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
2020 – 2021

B. E. (First Year)

Published By

Dr. R. S. Pande

Principal
Shri Ramdeobaba College of Engineering & Management
Ph No: 0712-2580011 Fax : 0712 - 2583237
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TEACHING SCHEME FOR FIRST YEAR (SEMESTER I & II) BACHALOR OF ENGG GROUP 1: SEMESTER-I/ GROUP 2: SEMESTER-II

Sr. No.	Code	Course	Branches	Hours/week			Credits	Maximum Marks			ESE Duration (Hrs)
				L	T	P		Continual Assessment	End Sem Examination	Total	
1	PHT152	Oscillations,waves & Optics	Electrical, Mechanical Engg	3	1	0	4	40	60	100	3
	PHT154	Introduction to Quantum Computing	Cyber Security, Artificial Intelligence and Machine Learning.								
	PHT155	Physics of Materials	Biomedical Engineering								
	PHT156	Semiconductor Physics	Electronics, Electronics & Communication Computer Science Engg; Data Science, Information Tech.								
	PHT157	Mechanics	Civil Engineering; Industrial Engineering								
2	PHP152	Oscillations,waves & Optics Lab	Electrical, Mechanical Engg	0	0	3	1.5	25	25	50	--
	PHP 154	Introduction to Quantum Computing Lab	Cyber Security, Artificial Intelligence and Machine learning.								
	PHP 155	Physics of Materials Lab	Biomedical Engineering								
	PHP156	Semiconductor Physics Lab	Electronics, Electronics & Comm Computer Science Engg; Data Science, Information Tech.								
	PHP157	Mechanics Lab	Civil Engineering; Industrial Engineering								
3	MAT152/ MAT151	Differential Equations, Linear Algebra, Statistics & Probability/ Calculus	All Branches	3	0/1	0	3/4	40	60	100	3
4	MAP151	Computational Mathematics Lab	All Branches	0	0	2	1	25	25	50	--
5	EET151	Basic Electrical Engineering	CIVIL, IT, CSE,EC, EE, IND, MECH, EN	3	1	0	4	40	60	100	3
	CAT103	Digital Electronics	AI&ML	3	0	0	3	40	60	100	3
	CCT103	Digital Electronics	Cyber Security	3	0	0	3	40	60	100	3
	CDT103	Digital Electronics	Data Science	3	0	0	3	40	60	100	3
	BMT101	Fundamentals of Electrical and Electronics Engineering	Biomedical Engineering	3	0	0	3	40	60	100	3
6	EEP151	Basic Electrical Engineering Lab	CIVIL, IT, CSE,EC, EE, IND, MECH, EN	0	0	2	1	25	25	50	--
	CAP103	Digital Electronics Lab	AI&ML	0	0	2	1	25	25	50	--
	CCP103	Digital Electronics Lab	Cyber Security	0	0	2	1	25	25	50	--
	CDP103	Digital Electronics Lab	Data Science	0	0	2	1	25	25	50	--
	BMP101	Fundamentals of Electrical and Electronics Engineering Lab	Biomedical Engineering	0	0	2	1	25	25	50	--
7	MET151	Engineering Graphics & Design	CIVIL, IT, CSE,EC, EE, IND, MECH, EN, Biomedical Engineering	1	0	0	1	40	60	100	3
	CAT104	Object Oriented Programming	AI&ML	3	0	0	3	40	60	100	3
	CCT104	Object Oriented Programming	Cyber Security	3	0	0	3	40	60	100	3
	CDT104	Object Oriented Programming	Data Science	3	0	0	3	40	60	100	3
8	MEP151	Engineering Graphics & Design Lab	CIVIL, IT, CSE,EC, EE, IND, MECH, EN, Biomedical Engineering	0	0	4	2	50	50	100	--
	CAP104	Object Oriented Programming Lab	AI&ML	0	0	2	1	25	25	50	--
	CCP104	Object Oriented Programming Lab	Cyber Security	0	0	2	1	25	25	50	--
	CDP104	Object Oriented Programming Lab	Data Science	0	0	2	1	25	25	50	--
9	HUT152	Constitution of India	All Branches	2	0	0	0	--	--	--	--
10	PEP151	Yoga/Sports	All Branches	0	0	2	0	--	--	--	--
Total (CIVIL, IT, CSE,EC, EE, IND, MECH, EN)				12	2/3	13	**17.5/18.5**			**650**	
Total (AI&ML, Cyber Security, Data science Engineering)				14	1/2	11	**17.5/18.5**			**600**	
Total (Biomedical Engineering)				12	1/2	13	**16.5/17.5**			**650**	

