SHRI RAMDEOBABA COLLEGE OF ENGINEERING AND MANAGEMENT, NAGPUR - 440013

An Autonomous College affiliated to
Rashtrasant Tukadoji Maharaj Nagpur University,
Nagpur, Maharashtra (INDIA)

PROGRAMME SCHEME & SYLLABI
2018 - 2022

B. E. (ELECTRONICS ENGINEERING)

Published by
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ISO 9001 : 2015 CERTIFIED ORGANISATION

ABOUT THE DEPARTMENT :

Department of Electronics Engineering was established in 1986 and presently offers a UG programme in Electronics Engineering and PG Programme in M. Tech. (VLSI Design). The National Board of Accreditation; New Delhi has accredited the UG Programme thrice in succession in the year 2003, 2007 & 2013 and PG programme in 2016. It is recognized center for Doctoral programmes of RTM Nagpur University. The students undergo projects and six month internship at various industries and institutes of repute. The department has 16 state of the art laboratories with investment of over Rs. 2 crores. The major software tools include VLSI design, development and verification platforms, such as Mentor Graphics FPGA advantage, COMSOL Multiphysics and Agilent ADS Design Suite. The back end place and route vendor specific tools are Xilinx's Vivado, Altera's Quartus II, Tanner tool, and ORCAD 15.7. The design Platforms includes Virtex 5 Development Platform, Spartan-6 Development Platform and Embedded System Design Storage Oscilloscope, MIC Trainer, Digital Signal Processors, Pattern Generator and logic analyzer, MATLAB, Lab View are also part of the state of the art labs. The Department and faculty consistently organize and deliver Workshops, training programs and guest lectures for students / researchers for up-gradation of their technical skills. There are various technical clubs, formed at the departmental level, in which, students actively participate for various national and international events. Faculty members and students participate in INUP programme at IIT, Powai, Mumbai.

VISION OF DEPARTMENT

Electronics Engineering Department endeavors to facilitate state of the art technical education in the field of electronics engineering by infusing scientific temper in students leading towards research and to grow as centre of excellence in the field of microelectronics.

MISSION OF DEPARTMENT

- To promote quality education through stimulating environment for dissemination of knowledge and technology.
- To impart necessary technical, professional skills with moral and ethical values to enable students for achieving a successful career.
- To develop centre of excellence in the field of microelectronics and its allied areas with continuing education program.
- To foster research and development in collaboration with institutions/industries.

1. PROGRAM EDUCATIONAL OBJECTIVES (PEO'S)

Program Objectives

1. To prepare graduates to solve engineering problems exhibiting a foundation in mathematical, scientific and electronics engineering fundamentals.
2. To inculcate an ability to design and develop electronic systems to cater the needs of the society.
3. To instill sense of professional and ethical values, effective communication, teamwork, multidisciplinary approach and lifelong learning to excel in professional career / higher studies.

PROGRAM OUTCOMES

1. **Engineering knowledge :** Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution to the solution of complex engineering problems.
2. **Problem analysis :** Identify, formulate, review research literature and analyze complex engineering problems reacting 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 process that meet the specified need 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 proffessional engineering solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.
8. **Ethic :** 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 report 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 project 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.

PROGRAMME SPECIFIC OUTCOMES:

1. To understand the basic concepts in Electronics Engineering and apply them to various areas, like Digital & Analog electronics, Communication systems, Signal processing, VLSI and Embedded systems.
2. To apply knowledge of Electronics Engineering to design, analyze evaluate circuits & systems using hardware and software tool, meeting realistic constraints.

TEACHING SCHEME FOR FIRST YEAR (SEMESTER I & II) BACHALOR OF ENGG GROUP 1: SEMESTER-I/ GROUP 2: SEMESTER-II

Sr. No.	Code	Course	Branches	Semester	Hours/week L	T	P	Credits	Maximum Marks: Continual Assessment	End Sem Examination	Total	ESE Duration (Hours)
1.	PHT151	Mechanics	Civil; Industrial	Group II: Sem II	3	1	0	4	40	60	100	03
	PHT152	Oscillations, waves & Optics	Electrical	Group I: Sem I								
			Mechanical	Group II: Sem II								
	PHT153	Semiconductor Physics	Electronics; EDT; Electronics & Comm	Group I:Sem I								
			Computer Science Engg; Information Tech.	Group II: Sem II								
2.	PHP151	Mechanics Lab	Civil; Industrial	Group II: Sem II	0	0	3	1.5	25	25	50	–
	PHP152	Oscillations, waves & Optics Lab	Electrical	Group I: Sem I								
			Mechanical	Group II: Sem II								
	PHP153	Semiconductor Physics Lab	Electronics; EDT; Electronics & Comm.	Group I:Sem I								
			Computer Science Engg; Information Tech.	Group II: Sem II								
3.	MAT151/ MAT152	Calculus/Differential Equations, Linear Algebra, Statistics & Probability	All Branches		3	1/0	0	4/3	40	60	100	03
4.	MAP151	Computational Mathematics Lab	All Branches		0	0	2	1	25	25	50	–
5.	EET151	Basic Electrical Engineering	All Branches		3	1	0	4	40	60	100	03
6.	EEP151	Basic Electrical Engineering Lab	All Branches		0	0	2	1	25	25	50	–
7.	MET151	Engineering Graphics & Design	All Branches		1	0	0	1	40	60	100	03
8.	MEP151	Engineering Graphics & Design Lab	All Branches		0	0	4	2	50	50	100	–
9.	HUT152	Constitution of India	All Branches		2	0	0	0	–	–	–	–
10.	PEP151	Yoga/Sports	All Branches		0	0	2	0	–	–	–	–
				Total	12	3/2	13	**18.5/17.5**			**650**	

GROUP 1: SEMESTER-II/ GROUP 2: SEMESTER-I

Sr. No.	Code	Course	Branches	Hours/week L	T	P	Credits	Maximum Marks: Continual Assessment	End Sem Examination	Total	ESE Duration (Hours)
1.	CHT151	Chemistry	All Branches	3	1	0	4	40	60	100	03
2.	CHP151	Chemistry Lab	All Branches	0	0	3	1.5	25	25	50	–
3.	MAT152/ MAT151	Differential Equations, Linear Algebra, Statistics & Probability / Calculus	All Branches	3	0/1	0	3/4	40	60	100	03
4.	CST151	Programming for Problem Solving	All Branches	4	0	0	4	40	60	100	03
5.	CSP151	Programming for Problem Solving Lab	All Branches	0	0	2	1	25	25	50	–
6.	IDT151	Creativity, Innovation & Design Thinking	All Branches	1	0	0	1	20	30	50	1.5
7.	INT151	Workshop / Manufacturing Practices	All Branches	1	0	0	1	20	30	50	1.5
8.	INP151	Workshop/Manufacturing Practices Lab	All Branches	0	0	2	1	25	25	50	–
9.	HUT151	English	All Branches	2	0	0	2	40	60	100	03
10.	HUP151	English Lab	All Branches	0	0	2	1	25	25	50	–
			Total	14	1/2	9	**19.5/20.5**			**700**	

Scheme of Teaching & Examination of Bachelor of Engineering
III Semester B.E. (Electronics Engineering)

