
Lecture 23	Particle aspect of wave – blackbody radiation, photo-electric effect, Wave aspect of particle - de Broglie's hypothesis, matter wave
Lecture 24	Electron diffraction: Davison-Germer experiment, Particle vs wave: classical scenario & quantum scenario – double slit experiment
Lecture 25	Wave particle duality, Heisenberg's uncertainty principle, wavefunction, its properties and probabilistic interpretation
Lecture 26	Wave packets, group velocity & phase velocity and relation between them in dispersive medium
Lecture 27	Development of the wave equation, Time dependent Schrödinger equation
Lecture 28	Introduction to wave function, Probabilistic interpretation of wave function, Probability density
Lecture 29	Quantum mechanical operators (position, momentum, energy), expectation value, correspondence principle, Eigen functions, Eigen value
Lecture 30	Stationary states, Time independent Schrödinger equation
Lecture 31	Infinite square well problem, allowed energies and wavefunctions, Normalization, expectation values
Lecture 32, 33	Potential barrier problem, tunneling phenomena, example of α-particle decay
Lecture 34	Classical theory of electrical conduction, Drude model; Success and failures of classical model;
Lecture 35	Band theory of solid (Qualitative description); Classification of materials on the basis of band theory of solids (qualitative description); Bloch's quantum theory of electrical conduction (Qualitative);
Lecture 36	Distribution of electrons between the energy states-the Fermi-Dirac distribution; temperature variation of Fermi-Dirac distribution function;
Lecture 37, 38	The density of energy states (using free electron model) of metal in 3-D; Estimation of Fermi energy for metals
Lecture 39	Fermi surface and Fermi Velocity; Intrinsic and Extrinsic semiconductors; Charge carriers in semiconductor; Concepts of hole; Free electron model applied to semiconductors
Lecture 40	The Hall effect, Magnetoresistance

Course Outcome:

CO1:- Learners will be able to relate different kind of oscillations to standard differential equations. They will be able to explain various natural vibration phenomena.

CO2:- To apply the concept of vector operators like gradient, curl and divergence. Analyze Maxwell's equation in different forms (differential and integral) and apply them to diverse engineering problems.

CO3:- Examine the phenomena of wave propagation in different media and its interfaces.

CO4:- They will be able to solve model problems like particle in a box and tunneling through potential barrier. They can apply these models to physical situations like free electron theory, scanning tunneling microscope (STM).

CO5:- Apply the free electron theory to solids to describe electronic behavior. Understand the origin of energy bands, and how they influence electronic behavior. Learners will be enabled to differentiate semiconductors, conductors and insulators. They can be on a platform to appreciate device physics.

References

1. Quantum Physics, Resnick and Eisberg
2. Vibration and waves, A. P. French
3. Introduction to Electrodynamics, D. J. Griffiths
4. Quantum Mechanics, D. J. Griffiths
5. Solid State Physics, A J Dekker
6. The Physics of Solid, R Turton

PH 111	**Physics Laboratory**	**L-T-P-C**
Semester/Year : First Year	**Pre-Requisite - None**	**0-0-3-2**

Course objectives:

1. To gain practical knowledge by applying the experimental methods to correlate with the Physics theory.

2. To learn the usage of electrical and optical systems for various measurements.

3. Apply the analytical techniques and graphical analysis to the experimental data.

4. To develop intellectual communication skills and discuss the basic principles of scientific concepts in a group.

List of experiments

1. To calibrate an ammeter with the help of a potentiometer.
2. To study the twist in the thin rod by statical method using Barton's horizontal apparatus and thus to determine the modulus of rigidity of the material of the rod.
3. To study the bending of a beam supported at its ends and loaded at the middle and thus to determine the young's modulus of the material of the beam.
4. To determine the refractive index of the material of a given prism using a spectrometer.
5. To determine frequency of a transverse waves and mass per unit length of given wire by using sonometer apparatus.
6. To study the charging and discharging of a capacitor and hence to determine it's time constant
7. To study the variation of magnetic field with distance along the axis of a circular coil carrying current by plotting a graph.
8. To determine the wavelength of sodium light using single slit diffraction.
9. Comparison of two low resistances by using meter bridge.

Books

1. University Practical Physics, D. C. Tayal
2. B.Sc. Practical Physics, Samir Kumar Ghosh

Course Outcomes (COs)

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

1. Apply the various procedures and techniques for the experiments.
2. Use the different measuring devices and meters to record the data with precision
3. Apply the mathematical concepts/equations to obtain quantitative results
4. Develop basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results

CH 101 **CHEMISTRY** **L-T-P-C**

Semester/Year : First Year **3-1-0-4**

Pre-Requisite - None

Lect No	**Unit I: Water and its treatment**	CO
1	Sources and types of impurities in water; Hardness: Definition, Causes and its disadvantages, numerical problems of hardness of water	C1
2	Boiler scale: Definition, Causes and its prevention; Caustic Embrittlement: Definition, Causes and its prevention	C2
3	Boiler corrosion: Definition, Causes and its prevention, Treatment of water at domestic level: Zeolite process: Numerical problems on zeolite process	C3
4	Lime soda process: Principles, Process, Limitation and numerical problems	C4
5	Treatment of water at industrial level: Ion Exchange process: Principles, Process, and Limitation; Adsorption and Solvent extraction	C5
6	Chemical oxygen demand, Biological oxygen demand: Definition, experimental procedure for their determination, limitations, their significance and numerical problems	C6
	Unit II: Chemical Kinetics	
7	Zero order and pseodo unimolecular reactions; determination of the order of reaction, rate laws	C7
8-9	kinetics of complex reactions- parallel, consecutive and reversible reactions steady state concept;	C8
10	Arrhenius equation, energy of activation and its experimental determination	C9
11-12	simple collision theory-mechanism of bimolecular reaction, chain reaction, activated complex theory of reaction rate, ionic reactions	C10
	Unit III : Petroleum and Fuels	
13-15	Cracking of hydrocarbon, knocking, cetane number and octane number, Synthetic petrol, petrochemical and bio-fuels.	C11
16-17	Sources and Classification of Coal, Carbonization of coal, analysis of coal.	C12
18	Determination of Calorific value of coal by Bomb Calorimeter	C13
	Unit IV: Polymers and plastics	
19	Introduction to polymers and plastics, Functionality of polymers, Classification of polymers (on the basis of their method of synthesis, structure, on the basis of source, their behavior when heated to processing temperature)	C14
20	Amorphous and crystalline polymers, Determination of Molecular weights of polymers, Bio-polymers, Degradation of polymers	C15
21	Structural difference between thermoplastics and thermosetting polymers, Different methods for doing polymerization.	C16
22	Commercially important thermoplastics and thermosetting plastics (Polyethylene (LDPE & HDPE), Polyvinyl chloride).	C17
23	Commercially important thermoplastics and thermosetting plastics (Polystyrene, Polytetrafluoroethylene). Recycling of plastics.	C18
24	Conducting polymers (conjugated and doped conducting polymers) and their conducting mechanism, chemical resistance of polymers.	C19