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

Sr.No.	Code	Course	Branches	Hours/week			Credits	Maximum Marks			ESE
				L	T	P		Continual Assessment	End Sem Examination	Total	Duration (Hrs)
1	CHT151	Chemistry	CIVIL,EC, EE, IND, MECH, EN	3	1	0	4	40	60	100	3
	CHT152	Chemistry	AI&ML, Cyber Security, Data Science, , IT, CSE	3	1	0	4	40	60	100	3
	CHT153	Biochemistry	Biomedical Engineering	3	1	0	4	40	60	100	3
2	CHP151	Chemistry Lab	CIVIL,EC, EE, IND, MECH, EN	0	0	3	1.5	25	25	50	--
	CHP152	Chemistry Lab	AI&ML, Cyber Security, Data Science, , IT, CSE	0	0	3	1.5	25	25	50	--
	CHP153	Biochemistry Lab	Biomedical Engineering	0	0	3	1.5	25	25	50	--
3	MAT151/ MAT152	Calculus / Differential Equations,Linear Algebra, Statistics & Probability	All Branches	3	1/0	0	4/3	40	60	100	3
4	CST151	Programming for Problem Solving	CIVIL,EC, EE, IND, MECH,CS,IT,EN ,Biomedical Engineering	4	0	0	4	40	60	100	3
	CAT101	Programming for Problem Solving	AI&ML	4	0	0	4	40	60	100	3
	CCT101	Programming for Problem Solving	Cyber Security	4	0	0	4	40	60	100	3
	CDT101	Programming for Problem Solving	Data Science	4	0	0	4	40	60	100	3
5	CSP151	Programming for Problem Solving Lab	CIVIL,EC, EE, IND, MECH,CS,IT,EN, BIOMEDICAL Engineering	0	0	2	1	25	25	50	--
	CAP101	Programming for Problem Solving Lab	AI&ML	0	0	2	1	25	25	50	--
	CCP101	Programming for Problem Solving Lab	Cyber Security	0	0	2	1	25	25	50	--
	CDP101	Programming for Problem Solving Lab	Data Science	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	CIVIL,EC, EE, IND, MECH,CS,IT,EN,	1	0	0	1	20	30	50	1.5
	CAT102	Computer Workshop	AI&ML	1	0	0	1	20	30	50	1.5
	CCT102	Computer Workshop	Cyber Security	1	0	0	1	20	30	50	1.5
	CDT102	Computer Workshop	Data Science	1	0	0	1	20	30	50	1.5
	BMT102	Human Anatomy and Physiology for Engineers - I	Biomedical Engg.	3	0	0	3	40	60	100	3
8	INP151	Workshop/Manufacturing Practices Lab	CIVIL,EC, EE, IND, MECH,CS,IT,EN,	0	0	2	1	25	25	50	--
	CAP102	Computer Workshop Lab	AI&ML	0	0	2	1	25	25	50	--
	CCP102	Computer Workshop Lab	Cyber Security	0	0	2	1	25	25	50	--
	CDP102	Computer Workshop Lab	Data Science	0	0	2	1	25	25	50	--
9	HUT151	English	All Branches	2	0	0	2	40	60	100	3
10	HUP151	English Lab	All Branches	0	0	2	1	25	25	50	--
Total(CIVIL, IT, CSE,EC, EE, IND, MECH, EN)				14	2/1	9	20.5/19.5			**700**	
Total (AI&ML, Cyber Security, Data science)				14	2/1	9	20.5/19.5			**700**	
Total: Biomedical Engineering				16	2/1	7	21.5/20.5			700	

Syllabus for Semester I/ II, B. E (Mechanical Engineering, Electrical Engineering)					
Course Code:	**PHT152**			**Course:**	**Oscillations, Waves, Optics**
L: 3 Hrs,	**T: 1 Hr,**	**P: 0Hr,**	**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 matterwaves.