Sr. No.	Course Code	Course Title	Hours per week L	T	P	Credits	Maximum Marks: Continuous Evaluation	End Sem Exam	Total	ESE Duration (Hrs)
1	MAT254	Mathematics III	2	0	0	2	40	60	100	3hrs
2	EET261	Network Theory	3	0	0	3	40	60	100	3Hrs
3	ENT251	Electronic Devices & Circuits	3	1	0	4	40	60	100	3Hrs
4	ENP251	Electronics Devices & Circuits Lab	0	0	2	1	25	25	50	
5	ENT252	Digital System Design	3	0	0	3	40	60	100	3Hrs
6	ENP252	Digital System Design Lab	0	0	2	1	25	25	50	
7	ENT253	Signals and Systems	3	1	0	4	40	60	100	3Hrs
8	CST261	Data structures & Algorithms	2	0	0	2	40	60	100	3Hrs
9	CSP261	Data structures and Algorithms lab	0	0	2	1	25	25	50	
10	CHT251	Environmental Science	2	0	0	0				
	TOTAL academic engagement		**18**	**2**	**6**	**21**				

Scheme of Teaching & Examination of Bachelor of Engineering
IV Semester B.E. (Electronics Engineering)

Sr. No.	Course Code	Course Title	Hours per week L	T	P	Credits	Maximum Marks: Continuous Evaluation	End Sem Exam	Total	ESE Duration (Hrs)
1	ENT254	Digital Signal Processing	3	0	0	3	40	60	100	3Hrs
2	ENP254	Digital Signal Processing Lab	0	0	2	1	25	25	50	
3	ENT255	Analog Circuits	3	1	0	4	40	60	100	3Hrs
4	ENP255	Analog Circuits Lab	0	0	2	1	25	25	50	
5	ENT256	Microprocessors & Microcontrollers	3	0	0	3	40	60	100	3Hrs
6	ENP 256	Microprocessors & Microcontrollers Lab	0	0	2	1	25	25	50	
7	ENT257	Electromagnetic Fields	3	0	0	3	40	60	100	3Hrs
8		**Open Elective 1**	3	0	0	3	40	60	100	3Hrs
9	IDT254	Biological Science	3	0	0	3	40	60	100	3Hrs
	TOTAL		**18**	**1**	**6**	**22**				

Scheme of Teaching & Examination of Bachelor of Engineering V Semester B.E. (Electronics Engineering)										
Sr. No.	Course Code	Course Title	Hours per week			Credits	Maximum Marks			ESE Duration (Hrs)
			L	T	P		Continuous Evaluation	End Sem Exam	Total	
1	EET361	Control Systems	3	0	0	3	40	60	100	3Hrs
2	ENT351	Electromagnetic Waves	3	0	0	3	40	60	100	3Hrs
3	ENT352	CMOS Digital Circuit Design	3	1	0	4	40	60	100	3Hrs
4	ENP352	CMOS Digital Circuit Design lab	0	0	2	1	25	25	50	
5	ENT353	Electronic Measurement & Instrumentation	3	0	0	3	40	60	100	3Hrs
6	ENP354	Instrumentation & control Lab	0	0	2	1	25	25	50	
7	ENT355	Program Elective – 1	3	0	0	3	40	60	100	3Hrs
8	ENP355	Program Elective – 1 lab	0	0	2	1	25	25	50	
9		**Open Elective 2**	3	0	0	3	40	60	100	3Hrs
10	HUT351	Professional Skill development	2	0	0	0				
		TOTAL	**20**	**1**	**6**	**22**				

Program Elective – 1	
ENT 355-1	Design of IoT
ENT 355-2	Digital Image Processing
ENT 355-3	Embedded System & RTOS

Scheme of Teaching & Examination of Bachelor of Engineering VI Semester B.E. (Electronics Engineering)										
Sr. No.	Course Code	Course Title	Hours per week			Credits	Maximum Marks			ESE Duration (Hrs)
			L	T	P		Continuous Evaluation	End Sem Exam	Total	
1.	MBT351	Business management and entrepreneurship	3	0	0	3	40	60	100	3Hrs
2.	ENT357	Analog and Digital Communication	3	1	0	4	40	60	100	3Hrs
3.	ENP357	Analog and Digital Communication Lab	0	0	2	1	25	25	50	
4.	ENT358	Probability Theory and Stochastic processes	3	0	0	3	40	60	100	3Hrs
5.	ENP359	Electronic Design workshop	0	0	2	1	25	25	50	
6.	ENT360	Computer Architecture	3	0	0	3	40	60	100	3Hrs
7.	ENP360	Computer Architecture lab	0	0	2	1	25	25	50	
8.	ENT361	Program Elective – 2	3	0	0	3	40	60	100	3Hrs
9.	ENP361	Program Elective – 2 lab	0	0	2	1	25	25	50	
10.		**Open Elective 3**	3	0	0	3	40	60	100	3Hrs
11.	ENP363	Comprehensive Viva	0	0	2	1	25	25	50	
	TOTAL		**18**	**1**	**10**	**24**				

Program Elective – 2	
ENT 361-1	Analog IC design
ENT 361-2	Microwave Theory & Techniques
ENT 361-3	Mechatronics

Scheme of Teaching & Examination of Bachelor of Engineering VII Semester B.E. (Electronics Engineering)										
Sr. No.	Course Code	Course Title	Hours per week			Credits	Maximum Marks			ESE Duration (Hrs)
			L	T	P		Continuous Evaluation	End Sem Exam	Total	
1	ENT451	Computer Networks	3	0	0	3	40	60	100	3Hrs
2	ENP451	Computer Networks Lab	0	0	2	1	25	25	50	
3	ENT452	Program Elective -3	3	0	0	3	40	60	100	3Hrs
4	ENT453	Program Elective -4	3	0	0	3	40	60	100	3Hrs
5		**Open Elective 4**	3	0	0	3	40	60	100	3Hrs
6	ENP455	Project Stage-I	0	0	10	5	100		100	
7	ENP456	Industry internship evaluation(6-8 weeks)	0	0	2	0	50		50	
		TOTAL	**12**	**0**	**14**	**18**				

Program Elective -3		Program Elective -4	
ENT 452-1	Testing and Verification of digital systems	ENT 453-1	Micro system technology
ENT 452-2	Wireless communication	ENT 453-2	Introduction to Machine learning
ENT 452-3	Power Electronics	ENT 453-3	Display Technology

Scheme of Teaching & Examination of Bachelor of Engineering
VIII Semester B.E. (Electronics Engineering)

Sr. No.	Course Code	Course Title	Hours per week			Credits	Maximum Marks			ESE Duration (Hrs)
			L	T	P		Continuous Evaluation	End Sem Exam	Total	
1	ENT457	Program Elective - 5	3	0	0	3	40	60	100	3Hrs
2	ENT458	Program Elective - 6	3	0	0	3	40	60	100	3Hrs
3	ENP459	Project Phase-II/One Semester Industry Project/Incubation	0	0	18	9	50	50	100	
TOTAL			**6**	**0**	**18**	**15**				

Program Elective -5		Program Elective -6	
ENT 457-1	CMOS Subsystem Design	ENT 458-1	Nano Electronics
ENT 457-2	SoC Design	ENT 458-2	Fiber optics Communication
ENT 457-3	Biomedical Electronics	ENT 458-3	Industrial Automation

Syllabus for Semester I / II
(Civil Engineering, Industrial Engineering)

Course Code: PHT151 **Course : PHYSICS : Mechanics**
L: 3 Hrs. T: 1 Hrs. P: 0 Hrs. Per week **Total Credits: 4**

Course Objectives:

1. To develop working knowledge of methods to treat particle and rigid body motions;
2. To introduce kinematics and dynamics of general rigid body motions.