	Unit V: Surface Chemistry	
25-27	Different forms of adsorptions; energetics of adsorptions; application of adsorptions; adsorption isotherms- Langmuir, Freundlich and BET isotherms	C20
28-29	colloids; surfactants; micelles; enzyme catalysis	C21
30	catalysis in industrial processes	C22
	Unit VI: Corrosion and its control	
31	Introduction to corrosion	C23
32-33	Types and mechanism of corrosion	C24
34-35	Factors affecting corrosion	C25
36	Methods to control corrosion	C26
	Unit VII: Chemistry of nanomaterials	
37-38	Introduction; different methods of synthesis of nanomaterials- top down and bottom up	C27
39	Role of surfactant or capping agent in morphology of nanoparticles	C28
40	Various dimensions of nanoparticles	C29
41-42	different analytical techniques for characterization of nanomaterials	C30

Books

1. Engineering Chemistry by Jain and Jain (Dhanpat Rai)
2. Engineering Chemistry by S Chawla (Dhanpat Rai)
3. Physical Chemistry by S Glasstone (McMillan India)
4. Environmental Chemistry by A K Dey (New Age international)
5. Chemistry of Nanomaterials by C N R Rao et al (Wiley-VCH)
6. Nanostructures and Nanomaterials -Synthesis , properties and applications by Guozhong Cao (Imperial College Press 57 Shelton Street Covent Garden London WC2H 9HE , 2004)

Course objectives

The objective of the course to impart fundamental knowledge about some selected aspects of chemistry. The topics include material chemistry, physical chemistry, organic chemistry and inorganic chemistry. Some industry relevant topics are also covered under which basic concepts are taught.

Course outcomes

After completion of the topic the students will be able to:

C1: Explain the aims of water and wastewater treatment

C2: Explain the importance of drinking water and discharge standards.

C3: Identify and explain the main physical, chemical and biological processes for water and wastewater treatment.

C4: Explain water quality characteristics of water sources. To describe the purpose and operational steps of key water treatment processes used to improve water quality.

C5: Working knowledge of drinking water regulations and standards required to protect public health and ensure compliance.

C6: Working knowledge of drinking water regulations and standards required to protect public health and ensure compliance.

C7: learn the significance of various orders of reaction in the study of kinetics of chemical reactions

C8: understand the different forms of complex chemical reactions and formulation of mechanism for them

C9: details of Arrhenius equation, energy of activation of chemical reaction and methods and ways for their experimental determination

C10: learn various theories that help to understand the complex reactions, chain reaction etc.

C11: Explain various type of fossil fuels available to the mankind

C12: Understand the importance of synthetic petrol, petrochemicals and bio-fuels

C13: Judge the quality of coal and petroleum for their proper utilization and conservation for future use.

C14: Understand the basic importance and synthetic procedure different typed of polymers/plastics

C15: Learn the concept of amorphous and crystallinity in polymer, the knowhow on determination of their molecular weight and their degradation.

C16: Learn structural difference between widely useful thermoplastics and thermosetting polymers, and method to produce them.

C17: Learn the different properties, synthesis and practical importance of plastics/polymers.

C18: Learn the different commercially important polymers and plastics and their recycling.

C19: Understand the behavior of polymers toward electricity, their conduction, methods of preparing conducting polymers and their resistance towards diverse chemicals and environment.

C20. Understand the different aspects surface phenomena and relate them different isotherms.

C21. Understand the phenomena of colloidal, surfactants and micellar formation and their applicability in chemical and physical processes, acquire substantial knowledge about the process of enzyme catalysis

C22. Learn the advantages and disadvantages of homogeneous and heterogeneous catalysis, relevance of heterogeneous catalysis in useful industrial processes.

C23: Understand the term corrosion, the reason for undergoing corrosion and the effects of corrosion. They will know the importance of discussing corrosion which is one of the greatest social enemy.

C24: Guess the kind of corrosion a particular metal is undergoing with clear understanding of the mechanism of corrosion

C25: Understand the various factor that affects the rates and extend of corrosion that is important in designing methods to prevent or control corrosion

C26: Select appropriate method for prevention of particular corrosion after understanding the principles of each methods.

C27: have detailed idea about various introductory concepts about nanomaterials and their different methods of preparations.

C28: understand the importance of different morphologies of nanoparticles and how various surfactants help to tune these morphologies

C29: gather knowledge about zero, one, two and three-dimensional nanoparticles with examples

C30: understand the working principles of various analytical tools routinely used for characterization of nanomaterials.

CH 111	CHEMISTRY LABORATORY	L-T-P-C
Semester/Year : First Year		0-0-3-2

Pre-Requisite - None

Experiment 1: To Determine the total hardness of pond water/ supplied water using Standard EDTA Solution

Experiment 2: Estimation of magnesium from supplied solution using standard EDTA

Experiment 3: Estimation of calcium from supplied solution using standard EDTA

Experiment 4: Determination of Dissolved oxygen (D.O) of lake water

Experiment 5: Determination of total alkalinity of supplied aqueous solution.

Experiment 6: To determine the strength of the $KMnO_4$ solution using standard oxalic acid solution

Experiment 7: To determine amount of Fe(II) present in the supplied solution using Standard KMnO4 solution

Experiment 8: To determine amount of Fe(III) present in the supplied solution using Standard K2Cr2O7

Experiment 9: Quantitative determination of Copper (II) using Standard HYPO ($Na_2S_2O_3$) Solution

Experiment 10: Estimation of calcium in milk powder using standard EDTA solution

Experiment 11. Detection of special elements in supplied organic compounds.