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. Basics of electromagnetic waves and optical media, phenomena of interference, diffraction ofoptical 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 successive phase difference; Damped oscillations, under, critical and over-damping with stress on mechanical oscillators, problems; Forced oscillations with focus on electrical/mechanical oscillations, impedance of a electrical/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 longitudinal 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, normalmodes of vibrating string, energy in modes, standing wave ratio; Longitudinal waves: sound waves ingases, 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 isotropicdielectric, impedance |E|/|Hperp,E|, Poynting vector, energy; Reflection and refraction of em waveat 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'sdouble-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 a infinitesquare 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 Press2016.

Syllabus for Semester II, B. E. CSE (Artificial Intelligence and Machine Learning) (Cyber Security)					
Course Code:	**PHT154**			**Course:**	**Introduction to Quantum Computing**
L: 3 Hrs,	**T: 1 Hr,**	**P: 0Hr,**	**Per Week**	**Total Credits:**	**4**

Course Objectives:

1. To introduce the fundamentals of quantum computing to students
2. The problem solving approach using finite dimensional mathematics

Course Outcomes: After successful completion of the course, the students will learn,

1. Basics of complex vector spaces
2. Quantum mechanics as applied in Quantum computing
3. Architecture and algorithms
4. Fundamentals of Quantum computations

Module 1: Complex Vector Spaces

Algebra and Geometry of Complex numbers, Real and Complex Vector Spaces, definitions, properties, basis and dimensions, Generalization to n-dimensional space

Module 2: Linear Algebra

Inner products, Hilbert Spaces, Eigenvalues and Eigenvectors, Hermitian and Unitary Matrices, Tensor Product, Applications of linear algebra in computer graphics, Geometric transforms, positioning the virtual camera

Module 3: Basic Quantum Theory

Introduction to Quantum mechanics, Schrodinger's time dependent equation, Wave nature of Particles, expectation values, variance, standard deviation, probability density, Stationary states, Infinite square well, Uncertainty principle

Module 4: Classical and Quantum Systems

Deterministic and Probabilistic Systems, Quantum Systems, Observations, Quantum measurement principles, Stochastic matrices, Probabilistic double slit experiment with photons, Entangled states, Quantum clocks

Module 5: Architecture

Bits and Qubits, Classical Gates, Reversible Gates, Quantum Gates, Toffoli and Fradkin Gates, Bloch Sphere, Deusch Gate, No-cloning theorem, Applications in Cryptography and Quantum teleportation

Module 6: Quantum algorithms

Deutsch’s algorithm, The Deutsch-Jozsa algorithm, Simon’s periodicity algorithm, Grover’s search algorithm, Shor’s factoring algorithm, Quantum Fourier Transform

Text Book

1. Quantum computing for computer scientists, Noson S. Yanofsky, Mirco A. Mannucci, Cambridge University Press 2008
2. Introduction to Quantum Mechanics, 2nd Edition, David J. Griffiths, Prentice Hall New Jersey 1995

Reference Books

1. Quantum computing explained, David McMahon, Wiley-interscience, John Wiley & Sons, Inc. Publication 2008
2. Quantum computation and quantum information, Michael A. Nielsen and Isaac L. Chuang, Cambridge University Press 2010

Syllabus for Semester I, B. E. (Biomedical Engineering)					
Course Code:	**PHT155**			**Course:**	**Physics of Materials**
L: 3 Hrs,	**T: 1 Hr,**	**P: 0Hr,**	**Per Week**	**Total Credits:**	**4**

Course Objectives

1. To provide basic knowledge of materials in sensors, electronic and electrical systems
2. To understand the governing mechanisms in engineering materials

Course Outcomes

The students will understand and work with,

1. Modern theory of solids
2. Quantum mechanical descriptions of the electronic conduction processes
3. Semiconducting and Dielectric materials
4. Magnetic materials and superconductivity

Module 1: Electrical and thermal conduction in Solids

Classical Theory of electrical conduction in Metals, Resistivity of Materials, Thermal conduction, Electrical conductivity in non-metals

Module 2: Quantum Physics

Electron in Quantum Mechanics, Confinement, Tunneling, Hydrogen Atom, Periodic Table, Light- matter interaction, Applications of lasers in biomedical instrumentation

Module 3:Modern Theory of Solids

Molecular Orbital Theory of Bonding, Band theory of solids, Energy band formation, Concepts in Statistical Mechanics, Quantum Theory of metals, Metal-Metal contacts, Thermionic Emission, Phonons, Thermal and Electrical conductivity

Module 4: Semiconductors

Intrinsic and Extrinsic Semiconductors, Carrier concentrations, Drift mobility, Recombination, Diffusion and conduction equations, Continuity Equation, Optical Absorption, Piezoresistivity, Junction physics, Applications in bioelectric sensors

Module 5: Dielectric Materials and Insulation

Polarization and relative permittivity, Type of polarization, Frequency dependence, Dielectric loss, Dielectric strength and Insulation breakdown, Capacitor dielectric materials, Piezo-ferro and Pyroelectricity, Applications in Transducers.