Course Outcomes:

After successful completion of the course students will

1. be able to understand and work with free, damped and forced oscillations;
2. be able to recognize and work problems with conservative as well as non-conservative forces ;
3. be able to use vector dierential operations in solving mechanics problems;
4. understand how to describe and solve simple general rigid body motions.

Module 1: Forces, Newton's Laws (8L)

Coordinate frames, change of frames as linear transformation, rotation matrix, Scalars and vectors - Denition based on their transformation under change of frames; Examples and problems; Newton's Laws of Motion, First law (law of inertia), inertial frame; Second law, concept of force; Third law; Forces in Nature, derived forces; friction, pressure in a fluid; Examples and problems including friction and constraints.

Module 2: One, and Two-dimensional Motion (7L)

One-dimensional harmonic oscillator, damped oscillator, over, critical and under damping; Forced oscillator, undamped and damped cases; Examples, resonance and Q factor; Projectile motion with drag; Two-dimensional oscillator; Charged particle in constant magnetic field.

Module 3: Conservative Forces (5L)

Work and kinetic energy: work-energy theorem, scalar and vector fields, Work done by a force field; Conservative and non-conservative forces, Potential energy function for conservative forces; Gradient of potential energy, F = - V; Curl of a vector field, test of conservation character of a force; Potential near equilibrium point.

Module 4: Angular Momentum, System of Particles (6L)

Angular momentum of a particle, torque of force; Radial-polar coordinates, Planetary orbits and Kepler's laws; elliptical, parabolic and hyperbolic trajectories; **' L'** of a system of particles, torque of external forces,

$$\frac{d\overline{L}}{dt} = \overline{N}_{ext}$$

Module 5: Rigid Body Dynamics-1 (5L)

Denition of a rigid body, rotation in a plane, angular momentum about a point of rigid body in planar motion about a fixed axis, Kinematics, concept of moment of inertia; The physical pendulum.

Module 6: Rigid Body Dynamics-2 (7L)

General rotation of a rigid body, Euler angles, angular velocity; Kinetic energy, moment of inertia tensor, examples, parallel axis theorem, angular momentum of a rigid body; Euler's equations of rigid body dynamics (statement and meaning without derivation), simple examples: rotating rod, torque-free precession.

Text Book(s):

1. Introduction to Mechanics (Second Edition), M. K. Verma, Universities Press 2016.

References:

1. An Introduction to Mechanics, Daniel Kleppner and Robert Kolenko, Cambridge University Press 2010.
2. Online course: Engineering Mechanics (Modules 1, 2,5, 6, 7, 8) by M K Harbola on NPTEL
3. Engineering Mechanics (Second Edition), M K Harbola, Cengage publications, New Delhi, 2013.

Syllabus for Semester BE I / II

Bachelor of Mechanical Engineering, Electrical Engineering

Course Code: PHT152 **Course: Oscillations, Waves, Optics**

L:3 Hrs.,T:1Hrs.,P:0Hrs.,Per week **Total Credits:4**

Course Objectives:

1. To train the student to work with oscillatory phenomena in electrical, mechanical and optical systems;
2. To introduce fundamental concepts and laws as relevant to electromagnetic waves and matter waves.

Course Outcomes:

After successful completion of the course students will understand and be able to work with

1. free, damped and forced oscillations;
2. fundamental properties of mechanical waves and their propagation across material boundaries;
3. phenomena of interference, diffraction of optical waves;
4. elementary understanding of quantum behavior of electrons in solids.

Module 1: Oscillations (8L)

Quick review of simple harmonic motion, mechanical and electrical oscillators, vector and complex number (phasor) representation, superposition of many SHMs of equal amplitude and equal succesive phase difference; Damped oscillations, under, critical and over-damping with stress on mechanical oscillators, problems; Forced oscillations with focus on mechanical oscillations, impedance of a mechanical circuit, forcing frequency dependence of velocity, displacement in a forced oscillator, two components of displacement, energy and power supplied by driving force, Q factor.

Module 2: Waves - 1 (5L)

Correlated harmonic oscillations in space and time, statement and meaning of the wave equation, general solution, concept of polarization of waves - transverse and logitudinal waves; Transverse wave on a string, characteristic impedance, reflection and transmission at a string-string boundary, impedance matching, insertion of quarter-wave element.

Module 3: Waves - 2 (5L)

Group of waves, group velocity, meaning of dispersion, causes of dispersion; Standing waves, normal modes of vibrating string, energy in modes, standing wave ratio; Longitudinal waves: sound waves in gases, statement and meaning of expressions for energy distribution and intensity.

Module 4: Wave Optics - 1 (6L)

Light as a transverse polarized electromagnetic wave in vacuum and in homogeneous isotropic dielectric, impedance $\overline{E}$ / $\overline{H}$ E Poynting vector, energy; Reflection and refraction of em wave at dielectric-dielectric boundary, parallel and perpendicular polarizations, boundary conditions on E and H components, Fresnel equations, Brewster's angle.

Module 5: Wave Optics - 2 (6L)

Huygens' principle, superposition, interference by division of amplitude and wavefront, Young's double-slit, Newton's rings, Michelson interferometer; Single-slit Fraunhofer diffraction, Rayleigh criterion for resolution, grating and its resolving power.

Module 6: Matter Waves (8L)

Plank's energy packets, Wave-particle duality of de Broglie, Heisenberg uncertainty relations; Wave function, , for matter waves and its interpretation, position and momentum operators, Hamiltonian operator, Schrodinger's equation; One-dimensional single particle systems: Particle in an infinite square well potential (rigid box), finite square well potential; Quantum tunneling.

Text Book(s):

1. The Physics of Vibrations and Waves (Sixth Edition), H J Pain John-Wiley 2005.
2. Optics, Ajoy Ghatak Tata McGraw Hill Education 2005

References:

1. Online course: Oscillations and Waves by S Bharadwaj on NPTEL
2. Engineering Physics (Second Edition), Sanjay Jain and Girish Sahasrabudhe, Universities Press 2016.

Syllabus for Semester I / II

(Electronics Engineering, Electronics Design Technology, Electronics and Communication Engineering, Information Technology, Computer Science Engineering)

Course Code : PHT153 **Course: Semiconductor Physics**

L: 3 Hr., T: 1 Hrs., P : 0 Hrs., Per week **Total Credits : 4**

Course Objectives:

1. To introduce ideas of quantum mechanics necessary to begin understanding semiconductor devices;
2. To familiarize prospective engineers with fundamental concepts of semiconductors and their interaction with light and resulting devices

Course Outcomes:

After successful completion of the course students will

1. have an elementary understanding of quantum behavior of electrons in solids;
2. have a grasp of band structure and its consequences for semiconductors;
3. should be able to use band structure to explain effects of doping, properties of junctions between semiconductors and metals;
4. have an elementary understanding of working of optoelectronics devices

Module 1: Quantum Mechanics Introduction (8L)

Wave-particle duality, Heisenberg uncertainty relations, the quantum state - wave function and its probability interpretation, Schrodinger's equation, Energies and wave functions of a single electron in one-dimensional infinite and finite square well potentials: formulae, function graphs, number of bound states, Atomic orbitals, Concept of molecular bonding via overlap of orbitals and formation of molecular anti-bonding and bonding energy levels and wave functions: Qualiitative description only.