Experiment 12: Determination of functional groups in the supplied organic compounds

Experiment 13: Preparation of Copper (II) glycinato complex

Experiment 14: Determination of relative viscosity of the given organic compound by Ostwald Viscometer

Experiment 15: Determination of surface tension of the given organic compound by stalagmometer.

Course Objectives:

To teach good laboratory practice and skills to analyze and interpret the data from experiments with some insight into future career prospect in the fields related to Chemistry.

Course Outcomes of Chemistry Laboratory, CH-111

After studying this module, the students shall be able to

- know about the methods for the determination of water quality parameters. They can assess the quality of water for drinking purposes, pisciculture etc. by performing experiments like determination of Total hardness, Total alkalinity, Ca^{2+}, Mg^{2+}, Fe, Cu ions and dissolved oxygen present in water.
- determine the physical properties of liquids by performing the experiments such as viscosity and surface tension of liquids. They will also be able to determine the viscous nature of the lubricating oil. The generated knowledge can be used for industrial product development like detergent formulation, paints, drugs etc.
- synthesize coordination complexes of biologically important transition metal ions.
- to perform the chemical reactions to find out different elements, functional groups or nonmetals present in the organic compounds. This will also help them to understand the role of different functional groups in chemical reactivity.
- gain the knowledge of central role of chemistry and will understand the concepts of safe laboratory practices. They will develop and apply the appropriate lab skills and instrumentation to solve chemical problems and environmental issues facing our society in terms of energy, health and medicine.

MA 101	Mathematics-I	L-T-P-C
Semester/Year : First Semester		3-1-0-4

Pre-requisite: *Limit, Continuity, Differentiability, First order ODE, Rolle's theorem, Mean value theorem, Basic idea of integration.*

Infinite Series:

Definition of Sequence & Infinite series, Convergence & Divergence of real Sequence & Infinite Series, Tests of Convergence of positive term infinite series: Comparison Test, D' Alembert's Ratio Test, Raabe's Test, Cauchy's root Test, Integral Test, Alternating Series, Leibnitz's Test (all tests without proofs).

Differential & Integral Calculus:

Successive Differentiation, Leibnitz's Theorem, Curvature: Radius & centre of curvature, Asymptotes and Curve tracing, Partial differentiation, Taylor's & Maclaurin's Theorems with Lagrange's form of remainder for a function of one variable, Euler's theorem, Taylor's theorem for a function of two variables, Jacobian. Improper Integrals: Beta function & Gamma function.

Ordinary Differential Equation:

Exact differential equation of first order, Integrating factors, Second & higher order linear differential equations with constant coefficients, Homogeneous (Cauchy's) linear differential equation, Method of variation of parameters. Series Solutions of ODE near ordinary point.

Integral Transform:

Basic idea of Integral Transform, Laplace and inverse Laplace transforms & their properties, Convolution Theorem, Solution of ODE by Laplace transform method, Applications in IVP and BVP.

Text Books:

1. Jr. Joel Hass, C. Heil, M.D. Weir, Thomas' Calculus, 14th Edition, Pearson Education, 2018.
2. E. Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley India Pvt. Ltd., 2015.

Reference Books:

1. S.G. Deo, V. Raghavendra, R. Kar, V. Lakshmikantham, Text Book of Ordinary Differential Equations, 3rd Edition, McGraw Hill Education, 2017.
2. B.C. Das, B.N. Mukherjee, Differential Calculus, U. N. Dhur & Sons Pvt. Ltd., 55th Edition, 1949.
3. B.C. Das, B.N. Mukherjee, Integral Calculus, U. N. Dhur & Sons Pvt. Ltd., 57th Edition, 1938.
4. B.S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publisher, 2017.

Course Objectives

1. To make the students knowledgeable in the area of infinite series and their convergence so that he/she may be familiar with limitations of series approximations of functions arising in Mathematical Modelling.
2. To make the students familiar in the area of application of differentiation, curve tracing, expansion of functions, and improper integrals.
3. To enable the students understand the basic ideas of ordinary differential equations and their solutions and the application of integral transform in solving ODE.

Course Outcomes

1. At the end of this course, students will be able to apply the concept of series convergence in engineering problems.
2. The students will be capable to apply differentiation, integration and differential equations in engineering and daily life problems.
3. The students will be able to apply Laplace transform and its inverse in engineering problems.

MA 102	Mathematics-II	L-T-P-C
Semester/Year : Second Semester		3-1-0-4

Pre-requisite: *MA 101: Mathematics-I, Matrix and determinants, Vector operations.*

Linear Algebra:

Linear dependence and independence of vectors in R^n space; Rank and nullity of a matrix, Elementary transformations, Consistency of a System of linear equations & their solutions by Direct Methods: Gaussian Elimination method, Gauss-Jordan method; Eigenvalues & Eigenvectors, Cayley-Hamilton's theorem & its applications, Diagonalization by Similarity Transformations.

Multiple Integrals:

Gradient, Divergence, Curl, Directional derivatives. Double and Triple integrals in Cartesian and Polar form with applications to Volume and Surface Area, Applications of Green's, Stokes' and Gauss Divergence theorems.

Complex Analysis:

Function of a Complex Variable, Analytic function, Harmonic function, Cauchy-Riemann equations, Complex line integral, Cauchy-Goursat theorem, Cauchy's Integral formula, Morera's theorem, Liouville's theorem, Singularities and Residues, Cauchy's Residue theorem and its application to evaluate real integrals.

Numerical Analysis:

Finite difference, Interpolation: Newton's forward and backward interpolation formulae, Lagrange's formula. Solution of algebraic and transcendental equations: Fixed point Iteration method, Newton-Raphson Method. Solution of system of linear equations by Iterative Methods: Gauss Jacobi's method & Gauss-Seidel method. Solution of ODE: Picard's method, Taylor series method and Runge-Kutta method (Fourth order).

Text Books:

1. Jr. Joel Hass, C. Heil, M.D. Weir, Thomas' Calculus, 14th Edition, Pearson Education, 2018.
2. E. Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley India Pvt. Ltd., 2015.

Reference Books:

1. F. Ayres, Theory and Problems of Matrices, Schaum's Outline Series, 1st Edition, 1962.
2. M.R. Spiegel, Laplace Transforms, Schaum's Outline Series, 1st Edition, 1965.
3. L. V. Ahlfors, Complex Analysis, McGraw-Hill Education, 3rd Edition, 1979.
4. D. Sarason, Complex Function Theory, American Mathematical Society, 2007.
5. B.S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publisher, 2017.