Module 2: Electronic Materials (8L)

Free electron theory, Extension of idea of energy level splitting in molecules to bonding in solids, Energy bands in solids, Kronig-Penny model (to better demonstrate origin of band gaps), Band gap based classication of electronic materials: metals, semiconductors, and insulators, E-k diagram, Direct and indirect bandgaps.

Module 3: Electrons in Semiconductors (4L)

Valence and conduction bands, Density of states, Fermi-Dirac statistics: Occupation probability of states, Fermi level, Effective mass, Phonons.

Module 4: Intrinsic and Extrinsic Semiconductors (6L)

Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diusion and drift, p-n junction, Continuity equation, Metal-semiconductor junction (Ohmic and Schottky).

Module 5: Light - Semiconductors Interaction (6L)

Optical transitions in bulk semiconductors: absorption, spontaneous emission, and stimulated emission; Joint density of states, Density of states for photons, Transition rates (Fermi's golden rule), Optical loss and gain, Semiconductor materials of interest for optoelectronic devices; Photovoltaic effect, Exciton, Drude model, LED, Photodiode.

Module 6: Engineered Semiconductor Materials (6L)

Low-dimensional systems such as quantum wells, wires, and dots: design, fabrication, and characterization techniques. Energies and wave functions in three dimensions with one, two, or all three dimensions of nano-sizes, Density of states for 2D, 1D and 0D electron gases, Hetero- junctions and associated band-diagrams.

Text Book(s):

1. Semiconductor Physics and Devices (Fourth Edition), Donald A Neamen, McGraw-Hill 2012.

References:

1. Online course: Semiconductor Optoelectronics by M R Shenoy on NPTEL
2. Online course: Optoelectronic Materials and Devices by Monica Katiyar and Deepak Gupta on NPTEL
3. Principles of Electronic Materials and Devices (Third Edition), S. O. Kasap, McGraw-Hill 2006.
4. Engineering Physics (Second Edition), Sanjay Jain and Girish Sahasrabudhe, Universities Press 2016.

Syllabus of Physics Lab for Semester II, Bachelor of Industrial, Civil Engineering

Course Code : PHP151 **Course : Mechanics Lab**

L:0 Hr., T:0Hrs., P:3 Hrs., Per week **Total Credits : 1.5**

Course Outcomes

The Physics Laboratory course will consist of experiments illustrating the principles of physics relevant to the study of science and engineering. Students will show that they have learnt laboratory skills that will enable them to properly acquire and analyze the data in physics laboratory and draw valid conclusions. At the end of the Course the students will learn to:

1. Develop skills to impart practical knowledge in real time.
2. Understand principle, concept, working and application of areas in physics and compare the results obtained with theoretical calculations.
3. Understand measurement technique, and report the results obtained through proper graph plotting and error analysis.

In addition to the demo experiments, the Lab turns will be utilized for performing the experiments based on the following list:

1. Error analysis and graph plotting
2. g by free fall
3. To determine acceleration due to gravity by compound pendulum
4. To determine the moment of inertia of a body using torsion pendulum
5. Young's modulus by bending of beam
6. Young's modulus by vibrational method
7. To study damping of a bar pendulum
8. Fixed pulley, loose pulley, and block and tackle as simple machine
9. Static friction, sliding friction, and rolling friction
10. Force oscillation and resonance
11. To study the oscillation of a mass in combinations of two springs and hence determination of force constant
12. Measurement of linear expansion of solid as a function of temperature
13. Determination of thermal conductivity of building materials using single plate model or heat flux plate principle
14. Thermal diffusivity Used for measuring the thermal diffusivity and thermal conductivity of brass.
15. Thermal conductivity of a bad conductor by Lee's disc method.
16. Data analysis using Mathematica.

Suggested References:

1. Physics Lab Manual written by the Teaching Faculty of Physics Department, RCOEM.

A minimum of 8 experiments to be performed from the following list of experiments

Syllabus of Physics Lab for Semester I/II,
(Semester-I: Electrical Engineering, Semester-II: Mechanical Engineering)

Course Code : PHP152 **Course : Oscillations, Waves , Optics lab**
L: 0 Hrs. T: 0 Hrs. P: 3 Hrs. Per week **Total Credits : 1.5**

Course Outcomes

The Physics Laboratory course will consist of experiments illustrating the principles of physics relevant to the study of science and engineering. Students will show that they have learnt laboratory skills that will enable them to properly acquire and analyze the data in physics laboratory and draw valid conclusions. At the end of the Course the students will learn to:

1. Develop skills to impart practical knowledge in real time.
2. Understand principle, concept, working and application of areas in physics and compare the results obtained with theoretical calculations.
3. Understand measurement technique, and report the results obtained through proper graph plotting and error analysis.

In addition to the demo experiments, the Lab turns will be utilized for performing the experiments based on the following lists as specific to Program:

1. Error analysis and graph plotting
2. Wave length, frequency and phase velocity of travelling wave.
3. Wavelength of source of light using Newton's rings
4. To study the oscillation in bifilar suspension arrangement
5. Determination of velocity of sound in liquid–standing ultrasonic waves as optical grating
6. Kundt's tube – Determination of the wavelength of sound with the cork powder method
7. Determination of velocity of sound in solid
8. Beating of ultrasonic waves
9. Investigation of Doppler effect with ultrasonic waves
10. Refractive Index of prism
11. Frequency, amplitude and phase determination using C.R.O.
12. Study of surface flatness using interference phenomena
13. To determine the resolving power of grating
14. Study of Polarizers and Analyzers
15. Study of total internal reflection using Laser source
16. Data analysis using Mathematica

Suggested References:

1. Physics Lab Manual written by the Teaching Faculty of Physics Department, RCOEM.

A minimum of 8 experiments are to be performed from the above list of experiments.

Syllabus for Semester I/II, B.E. (2018-19)
(Semester I: Electronics, Electronics Design Technology, Electronics & Communication Engineering)
(Semester II: Computer Science Engineering and Information Technology)

Course Code : PHP153 **Course : Semiconductor Physics Lab**
L: 0 Hrs. T: 0 Hrs. P: 3 Hrs. Per week **Total Credits : 1.5**

Course Outcomes

The Physics Laboratory course will consist of experiments illustrating the principles of physics relevant to the study of science and engineering. Students will show that they have learnt laboratory skills that will enable them to properly acquire and analyze the data in physics laboratory and draw valid conclusions. At the end of the Course the students will learn to:

1. Develop skills to impart practical knowledge in real time.
2. Understand principle, concept, working and application of areas in physics and compare the results obtained with theoretical calculations.
3. Understand measurement technique, and report the results obtained through proper graph plotting and error analysis.

In addition to the demo experiments, the Lab turns will be utilized for performing the experiments based on the following lists as specific to Program

1. Error analysis and graph plotting
2. Energy gap of semiconductor/thermister
3. Study of Hall Effect
4. Parameter extraction from I-V characteristics of a PN junction diode
5. Parameter extraction from I-V characteristics of a zener diode
6. Study of diode rectification
7. Parameter extraction from I-V characteristics of a transistor in common-emitterconfiguration.
8. Determination of Planck's constant
9. Determination of time constant of RC circuit
10. V-I Characteristics of Light Emitting Diodes
11. Study of a photodiode
12. Solar Cell (Photovoltaic cell)
13. Resistivity measurement by Four Probe method
14. Van der Pau and conventional techniques for resistivity measurement (LCR meter)
15. Study of R-C filters using C.R.O.
16. Data analysis using Mathematica.

A minimum of 8 experiments to be performed from the following list of experiments

Syllabus for B.E. Semester I

Course Code: MAT151 | **Course: Mathematics-I: Calculus**

L: 3 Hrs., T: 1 Hrs., P: 0 Hrs., Per week | **Total Credits: 04**

Course Objective:

The objective of this course is to familiarize the prospective engineers with techniques in Calculus and multivariate analysis. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics & applications that they would find useful in their disciplines.

Course Outcomes

On successful completion of the course, the students will learn:

1. To apply differential and integral calculus to notions of curvature and to improper integrals. Apart from some other applications they will have a basic understanding of Beta and Gamma functions and the fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.
2. The tool of power series and Fourier series for learning advanced Engineering Mathematics.
3. To deal with functions of several variables that are essential in most branches of engineering.

Syllabus

Module 1 Calculus: (6 hours)

Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

Module 2: Calculus: (6 hours)

Rolle's theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima.

Module 3:Sequences and series: (10 hours)

Convergence of sequence and series, tests for convergence, power series, Taylor's series. Series for exponential, trigonometric and logarithmic functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

Module 4:Multivariable Calculus (Differentiation) (10 hours)

Limit, continuity and partial derivatives, Jacobians, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl & divergence.

Module 5: Multivariable Calculus (Integration) (10 hours)

Multiple Integration: double and triple integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes by (double integration) Center of mass and Gravity (constant and variable densities). Theorems of Green, Gauss and Stokes.

Textbooks/References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
5. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
6. A text book of Applied Mathematics Volume I & II, by P. N. Wartikar and J. N. Wartikar, Pune Vidhyarthi Griha Prakashan, Pune - 411030 (India).

Syllabus for B.E. Semester II

Course No. MAT152 | **Course : Mathematics-II: Differential Equations, Linear Algebra, Statistics & Probability**

L: 3 Hrs., T: 0 Hrs., P: 0 Hrs., Per week | **Total Credits : 03**

Course Objective:

The objective of this course is to familiarize the prospective engineers with techniques in ordinary differential equation, statistics, probability and Matrices. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.

Course Outcomes

On successful completion of the course, the students will learn:

1. The effective mathematical tools for the solutions of ordinary differential equations that model physical processes.
2. The essential tool of matrices in a comprehensive manner.
3. The ideas of probability and various discrete and continuous probability distributions and the basic ideas of statistics including measures of central tendency, correlation and regression.

Syllabus

Module 1:First order ordinary differential equations(7 hours)

Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

Module 2:Ordinary differential equations of higher orders (8 hours)

Second order linear differential equations with constant and variable coefficients, method of variation of parameters, Cauchy-Euler equation.

Module 3: Basic Statistics: (7 hours)

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves, correlation and regression – Rank correlation, Multiple regression and correlation.

Module 4: Basic Probability: (8 hours)

Probability spaces, conditional probability, independence; Discrete random variables, Binomial distribution, Poisson distribution, Normal distribution. Relation between binomial, Poisson and Normal distributions.

Module 5: Matrices (10 hours)

Algebra of matrices, Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, Orthogonal transformation and quadratic to canonical forms.

Textbooks/References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. W. E. Boyce and R. C. Di Prima, Elementary Differential Equations and Boundary Value Problems, 9th Edition, Wiley India, 2009.
3. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
4. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
5. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
6. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
7. Theory & Problems of probability and statistics : 2nd ed :J. R. Spiegal, Schaum series
8. A text book of Applied Mathematics Volume I & II, by P. N. Wartikar and J. N. Wartikar, Pune Vidhyarthi Griha Prakashan, Pune - 411030 (India).
9. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.

Syllabus of Mathematics Computational Lab for Semester I/II, B.E. (2018-19)

Course Code : MAP151 **Course : Computational Mathematics Lab**

L:0 Hr., T:0Hrs., P:2 Hrs., Per week **Total Credits : 1**

Course Outcomes

The Computational Mathematics Lab course will consist of experiments demonstrating the principles of mathematics relevant to the study of science and engineering. Students will show that they have learnt laboratory skills that will enable them to properly acquire and analyze the data in the lab and draw valid conclusions. At the end of the Course the students will learn to:

1. Develop skills to impart practical knowledge in real time.
2. Understand principle, concept, working and application of areas in mathematics and compare the results obtained with theoretical calculations.
3. Understand basics of mathematics, and report the results obtained through proper programming.

The Lab turns will be utilized for performing the experiments based on the following list:

1. Calculus
2. Ordinary Differential Equations
3. Statistics
4. Linear Algebra

Suggested References:

1. Computational Mathematics Lab Manual written by the Teaching Faculty of Mathematics Department, RCOEM.

A minimum of 8 experiments to be performed based on the above list.

Syllabus of Group 1 - Semester I and Group 2 - Semester II, Bachelor of Engineering

Course Code : EET151 **Course : Basic Electrical Engineering**

Course Outcomes:

At the end of this course, students will demonstrate the ability

CO1: To understand and analyze basic electric and magnetic circuits.

CO2: To study the working principles of electrical machines and power converters.

CO3: To study the working principles of power converters.

CO4: To introduce the components of power systems and low-voltage electrical installations.

Module 1: Introduction to Power system (2 hours)– CO4:

Introduction to Power Generation (Thermal, Hydro, Nuclear, Wind, and Solar) with block schematic presentation only. Single line diagram for Generation, Transmission & Distribution through different voltage levels.

Module 2 : DC Circuits & Magnetic Circuits(8 hours) - CO1:

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff's current and voltage laws, analysis of simple circuits with dc excitation, Time-domain analysis of first order RL and RC circuits, Magnetic materials, BH characteristics, Basics of Magnetic circuits.

Module 3: Single Phase AC Circuits (6 hours) - CO1:

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance.

Module 4: Three Phase AC Circuits (4 hours) - CO1:

Three phase Ac generation, Three phase balanced circuits, voltage, and current relations in star and delta connections. Power factor improvement.

Module 5: Transformers (6 hours) - CO2:

Ideal and practical transformer, Equivalent circuit, losses in transformers, regulation, and efficiency. Auto transformer and three-phase transformer connections.

Module 6: Electrical Machines (8 hours) - CO2:

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components, efficiency, starting of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic, and speed control of separately excited dc motor.

Module 7: Power Converters (4 hours) - CO3:

Block schematic introduction to power converters and its practical applications (DC-DC, DC-AC, AC-DC, AC-AC), Types of Batteries, Important Characteristics for Batteries and battery backup.

Module 8: Electrical Installations (4 hours) - CO4:

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Elementary calculations for energy consumption, energy tariff.

Text / References:

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
4. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
5. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.
6. Electrical Technology: B. L. Thereja, S. Chand Publications.
7. Basic Electrical Engineering: S. B. Bodkhe, N. M. Deshkar, P. P. H. Pvt. Ltd.

Syllabus of Group 1 - Semester I and Group 2 - Semester II, Bachelor of Engineering

Course Code : EEP151 **Course: Basic Electrical Engineering Lab.**

Laboratory Outcomes: The students are expected to

CO1: Get an exposure to common electrical components and their ratings.

CO2: Make electrical connections by wires of appropriate ratings.