Course Objectives

1. To make the students knowledgeable in the area of system of linear equations together with solution techniques and applications in engineering problems.
2. To make the students familiar in calculating multiple integrals, and application of vector differential operators.
3. To enable the students understand the basic ideas of complex analysis and its application in evaluating real integrals.
4. To enable the students understand the limitations of direct methods and application of numerical methods in solving algebraic/ transcendental equations and ordinary differential equations.

Course Outcomes

1. The students will be able to apply the consistency concepts, eigenvalues and eigenvectors concepts in engineering problems.
2. The students will be capable to find the surface area and volume using multiple integrals in engineering and daily life problems.
3. The students will be able to apply basic idea of complex analysis in evaluating real integrals and engineering problems.
4. The students will be capable of solving numerically various types of equations/differential equations arising in engineering problems up to desired degree of accuracy.

HS 101	Communicative English	L-T-P-C
Semester/Year : First Year		3-0-0-3
	Pre-requisite - Nil	

Objectives of the Course

This course has been designed:

1) To impart advanced skills of technical communication in English through practice sessions to first semester UG students of Engineering and Technology.
2) To enable them to communicate confidently and competently in English language.

1. Writing

(i) Common Grammatical Error
(ii) Citation, Formatting, Stylesheet, Plagiarism etc.
(iii) Writing based on Visual Elements: Tables, Figures, Graphs etc.
(iv) Report writing & Poster Presentation

2. Speaking

(i) Simulation of interactive speaking environment&Group Activities: Group Discussions, Debates, Extempore

3. Reading

(i) Comprehension Skills
(ii) Critical reading Skills

4. Listening

(i) Proper Pronunciation and Transcription
(ii) Speech-Thought Coordination

Outcome

After completion of the course, the students are expected to have basic command over the English language in order to communicate with others in day to day affairs, understand and respond to lectures delivered in English, read and comprehend relevant materials written in English, and thus go forth into their professional lives beaming with confidence.

References

1. Knisely&Knisely, Engineering Communication, Cengage Learning; 2015
2. S. Upendran, Know Your English, Vols. 1 & 2, Univesities Press, 2014
3. Seema Miglani&Sikha Goyal, English for Professionals, vayu Education, 2010
4. Nilanjana Gupta, English for All, McMillan, 2000

HS 111	**Language Laboratory**	**L-T-P-C**
Semester/Year : First Year		**0-0-3-2**
	Pre-requisite - Nil	

Objectives of the Course

This course has been designed:

1) To develop and consolidate the spoken language skill of the participants by enhancing overall competency in the English Language
2) To allow students to develop proficiency so as to communicate more coherently and emphatically

1. Introduction to Phonetics - Speech Sound s- Vowels and Consonants
2. Articles, Prepositions, Word Formation-Prefixes & Suffixes, Synonyms & Antonyms
3. Tense & Number
4. Situational Dialogues- Role Play- Expressions in various situations- Self introduction and introducing others- Greetings- Apologies- Requests- Social and Professional Etiquette- Telephone Etiquette etc.
5. Minimal Pairs- Word Accent and Stress Shifts- Listening Comprehension.
6. Descriptions- Narrations- Giving directions and guidelines
7. Intonation and Common Errors in Pronunciation
8. Extempore- Public Speaking - Active and Passive Voice
8. Common Errors in English, Idioms and Phrases.
9. Neutralization of Mother Tongue Influence and Conversation Practice.
10. Information Transfer- Oral Presentation Skills Reading Comprehension

Outcome

After completion of the course, the students are expected to have good pronunciation, to be better in listening and comprehension, to become more effective communicators by organizing communication coherently, and to articulate ideas in a clear concise manner.

CE 101 **ENGINEERING GRAPHICS & DESIGN** **L-T-P-C**

Semester/Year : First Year **1-0-3-3**

Pre-requisite - Nil

Total hours	Lecture: 13 Hours, Tutorial: Nil, Practical: 42 Hours
Course Description	This course is designed to provide engineering undergraduates with basic understanding of the theory and practice of engineering drawings and computer aided drawing for engineering applications. Students will learn to read and construct blueprints and working drawings by means of lectures, discussion of drawing examples related to 2D and 3D objects, Auto-CAD practice. Topics will include basic fundamentals of graphics and drafting principles, Auto-Cad fundamentals, plan and elevation of simple and complex objects, conversion of given plan and elevation of an object into 3D views.
Course Objectives	1. To present fundamentals of graphics and drafting appropriate for developing functional skill in computer aided drafting. 2. To provide students with adequate knowledge and experience in preparing engineering drawings using AutoCAD and CATIA 3. To teach students to read, construct and understand basic engineering drawings. 4. To help students acquire the skills pertinent to the production of properly detailed, formatted and dimensioned Engineering drawings.
Course outcome	Upon completion of this course, students should be able to: 1. produce geometric construction, multiview, dimensioning and detail drawings of typical 3-D engineering objects. 2. apply the skill for preparing detail drawing of engineering objects. 3. understand and visualize the 3-D view of engineering objects. 4. understand and apply computer software to prepare engineering drawing.

Syllabus

Introduction

Introduction to Engg. Graphics. General instruction regarding instruments, dimensions and lettering. Division of lines, angles and curves. Construction of different polygons.

Scales and Conic sections

Construction of Scales – Plain, Diagonal and Vernier Scales, Construction of conic sections - parabola, ellipse, hyperbola, cycloid, trochoids, epicycloid and hypocycloid.

Orthographic projection

Projections of Regular Solid covering, those inclined to both the Planes-Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Conversion of pictorial views of objects into orthographic projections

Sections and Sectional Views

Sections and sectional views of Solids - Prism, Cylinder, Pyramid, Cone, Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)

Isometric projection

Isometric projection and isometric views of lines, planes and solids, isometric scale, conversion of orthographic projections into isometric views.

Computer Graphics

Overview, listing of computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD and CATIA software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids];

Graphics tool Customisation

Drawing tool (CAD & CATIA) customization consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;

Annotations

Layering & other functions, applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar

projection theory, including sketching of perspective, isometric, multi-view, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling.

Product design and development

Demonstration of a simple team design project that illustrates Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modeling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

Reference Books:

1. Engineering drawing	N.D.Bhatt & V.M.Panchal	Rupalee Publication, New Delhi
2. Engineering Drawing and Graphics+ AutoCAD	K. Venugopal	New Age International, New Delhi.
3. CATIA V5-6R2016 of Designers	Prof. Shyam Tickoo	BPB Publication, ISBN: 9789386551191, 9386551195 Edition: 14th, 2017
4. Text book on Engineering Drawing,	Narayana, K.L. & P Kannaiah),	Scitech Publishers
Theory and User Manuals for CAD and CATIA Software		

CE 102 **ENVIRONMENTAL SCIENCE & ENGINEERING** **L-T-P-C**

Semester/Year : First Year **3-0-0-3**

Pre-requisites: **None**

Course Objectives

CO1	To acquire a basic understanding and knowledge about the environment and its allied problems
CO2	Realize the importance of ecosystem and biodiversity for maintaining ecological balance
CO3	Develop the ability to evaluate measures for the improvement and protection of environment
CO4	To develop analytical skills, critical thinking, and demonstrate problem-solving skills using scientific techniques towards solutions of current problems and prevention of future problems.

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

CO1	Understand environmental problems arising due to developmental activities.
CO2	Identify the natural resources and suitable methods for conservation and sustainable development.
CO3	Realize the importance of ecosystem and biodiversity for maintaining ecological balance.
CO4	Identify the environmental pollutants and abatement devices.

Detailed syllabus:

Introduction: Environment, Definition, scope and importance, multidisciplinary nature of environmental studies

Natural Resources: Forest Resources –use and over-exploitation of forests, deforestation, timber extraction, mining, dams and their effects on forests and tribal people Water Resources-Use and over – utilization of surface and groundwater, floods, droughts, conflicts over water, dams-benefits and problems. Mineral resources-use and exploitation, environmental effects of extracting and using mineral resources. Agriculture land and food resources-Land as resources land degradation, man induce landslides, soil erosion and desertification; World food problems, changes caused agricultural and overgrazing, effects of modern agriculture practices, fertilizers and pesticides problems, water logging, salinity, case studies Energy Resources- Growing energy needs, renewable and non-renewable energy resources, Sources of alternate energy sources, Case studies Energy conservation.

Ecosystem and Biodiversity: Ecosystem-Concept of an ecosystem, structure and function of an ecosystem, Food chain, food webs and ecological pyramids, Energy flow in ecosystem producers and consumers Ecological Succession, Biodiversity and its Conservation – introduction, definition, genetic species and

ecosystem diversity, value of biodiversity, Consumptive use, productive use, social, ethical aesthetic and optional values, biodiversity at global, national and local values, India as a mega-biodiversity nation, hotspots of biodiversity, threats to biodiversity- habitat loss, poaching of wildlife conflicts, endangered and endemic species in India, conservation of biodiversity – in-situ and ex-situ conservation of biodiversity.

Environmental Pollution: causes, effects and control measures of air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution, nuclear radiation hazards, Solid waste management, sources of solid waste effects and control measures of urban industrial wastes: Pollution case studies, disaster management- floods, earthquakes, cyclones and landslides.

Environment and society: Role of an individual prevention of pollution, consumerism and waste products, unsustainable to sustainable development, water conservation, rainwater harvesting, watershed management, wasteland reclamation, observance and popularization of Environmental Protection Act. Air (Prevention and control of pollution) Act. Water (Prevention and control of pollution) Act, Wildlife Protection Act, Forest Conservation Act, issue involved in enforcement of environmental legalizations, population growth, variation among nations, Environment and human health, epidemics, Women and child welfare, Role of information technology in environment and human health.

Reading

1. Henry J.G. and Heinke G.W. (2004). “Environmental Science and Engineering”. Second Edition, Prentice Hall of India. New Delhi.
2. Chandrasekhar M (2004), “Environmental Science”. Hi-Tech Publishers, Hyderabad.
3. Masters G.M. (2004), “Introduction to Environmental Engineering and Science”. Second Edition, Prentice Hall of India. New Delhi.
4. Garg S.K. and Garg R. (2006), Ecological and Environmental Studies, Khanna Publishers, Delhi
5. Bharucha, E. (2003), “Environmental Studies”, University Publishing Company, New Delhi.
6. De A.K. (2002), “Environmental Chemistry”, New Age India Publication Company, New Delhi.
7. Chauhan, A.S. (2006) Environmental Studies, Jain Brothers, New Delhi.
8. Deswal, S. and Deswal A. (2004), A Basic Course in Environmental Studies, Dhanpat

ME 101	ENGINEERING MECHANICS	L-T-P-C
Semester/Year : First Year		**3-1-0-4**

Pre-requisites: **None**

Objectives:

- To introduce the basic principles of engineering mechanics with emphasis on their analysis and application to practical engineering problems
- To understand the representation of forces and moments
- To describe static equilibrium of particles and rigid bodies
- To comprehend the effect of Friction on general plane motion
- To analyse the properties of surfaces & solids in relation to moment of inertia
- To illustrate the laws of motion, kinematics of motion and their interrelationship

PART – I: STATICS

Statics of rigid bodies: Classification of force systems- principle of transmissibility of a force Composition and resolution- Resultant of a coplanar force systems and conditions of equilibrium, free body diagrams. Moment of a force, couple, properties of couple- Varignon's theorem, Concurrent and parallel forces, conditions of equilibrium.

Beams: Types of loading, Support reactions of simply supported and overhanging beams under different types of loading.

Friction: Laws of dry friction - Angle of friction - Cone of friction - Ladder friction, Wedge friction, Belt friction, Simple Screw Jack.

Properties of surfaces: Centroid of simple and composite areas- Theorems of Pappus and Guldinus. Moment of inertia of areas, Parallel and perpendicular axes theorems- Radius of Gyration, moment of inertia of simple and composite areas.

Plane Truss: Statically determinate trusses; Analysis of a truss and frames - Method of joints, Method of section, Method of Members.

Virtual Work: Degree of freedom, Virtual displacement and virtual work; Principle of virtual work.

PART–II: DYNAMICS

Kinematics of Particles: Differential equations of kinematics; Cartesian coordinate system; Normal and tangent co-ordinate system, projectile motion.