CO3: Understand the usage of common electrical measuring instruments.

CO4: Understand the basic characteristics of transformers and electrical machines.

CO5: Get an exposure to the working of power electronic converters.

List of Laboratory Experiments/Demonstrations:

1. Basic safety precautions. Introduction & use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope).Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification.
   Observation of phase differences between current and voltage.
3. Transformers : Observation of the no-load current waveform on an oscilloscope (non sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
4. Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-toneutral voltage, line and phase currents). Cumulative three-phase power in balanced three-phase circuits.
5. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winding - slip ring arrangement) and single-phase induction machine.
6. Torque Speed Characteristic of dc shunt motor.
7. Synchronous speed of two and four-pole, three-phase induction motors. Direction reversal by change of phase-sequence of connections.
8. Demonstration of (a) dc-dc converters (b) dc-ac converters – PWM waveform (c) the use of dc-ac converter for speed control of an induction motor and (d) Components of LT switchgear.

Syllabus of Department of Mechanical Engineering

Course Code : MET151 **Course: Engineering Graphics and Design**

L:1 Hr., T:0Hrs., P:0 Hrs., Per week **Total Credits : 01**

Course Outcomes

The expected learning outcome is that, the students shall be able to

1. Draw and interpret technical drawing
2. Convert 2-D to 3-D drawing and vice versa.
3. Represent the various positions of planes and solids in different orientations.
4 Develop the solid surface for sheet metal working.

UNIT 1 : Introduction to Engineering Drawing

Principles of Engineering Graphics and their significance, usage of drawing instruments, Lettering and dimensioning.

UNIT 2 : Orthographic Projections

Principles of Orthographic Projections -Conventions : Projections of Points and lines (line inclined to both planes) Projections of planes (inclined to both the planes), Introduction to Auxiliary Planes;

UNIT 3 : Projections of Solids

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.

UNIT 4 : Sections and Sectional Views of Right Angular Solids

Prism, Cylinder, Pyramid Cone-Auxiliary Views; Development of surface of Right Regular solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)

UNIT 5 : Isometric Projections

Principles of Isometric projection - Isometric Scale, Isometric Views, Conventions; Isometric Views of Simple Solids; Conversion of Orthographic views to Isometric Views / Projection.

Suggested Text / Reference Books :

i) Bhatt N. D. Panchal V.M. & Ingle P.R., (2014) Engineering Drawing, Charotar Publishing House.

ii) Jolhe D. A. (2016) Engineering Drawing with an Introduction to Auto CAD", Tata McGraw- Hill Publishing Co. Ltd., New Delhi.

iii) Narayan K. L. & P. Kannalah (2008), Text book on Engineering Drawing, Scitech Publishers.

iv) Shah, M. B. & Rana B. C. (2008), Engineering Drawing and Computer Graphics, Pearson Education.

v) Agrawal B & Agrawal C. M. (2012), Engineering Graphic, TMH Publication.

vi) Corresponding set of CAD Software Theory and User Manuals.

Syllabus of Department of Mechanical Engineering

Course Code : MEP151 **Course: Engineering Graphics & Design Lab**

L:0 Hr., T:0Hrs., P:4 Hrs., Per week **Total Credits : 02**

Course Outcomes

Students are prepared for actual work situations through practical training in a new state of the art computer designed CAD laboratory using engineering software. The student will learn to :

1. Draw and interpret technical drawing
2. Plan the sheet layout for the given drawing
3. Convert 2-D to 3-D drawing and vice versa
4. Represent the various positions of planes and solids in different orientations.
5. Develop the solid surface for sheet metal working
6. Use & demonstrate drafting package.

UNIT 1 : Introduction to Engineering Drawing

Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloids, Hypocycloid and involutes; Introduction to Scales.

UNIT 2 : Orthographic Projections

Principles of Orthographic Projections -Conventions - Projections of Points and lines inclined to both planes; Projections of planes - Auxiliary Planes.

UNIT 3 : Projections of Solids

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.

UNIT 4 : Sections and Sectional Views of Right Angular Solids

Prism Cylinder, Pyramid, Cone - Auxilary Views; Development of surfaces of Right Regular Solids Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)

UNIT 5 : Isometric Projections

Principles of Isometric projection - Isometric Scale, Isometric Views, Conventions; Isometric Views of Simple Solids; conversion of Orthographic views to Isometric views / Projection

UNIT 6 : Overview of Computer Graphics

Demonstrating knowledge of the theory of CAD software such as (the Menu System Toolbars Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, crosshairs, Coordinate Systems), Dialog boxes and windows, Shortcut menus (Button Bars), The command Line (wherever 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);

UNIT 7 : Customization & CAD Drawing

Setting up drawing page and the printer, including scale settings, Setting up of units and Drawing limits; ISO and ANSI standards for coordinate dimensioning; Orthographic constraints, map to objects, manually and automatically, Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;

UNIT 8 : Annotations Layering & Other Functions

Applying dimensions to objects, applying annotations to drawings; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques.

UNIT 9 : 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 toplogies for engineering, Introduction to Building Information Modeling (BIM)

List of sheets

1. Curves (ellipse, Parabola, hyperbola, Cycloid, involute)
2. Line, Planes, Solids
3. Application of Section and development of solids
4. Orthgraphic Projection
5. Isometric
6. Auto CAD practic sheet 1
7. Auto CAD practice sheet 2
8. Blueprint sheet

Suggested Text/ Reference Books :

i) Bhatt N.D. Panchal V.M. & Ingle P.R., (2014), Engineering drawing, Charotar Publiishing house

ii) Jolhe D.A., (2016) Engineering drawing with an Introduction to Auto CAD", Tata McGraw-Hill Publishing Co. Ltd., New Delhi.

iii) Shah M.B. & Rana B.C. (2008), Engineering drawing and Computer Graphic, Pearson Education.

iv) Agarwal B & Agarwal C.M. (2012), Engineering Graphics, TMH PUBLICATION

v) Narayana, K.L & P Kannaiah (2008), Text Book on Engineering Drawing, Scitech Publishers.

vi) (Concesponding set of) CAD Software Theory and USER Manuals.

Syllabus for B.E. Semester I Department of Humanities

Course Code : HUT152 **Course : Constitution of India**

L: 2 Hrs. T: 0 Hrs. P: 0 Hrs. Per week **Total Credits : 0**

Course outcome

1. Students will understand the role of constitution in democratic India
2. Students will be responsible students by knowing their fundamental rights and duties
3. Students will develop better understanding of democratic functions of the government of India
4. Students will form better understanding of system of governance for effective participation

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. Union Executive: structure, functions
10. Judiciary: Structure, role with special reference to PIL, writ petitions, strengthening of democracy & social justice
11. Amendment of the Constitutional Powers and Procedure
12. Emergency Provisions: National Emergency, President Rule, Financial Emergency
13. Local Self Government – Constitutional Scheme in India
14. Provisions of civil services: Characteristics, functions, merits and demerits
15. Democratic principles in industry

Book

1. Durga Das Basu "An Introduction to Constitution of India" 22nd Edition, LexisNexis

Syllabus for B.E. Semester I / II

Course Code : CHT151 **Course : Chemistry**

L: 3 Hrs, T: 1 Hr, P : 0 Hr., Per week **Total Credits : 4**

Course Outcomes

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10 + 2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications. Quantum theory is more than 100 years old and to understand phenomena at nano meter levels, one has to base the description of all chemical processes at molecular levels. The course will enable the student to:

- Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
- Rationalise bulk properties and processes using thermodynamic considerations.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
- Rationalise periodic properties such as ionization potential, electro negativity, oxidation states and electro negativity.
- List major chemical reactions that are used in the synthesis of molecules.

(i) Chemistry-I (Concepts in Chemistry for Engineering)

(i) Atomic and molecular structure (12 lectures)

Schroedinger equation. Particle in box solutions and their applications for conjugated molecules and nanoparticles. Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations. Molecular orbitals of diatomic molecules and plots of the multicentre orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomics. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

(ii) Spectroscopic techniques and applications (8 lectures)

Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterisation techniques. Diffraction and scattering.

(iii) Intermolecular forces and potential energy surfaces (4 lectures)

Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H3, H2F and HCN and trajectories on these surfaces.

(iv) Use of free energy in chemical equilibria (6 lectures)

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free energy considerations in metallurgy through Ellingham diagrams.

(v) Periodic properties (4 Lectures)

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries

(vi) Stereochemistry (4 lectures)

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry & chirality, enantiomers, diastereomers, optical activity, absolute configurations & conformational analysis. Isomerism in transitional metal compounds.

(vii) Organic reactions and synthesis of a drug molecule (4 lectures)

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

Suggested Text Books

(i) University chemistry, by B. H. Mahan
(ii) Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
(iii) Fundamentals of Molecular Spectroscopy, by C. N. Banwell
(iv) Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
(v) Physical Chemistry, by P. W. Atkins
(vi) Organic Chemistry: Structure & Function by K. P. C. Volhardt & N. E. Schore, 5th Edition http://bcs.whfreeman.com/vollhardtschore5e/default.asp
(vii) Selected topics in Inorganic Chemistry by Malik, Madan & Tuli.

Syllabus for B.E. Semester I / II

Course Code : CHP151 **Course : Chemistry Lab**

L: 0 Hrs., T: 0 Hrs., P: 3 Hrs., Per week **Total Credits : 1.5**

Laboratory Outcomes

The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering. The students will learn to:

- Estimate rate constants of reactions from concentration of reactants/products as a function of time
- Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials and impurities in water etc.
- Synthesize a polymer or drug molecule or nano-material.

List of Experiments for Chemistry Lab

1. Determination of Surface tension and Viscosity of a given liquid.
2. Determination of total hardness and alkalinity of a given water sample.
3. Synthesis of a polymer.
4. Determination of Cu and Zn in a brass sample.
5. Determination of partition coefficient of a substance between two immiscible liquids.
6. Study of chemical oscillations or iodine clock reaction.
7. Estimation of acid value and saponification value of oil.
8. Determination of cell constant and conductometric titration of strong acid vs. strong base.
9. Colligative properties using melting point.
10. Determination of rate constant of a reaction.
11. Ion Exchange column for removal of hardness.
12. Synthesis of nanoparticles.
13. Adsorption of acetic acid by charcoal.
14. Demonstration of UV-Visible spectrophotometer and FTIR

Syllabus of Group 1 - Semester I and Group 2 - Semester II, Bachelor of Engineering

Course Code: CST151 **Course : Programming for Problem Solving**

L: 4 Hrs., T: 0 Hrs., P: 0 Hrs., Per week **Total Credits : 4**

Course Outcomes :

On successful completion of course student will learn:

1. To formulate simple algorithms for arithmetic and logical problems, translate the algorithms to programs (in C language), test and execute the programs and correct syntax and logical errors.
2. To implement conditional branching, iteration and recursion, to decompose a problem into functions and synthesize a complete program using divide and conquer approach.
3. To use arrays, pointers, structures and I/O operations for the formulation of algorithms and programs.
4. To apply programming to solve matrix addition, multiplication problems and searching & sorting problems.

UNIT-I: Introduction to Programming

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)

Idea of Algorithm : Steps to solve logical and numerical problems. Representation of Algorithm: Flowchart / Pseudocode with examples. Arithmetic expressions and precedence

UNIT-II: C Programming Language

Introduction to C language: Keywords, Constant, Variable, Data types, Operators, Types of Statements, Preprocessor Directives, Decision Control Statement-if, if-else, Nested if-else statement, Switch case, Loops and Writing and evaluation of conditionals and consequent branching.

UNIT-III: Arrays and Basic Algorithms

Arrays: 1-D, 2-D, Character arrays and Strings.

Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

UNIT-IV: Functions and Recursion

User defined and Library Functions, Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference. Recursion: As a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

UNIT-V: Pointers and Structures

Structures, Defining structures, Array of Structures, Introduction to pointers, Defining pointers, Pointer arithmetic, pointer operators, Use of Pointers in self-referential structures, notion of linked list (no implementation)

UNIT-VI: File handling

Streams in C, Types of Files, File Input/ Output Operations: Modes of file opening, Reading and writing the file, Closing the files, using fflush().

Text Books:

1. Programming in ANSI C : E. Balguruswami McGraw Hill
2. Mastering C: K. R. Venugopal and S. R. Prasad, Tata McGraw Hill

Reference Books:

1. Programming with C: Byron Gottfried, Schaums Outline Series.
2. Let Us C: Yashwant Kanetkar, BPB Publication

Syllabus of Group 1 - Semester I and Group 2 - Semester II, Bachelor of Engineering

Course Code: CSP151 **Course : Programming for Problem Solving Lab**

L: 0 Hrs., T: 0 Hrs., P: 2 Hrs., Per week **Total Credits : 1**

Course Outcomes :

On successful completion of course student will be able to:

1. Understand the fundamentals of C programming and choose the loops and decision making statements to solve and execute the given problem.
2. Implement different Operations on arrays also design functions to solve the given problem using C programming.
3. Understand pointers, structures, unions and apply them to develop programs.
4. Implement file Operations in C programming for a given application.

CREATIVITY INNOVATION AND DESIGN THINKING
COURSE SYLLABUS

Course Code : IDT151 **Credits:1**

L:1Hrs., T:0Hrs., P:0Hrs., Per week

Course Outcomes

C1: Be familiar with processes and methods of creative problem solving

C2: Enhance their creative and innovative thinking skills

C3: Practice thinking creatively and innovative design and development

Detailed Topics

UNIT I. Introduction: Making a case for creativity, Creative thinking as a skill, Valuing diversity in thinking: Thinking preferences, Creativity styles, Creativity in problem solving

UNIT 2. Pattern Breaking: Thinking differently , Lateral thinking, Mind stimulation: games, brain-twisters and puzzles, Idea-collection processes, Brainstorming/Brainwriting, The SCAMPER methods, Metaphoric thinking, Outrageous thinking , Mapping thoughts, Other (new approaches)

UNIT 3. Using Math and Science, Systematic logical thinking, Using math concepts, Eight-Dimensional (8D) Approach to Ideation: Uniqueness, Dimensionality, Directionality, Consolidation, Segmentation, Modification, Similarity, Experimentation

UNIT4. Systematic Inventive Thinking: Systematic inventive thinking: The TRIZ methodology, Decision and Evaluation: Focused thinking framework, Six thinking hats , Ethical considerations

UNIT 5. Design for Innovation: Introduction to design for interaction, nine lessons for innovation, difference in creativity and innovation, Building blocks for innovation

UNIT 6.Intellectual Property: Introduction to intellectual property: Patents, Copyrights©, Trademarks ®, Trade Secret, Unfair Competition.