Kinetics of Particles: Kinetics of rectilinear and curvilinear motion, D'Alemberts Principle, Principle of impulse and momentum, Work, energy and power, Direct and oblique collision

Rotation of Rigid Bodies: Moment of inertia of material bodies, Kinematics and Kinetics of rotation- equation of motion, Principle of work and energy; Principle of impulse and momentum.

Plane motion of Rigid Bodies: Translation of a rigid body in a plane; Kinematics of plane motion; Instantaneous center of rotation; Kinetics of plane motion – equation of motion, principle of work and energy; Principle of impulse and momentum.

Outcome:

On successful completion of this course, a student would be able to identify and analyze the problems by applying the fundamental principles of engineering mechanics and to proceed to design and development of the mechanical systems.

Texts/Reference:

1. S. Timoshenko, D. H. Young, J.V. Rao, S. Pati: Engineering Mechanics: McGraw Hill Education; 5th edition
2. J. L. Meriam & L.G. Kraige: Engineering Mechanics -Statics: John Wiley & Sons, Inc
3. J. L. Meriam & L.G. Kraige: Engineering Mechanics -Dynamics: John Wiley & Sons, Inc
4. F. P. Beer, Jr., E. R. Johnston, E. R. Eisenberg, P. J. Cornwell, D. Mazurek: Vector Mechanics for Engineers- Statics & Dynamics: McGraw-Hill Higher Education; 9th edition
5. R.C. Hibbeler: Engineering Mechanics - Statics & Dynamics: Pearson Education; Fourteenth edition
6. A. Nelson: Engineering Mechanics Statics and Dynamics: McGraw Hill Education; 1st edition
7. K. L. Kumar, V. Kumar: Engineering Mechanics: McGraw Hill Education; 4th edition

ME 111	WORKSHOP PRACTICE	L-T-P-C
Semester/Year : First Year		0-0-3-2

Pre-requisites: **None**

Objectives:

- To develop a skill in dignity of labour, precision, safety at work place, team working and development of right attitude.
- To acquire skills in basic engineering practice
- To identify the hand tools and instruments
- To gain measuring skills
- To develop general machining skills in the students

General safety precautions in workshop and introduction.

Carpentry Shop: Safety precaution, Kinds of wood and timber, Application of timber as per their classification, Carpentry hand tools and machines, Different types of carpentry joint, Demonstration of wood working machine like, band saw, circular saw, thickness planner, wood working lathe, surface planners etc.

Welding Shop: Safety precaution in welding shop, Introduction to gas and arc welding, Soldering and brazing etc. Welding equipment and welding material.

Fitting Shop: Safety precaution, Introduction to fitting shop tools, equipment, Operation and their uses, Marking and measuring practice.

Machine Shop: Safety precautions, Demonstration and working principles of some of the general machines, like lathe, shaper, milling, drilling , grinding, slotting etc., General idea of cutting tools of the machines.

Texts/Reference:

1. S K Hajra Choudhury, A K Hajra Choudhury, N. Roy: Workshop Technology Vol I & II; Media Promoters & Publishers Pvt. Ltd.
2. H S Bawa: Workshop Practice; McGraw Hill Education; 2nd edition

Course Outcomes

The student will be able to:

- know the importance of general safety precautions on different shop floors.
- identify the basics of tools and equipments used in fitting, carpentry, sheet metal, machine, welding and smithy.
- fabrication of wooden joints and understand joining of metals.
- make metal joints and sheet metal work.
- understand the basics of removal of material from workpiece surface to attain specific shape.
- familiarize with the production of simple models in fitting, carpentry, sheet metal, machine, welding and smithy trades.

EE 101 **BASIC ELECTRICAL ENGINEERING** **L-T-P-C 3-1-0-4**

Semester/Year : First Year

Prerequisite: None

Introduction: Definition of active, passive, linear, non-linear, unilateral, bilateral, symmetrical, unsymmetrical network with example. Basic concept of circuit elements and their uses. Sources: current sources and voltage sources, dependent source, independent source, circuit laws (KCL & KVL), commonly used symbol and notations in electrical circuits. (3 Hours)

A.C. Fundamentals and R, L, C Circuit: Equation of AC Voltage and currents, waveform, time period, frequency, amplitude, different forms of emf equations, phase, phase difference, average value, RMS value, form factor, peak factor. Series and parallel RL, RC, and RLC circuits and their phasor representation; steady state response; Operator j notation of complex quantity in rectangular and polar form. Concept of Impedance and admittance: definition, relation, impedance, and admittance triangle. Complex power: active, reactive and apparent power, power triangle. (10 Hours)

Network Theorems: Star delta conversions, Node & loop equations, Thevenin's Theorem (AC & DC), Norton's Theorem (AC & DC), Superposition Theorem (AC & DC), Maximum power transfer theorem (AC & DC), Reciprocity Theorem (AC & DC) (All theorems with independent sources only). (7 Hours)

Poly-phase Networks: Balanced Star-Delta connections, phase and line currents and voltages and their relations; (2 Hours)

Electromechanical Energy conversion: Electromechanical laws: relation between electricity and magnetism, production of emfs (ac & dc), Faraday's law of electromagnetic induction, direction of induced emf, Lenz law, dynamically and statically induced emfs, self-inductances, and mutual inductances. (3 Hours)

Electrical Machines: Types of Electrical Machines and their applications; Working principle of DC machines, single phase transformer, and 3-phase induction motor; EMF equation, (7 Hours)

Measurement: Measurement of voltage, current and Power in single and three phase (2 hours)

Electrical safety: Definition, precautions, concepts of grounding and earthing. (2 Hours)

Reference Books:

S. N.	Author	Name of Book	Publisher
1	Del Toro V.	Electrical Engineering Fundamentals	PHI
2.	Theraja B. L.	Electrical Technology	S Chand
3.	Hayt W. H., Kemmerly J. E.	Engineering Circuit Analysis	McGraw Hill
4.	H. Cotton	Electrical Technology	PHI
5.	J. B. Gupta	Basic Electrical Engineering	Katson

Course Objective:

- To provide knowledge on various components used in fundamental electric circuits.
- To study the fundamentals of alternating current fundamentals and its use and behaviour in R, L and C circuits.
- To solve simple electrical circuit parameters using circuit analysis theorems, voltage and current dividers and node and mess analysis methods.
- To understand the basics of single phase and 3 phase poer supple fundamentals.
- To provide concept of electro-mechanical conversion of energy using DC machines and basics of transformers and 3 phase induction machines.
- To use simple electrical measurement techniques for measurement of current, voltage and power in both 1 phase and 3 phase systems.
- To learn basics of electrical safety in work place and sue of grounding and earthing.