Reference Books and Text Book :

1. Creative Problem Solving for Managers - Tony Proctor - Routledge Taylor & Francis Group
2. 101 Activities for Teaching creativity and Problem Solving - By Arthur B Vangundy - Pfeiffer
3. H. S. Fogler and S.E. LeBlanc, Strategies for Creative Problem Solving, Prentice Hall
4. E. Lumsdaine and M. Lumsdaine, Creative Problem Solving, McGraw Hill,
5. J. Goldenberg and D. Mazursky, Creativity in product innovation. Cambridge University Press, 2002.

Course Assignments for internal continuous assessment of 20 Marks (NO T1 and T2)

- Brain teasers (aka Puzzle Busters, to be solved individually)
- Cartoon captions (small teams)
- TRIZ, a systematic ideation method, reading (individual)
- Book readings and discussions (small teams)
- Small teams presentations on innovation: (1) innovative individual, (2) innovative company, (3) innovative movie / game, (4) sustainable innovation, (5) innovation in business, (6) innovation in art, (7) innovation in architecture, (8) innovative nation, (9) innovation in science, and (10) innovation in engineering.
- Large groups hands-on projects
- Eight-dimensional (8D) ideation method examples
- Large teams videos

Syllabus Department of Industrial Engineering

Course Code : INT151 **Course : Workshop / Manufacturing Practices (Theory)**

L:1Hrs., T:0Hrs., P:0Hrs., Per week **Total Credits:1**

Course Outcomes

1. Identify the different manufacturing process commonly employed in Industry along with prevailing safety practices.
2. Identify the various tools and equipments to carry out different manufacturing processes accompanied by the inspection of the work part.

Syllabus

Unit-1 Fundamentals of metal cutting, single point cutting tool, fundamental mechanics of metal cutting, fitting operations, and associated measuring and marking tools

Unit-2 Introduction to pattern making for metal casting, different types of carpentry tools, measuring tools and marking tools, holding devices, different types of carpentry joints.

Unit-3 Smithy and Forging, Forging tools like chisels, hammers, types of furnaces, types of coal, Forming operations, Hot working and Cold working of metals.

Unit-4 Metal joining Process, mechanics of welding, types of welding, soldering and brazing, types of joints

Unit-5 Introduction to foundries, Metal Casting, types of sand, Introduction to Molding tools & casting process.

Unit-6 Introduction to Plastic Injection Molding

Suggested Text Book

1. "Elements of Workshop Technology" Hajra S.K, Choudhury A. K , Roy Nirjhar Vol. I and Vol .II, Media Promoters and Publishers Private Ltd. Mumbai.

Reference Books

1. Kalpakjian S. and Schmid S. “Manufacturing Engineering and Technology”4th Edition, Pearson India Education 2008
2. Roy A. and Lindberg, “Process and Materials of Manufacture”4th Edition, Prentice Hall India 1998.

Syllabus Department of Industrial Engineering

Course Code : INP151 **Course : Workshop/Manufacturing Practices Lab (Practical)**

L:0Hrs.,T:0Hrs.,P:2Hrs.,Per week **Total Credits:1**

Laboratory Outcomes

On the completion of the course the students shall be able to;

1. Recognize the different manufacturing process commonly employed in the Industry
2. Make the components using required manufacturing process, inspection methods while practicing the requisite safety precautions

Contents

1. Fitting Practice
2. Welding and Soldering Practice
3. Pattern Making Practice
4. Metal Casting Practice
5. Smithy and Forging Practice
6. Machining Practice
7. Plastic Molding Process
8. Glass Cutting Process

Suggested Text Book

1. "Elements of Workshop Technology'" Hajra S.K, Choudhury A.K , Roy Nirjhar Vol. I and Vol .II, Media Promoters and Publishers Private Ltd Mumbai.

Reference Books

1. Kalpak Jain S. and Schmid S. "Manufacturing Engineering and Technology"4th Edition, Pearson India Education 2008
2. Roy A. and Lindberg, "Process and Materials of Manufacture", Prentice hall India 1998.

Syllabus for B.E. Semester I / II Dept of Humanities
Humanities and Social Sciences

Course Code: HUT151 **Course : English**

L: 2 Hrs. T: 0 Hrs. P: 0 Hrs. Per week **Total Credits : 2**

Course Objectives

The main objective of the subject is to enhance the employability skills of engineering students as well as communication skills at work place. The sub-objectives are:

1. To develop vocabulary of students.
2. To orient students in basic writing skills.
3. To orient students in functional grammar.
4. To orient students in the process of effective writing.
5. To provide practice and improve students' oral communication skills.

Course Outcomes

1. Students will have good word power.
2. Students will acquire basic writing skills.
3. Students will understand functional grammar and its usage.
4. Students will organize and express their thoughts effectively through written communication.
5. Students will learn oral communication skills in order to handle themselves effectively in an interview and group discussion

SYLLABUS

1. Vocabulary Building
- 1.1. The concept of Word Formation
- 1.2. Root words from foreign languages and their use in English
- 1.3. Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives
- 1.4. Synonyms, Antonyms and standard abbreviations

2. Basic Writing Skills
- 2.1 Sentence Structures
- 2.2 Use of phrases and clauses in sentences
- 2.3 Importance of proper punctuation
- 2.4 Creating coherence
- 2.5 Organizing principles of paragraphs in documents
- 2.6 Techniques for writing precisely

3. Identifying Common Errors in Writing
- 3.1 Subject-verb agreement
- 3.2 Noun-pronoun agreement
- 3.3 Misplaced modifiers
- 3.4 Articles
- 3.5 Redundancies
- 3.6 Cliches

4. Nature and Style of sensible Writing

4.1 Describing
4.2 Defining
4.3 Classifying
4.4 Providing examples or evidence

5. Writing Practices

5.1 Comprehension
5.2 Precis Writing
5.3 Essay Writing
5.4 Letter Writing
5.5 Email Writing

6. Oral Communication

(This unit involves interactive practice sessions in Language Lab)

- Listening Comprehension
- Pronunciation, Intonation, Stress and Rhythm
- Common Everyday Situations : Conversations and Dialogues
- Communication at Workplace
- Interviews
- Formal Presentations

Books

1. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
2. Practical English Usage. Michael Swan. OUP. 1995.
3. Remedial English Grammar. F.T. Wood. Macmillan.2007
4. On Writing Well. William Zinsser. Harper Resource Book. 2001
5. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

Syllabus for B.E. Semester I

Course Code: HUP151 | **Humanities and Social Sciences including Management courses** | **Course : English Lab**

L: 0 Hrs. T: 0 Hrs. P: 2 Hrs. Per week | **Total Credits: 1**

Course objective :

1. To enhance competency of communication in English among learners.

Course outcomes:

1. Students learn presentation and public speaking skills
2. Students learn to practice effective strategies for Personal Interview and Group Discussions
3. Students learn and effectively apply language skills – listening, speaking, reading and writing

List of Practical (2 hours each for each batch) based on unit 6 (oral communication).

1. Common Everyday Situations: Conversations and Dialogues
2. Pronunciation, Intonation , Stress, and Rhythm
3. Formal Presentations: Orientation
4. Formal Presentations : Practice Session
5. Interviews: Orientation
6. Interviews: Practice Session
7. Communication at Workplace: Group Discussion- Orientation
8. Communication at Workplace: Practice Session

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