Course Outcome:

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

- Learn how to develop and employ circuit models for elimentary slsctric components, e.g. resistor, sources, inductor, capacitors and power sources.
- Demonstrate the relationship of current and voltage phasors in 1 phase AC and their relationship in combinations of R, L and C
- Become adept at using various methods of circuit analysis, including simplified methods such as series-parallel reductions, voltage and current dividers, and node and mesh methods.
- Appreciate the consequences of linearity, in particular the principle of superposition, Thevenin-Norton equivalent circuits and Reciprocity theorem.
- Gain an intuitive understanding of the role of AC power flow in star and delta networks and relationship of line and phase values.
- Develop the capability to analyze the concept of electromechanical conversion of energy using DC machines and basics of transformer with 3 phase induction machine.
- Apply various modes and methods of measurement of voltage, current and power in both 1 phase and 3 phase circuits.
- Demonstrate the common safety practices of using electricity in workplace with knowledge of grounding and earthing.

EE 111 **BASIC ELECTRICAL ENGINEERING LABORATORY** **L-T-P-C 0-0-3-2**

Semester/Year : First Year

Prerequisite: None

The laboratory experiments are designed to cover the syllabus of EE 1101 and a list of such experiments are listed. This list is not exclusive.

List of Experiments

1. Study and verification of Kirchhoff's Laws applied to direct current circuit.
2. Study the behavior of AC series circuits.
3. Study the behavior of AC Parallel circuits.
4. Verification of Superposition theorem.
5. Verification of Thevenin's theorem.
6. Verification of Norton's theorem.
7. Verification of Maximum power transfer theorem.
8. Verification of Reciprocity theorem.
9. Measurement of LC parameters by using 3- Ammeter method.
10. Calibration of milliammeter.
11. Resonance of series RLC circuit.
12. To study the balanced three phase circuit.
13. Speed control DC motor using flux control and armature resistance control methods
14. OC and SC test on Single-phase transformer.
15. Study of balanced three-phase circuit/ Measurement of three-phase power using two wattmeter method.
16. Reversal of direction of rotation of a three-phase Induction motor/ Load test of three-phase Induction motor.

Course Objective:

- To provide practical knowledge on various electrical circuits including series-parallel combinations with R, L and C.
- To understand the basic electrical laws like KCL, KVL, Ohms law
- To demonstrate the use of various electrical circuit solving theorems including Thevenin;s theorm, Norton's theorem, maximum power transfer theorem, Reciprocity theorem.
- To study resonance of RLC circuit n series and parallel combinations.
- To demonstrate calibration of various meters like millivoltmeter, milliammeter.
- To demonstrate the DC motor speed control.
- To study the OC and SC test of 1 phase transformer
- To demonstrate measurement of current, voltage and power in electrical circuit.

Course Outcome:

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

- Demonstrate the different circuit laws in practical circuits.
- Apply various network theorems to solve circuit parameters.
- Gain an intuitive understanding of the role of common measurement methods used for current, voltage and power in 1 phase and 3 phase circuits.
- Become adept at using various methods calibration of measuring meters.
- Demonstrate the ability to control of speed of DC motors using flux control and armature resistance control
- Find out the resonance frequency of a given RLC circuit in series and parallel combinations.

EC 101	**Basic Electronics**	**L-T-P-C**
Semester/Year : First Year		**3-1-0-4**

Pre-requisite- None

Course objectives- This course introduces students to the basic components of electronics: diodes, transistors, and op amps. It covers the basic operation and some common applications and fundamental aspects of digital electronics

Introduction to Electronic devices: passive devices, diode, bipolar junction transistor (BJT), metal oxide semiconductor field-effect transistor (MOSFET);

Diode: basic structure and operating principle, current-voltage characteristic, large and small-signal models, iterative and graphical analysis; Diode Applications : rectifier circuits (half-wave and full-wave rectifiers, rectifiers with capacitor filter), voltage regulator (using Zener diode), clipper (limiter) circuits, clamper circuits;

Bipolar Junction Transistors and their Applications: structure and modes of operation; n-p-n and p-n-p transistor in active mode, DC analysis of both transistor circuits; BJT as an amplifier, small-signal equivalent circuits, single-stage BJT amplifier (common-emitter mode); BJT as a switch; concepts of feedback amplifier

Metal Oxide Semiconductor Field-Effect Transistors and their Applications: structure and physical operation of n-type and p-type MOSFET; DC analysis of MOSFET circuits; MOSFET as an amplifier, small-signal equivalent circuits, single-stage MOSFET amplifier (common-source mode); MOSFET as a switch;

Operational Amplifier (Op Amp) : ideal op amp; inverting amplifier, amplifier with a T-network, effect of finite gain, summing amplifier; non-inverting configuration, voltage follower; op amp applications like current-to-voltage converter, voltage-to-current converter, difference amplifier, instrumentation amplifier, integrator and differentiator;

Digital Electronics: Boolean algebra and rules of simplification; combinational circuits like adder, decoder, encoder, multiplexer and demultiplexer; sequential circuits like flip-flops, counters and shift registers.

Text/Reference books:

1.	Microelectronic Circuits, 7th Edition	Adel S Sedra and Kenneth C Smith	Oxford University Press
2.	Microelectronics, 2nd Edition	Jacob Millman and Arvin Grabel	Tata McGraw Hills
3.	Digital Design, 5th Edition	M. Morris Mano and Michael D Ciletti	Pearson
4.	Fundamentals of Digital Circuits, 4th Edition	A Anand Kumar	PHI
5.	Integrated Electronics, 2nd Edition	Jacob Millman and Christos Halkias	Tata McGraw Hills

1. Course Outcome (CO)

CO	Course Outcome Statement	Bloom's Taxonomy level
1	Students can understand the fundamentals of electronic devices.	Knowledge
2	Student will become familiar with the principle of operation, configuration and their characteristics.	Comprehension
3	Students will understand and analyze the different topologies of above devices.	Evaluation and Analysis
4	Students will understand the designing of particular electronic circuit for specific application.	Application

2. Program Outcome (PO)

PO	Program Outcome Statement
1	**Engineering Knowledge :** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	**Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

3. Program Specific Outcome (PSO)

PSO	Program Specific Outcome Statement
1	Ability to Identify, Formulate & Solve problems of basics of Electronics & Communication Engineering and to apply them to various areas like Analog & digital Circuits, Signal & systems, Communication, VLSI, Embedded System etc.
2	Ability to design the systems of Electronics & Communication Engineering using advanced hardware and software tools with analytical skills to achieve the social needs.

3	Knowledge of social & environmental awareness along with ethical responsibility to achieve a successful career addresses the real world applications using optimal resources as an entrepreneur.

4. COURSE PLAN:

Day	MODULE	TOPIC	CO/PO/PSO
1-2	**INTRODUCTION TO ELECTRONIC DEVICES**	passive devices, diode, bipolar junction transistor (BJT), metal oxide semiconductor field-effect transistor (MOSFET)	CO (1) /PO (1) /PSO (1)
3-5	**DIODE: INTRODUCTION AND ANAYLSIS**	basic structure and operating principle, current-voltage characteristic, large and small-signal models, iterative and graphical analysis	CO (2,3) /PO (2,3) /PSO (2)
6-9	**DIODE: APPLICATIONS**	rectifier circuits (half-wave and full-wave rectifiers, rectifiers with capacitor filter), voltage regulator (using Zener diode), clipper (limiter) circuits, clamper circuits	CO (4) /PO (4,5,8) /PSO (3)
10-12	**BIPOLAR JUNCTION TRANSISTORS: INTRODUCTION AND ANALYSIS**	structure and modes of operation; n-p-n and p-n-p transistor in active mode, DC analysis of both transistor circuits	CO (2,3) /PO (2,3) /PSO (2)
13-16	**BIPOLAR JUNCTION TRANSISTORS: APPLICATIONS**	BJT as an amplifier, small-signal equivalent circuits, single-stage BJT amplifier (common-emitter mode); BJT as a switch; concepts of feedback amplifier	CO (4) /PO (4,5,8) /PSO (3)
17-19	**METAL OXIDE SEMICONDUCTOR FIELD-EFFECT TRANSISTORS: INTRODUCTION AND ANAYSIS**	structure and physical operation of n-type and p-type MOSFET; DC analysis of MOSFET circuits	CO (2,3) /PO (2,3) /PSO (2)
20-22	**METAL OXIDE SEMICONDUCTOR FIELD-EFFECT TRANSISTORS: APPLICATIONS**	MOSFET as an amplifier, small-signal equivalent circuits, single-stage MOSFET amplifier (common-source mode); MOSFET as a switch	CO (4) /PO (4,5,8) /PSO (3)
23-26	**OPERATIONAL AMPLIFIER (OP-AMP): IDEAL OP-AMP; INTRODUCTION AND BASIC TOPOLOGIES**	ideal op amp; inverting amplifier, amplifier with a T-network, effect of finite gain, summing amplifier; non-inverting configuration, voltage follower	CO (2,3) /PO (2,3) /PSO (2)
27-30	**OPERATIONAL AMPLIFIER (OP-AMP): APPLICATIONS**	current-to-voltage converter, voltage-to-current converter, difference amplifier, instrumentation amplifier, integrator and differentiator	CO (4) /PO (4,5,8) /PSO (3)

31-33	**DIGITAL ELECTRONICS: FUNDAMENTALS AND IMPLEMENTATION OF LOGIC GATES**	Boolean algebra and rules of simplification	CO (2,3) /PO (2,3) /PSO (2)
34-37	**COMBINATIONAL LOGIC-CIRCUITS IN DIGITAL SYSTEMS**	adder, decoder, encoder, multiplexer and demultiplexer	CO (4) /PO (4,5) /PSO (3)
38-42	**SEQUENTIAL LOGIC-CIRCUITS IN DIGITAL SYSTEMS**	flip-flops, counters and shift registers	CO (4) /PO (4,5) /PSO (3)

EC 111	**Basic Electronics Laboratory**	**L-T-P-C**
Semester/Year : First Year		**0-0-3-2**

Pre-Requisite – None

SYLLABUS:-

1. Familiarization with electronic components and usage of multimeter
2. Familiarization with oscilloscope, signal generator and further usage of multimeters
3. Frequency-response and square-wave testing of R-C, C-R and R-L networks
4. Studies on Voltage Rectifiers
5. Studies on Common-Emitter amplifiers
6. Studies on analog circuits using OP-AMP
7. Studies on logic gates

CS 101 **Introduction to Programming** **L-T-P-C**
Semester/Year : First Year **3-1-0-4**

Prerequisites: None

What is a program; Digital computer fundamentals; What is a language; How program executes.

C programming: Data types; Operators; Expressions; Scope resolution and variable types; Control flow structures; Functions; Arrays and pointers; Structures and Unions; Stream data processing.

Introduction to Object Oriented Programming; Objects and classes; Object hierarchy

BOOKS:

1. Programming in C – Gottfried B.S. (TMH)
2. The C Programming Language - Kernighan B.W. and Ritchie D.M. (PHI)
3. Programming in ANSI C - Balagurusamy E. (TMH)
4. C: How to program - H. M. Deitel and P. J. Deitel (Pearson Ed.)
5. Programming for Engineers - A.R. Bradley (Springer)
6. How to Solve it by Computer - R. G. Dromey (PHI)
7. The C++ Programming Language – Stroustrup B. (Addison-Wesley)

CS 111 **Programming Laboratory** **L-T-P-C**
Semester/Year : First Year **0-0-3-2**

Prerequisites: None

Basic arithmetic operations, control statements, functions, arrays and pointers, structures and unions, file handling etc.

Course Objective:

1. To make students aware about building blocks of programming.
2. To provide exposure to procedural programming.
3. To enable students to synthesize a problem and structure it in programmatic way.

Course Outcome (CO):

1. Learn formulation of simple algorithms for arithmetic and logical problems.
2. Able to translate the algorithms into programs (in C language).
3. Able to use derived types, control structures, functions and pointers for problem solving.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1		✓			✓		✓				
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO3	✓		✓	✓	✓	✓	✓		✓	✓	✓