Module 6: Magnetic Materials and Superconductivity

Magnetization vector, Permeability and Susceptibility, Magnetic materials, Ferromagnetism, Soft and hard magnetic materials, Ferro fluids for drug delivery, Superconductivity, Phenomenological theory of superconductivity, Josephson Effect, Flux quantization, Superconducting magnets in Biomedical imaging

Text Book

1. Principles of Electronic Materials and Devices, S. O. Kasap,3rd Edition McGraw Hill.

Reference Books

Electrical Engineering Materials, A. J. Dekker, Prentice Hall

Introduction to Solid State Physics, Charles Kittle, John Wiley & Sons,Inc.

Semiconductor Nanocrystals and Metal Nanocrystals, Physical Properties and Device Applications, Eds. Tupei Chen, Yang Liu, CRC Press2017

Clinical Applications of Magnetic Nanoparticles, Eds. Nguyên T. K. Thanh, CRC Press 2018

How Does MRI work, Eds. D. Weishaupt, V. D. Kochli, B. Marincek, 2nd Edition, Springer2006

Syllabus for Semester I/II, B. E. (Electronics, EC, CS, IT and Data Science Engineering)					
Course Code:	**PHT156**			**Course:**	**Semiconductor Physics**
L: 3 Hrs,	**T: 1 Hr,**	**P: 0Hr,**	**Per Week**	**Total Credits:**	**4**

Course Objective

To introduce ideas of quantum mechanics necessary to begin understanding semiconductor devices;
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
have an elementary understanding of quantum behaviour of electrons in solids;
have a grasp of band structure and its consequences for semiconductors;
should be able to use band structure to explain effects of doping,on the properties of junctions between semiconductors and metals;
have an elementary understanding of working of optoelectronic devices

Module 1: Quantum Mechanics Introduction

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 potentials: formulae, function graphs, number of bound states, tunneling, One electron atom, periodic table, Quantum confinement effects in nanosystems

Module 2: Electronic Materials

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 classification of electronic materials: metals, semiconductors, and insulators, E-k diagram, Direct and indirect bandgaps, Valence and conduction bands, Density of states, Fermi-Dirac statistics: Occupation probability of states, Fermi level, Effective mass.

Module 3: Intrinsic and Extrinsic Semiconductors

Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier transport: diffusion and drift

Module 4: Non-Equilibrium Semiconductors

Carrier generation and recombination, Continuity equation, Ambipolar transport equation, Quasi- Fermi Energy levels, Excess Carrier Lifetime, Qualitative introduction to recombination mechanisms, Shorkley-Read-Hall Recombination, Surface Recombination

Module 5: Junction Physics

p-n junction, Zero applied bias, forward bias, reverse bias, Metal-semiconductor junction, Shottky barrier, Ideal junction properties, Ohmic contacts, ideal non-rectifying barrier, tunneling barrier, Heterojunctions, Nanostructures, Energy band diagram, two dimensional electron gas

Module 6: Light - Semiconductors Interaction

Optical absorption in semiconductors, Light emitting diodes, Principles, Device Structures, Materials, High Intensity LEDs, Characteristics, LASERS, Stimulated emission and photon amplification, Einstein Coefficients, Laser oscillation conditions, Laser diode, Solar Energy Spectrum, photovoltaic device principles, Solar Cells

Text Book(s)

Modules 1-5

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

Reference

1.Physics of Semiconductor Devices, S. M. Sze, 2nd Edition, Willey-Interscience Publication 1986

Modules 6

Online course: Semiconductor Optoelectronics by M. R. Shenoy on NPTEL

Optoelectronics and Photonics: Principles and Practices by S. O. Kasap, Prentice Hall 2001

Syllabus for Semester I/II, B. E. (Civil and Industrial Engineering)					
Course Code:	**PHT157**			**Course:**	**Mechanics**
L: 3 Hrs,	**T: 1 Hr,**	**P: 0Hr,**	**Per Week**	**Total Credits:**	**4**

Course Objectives

1. To build a strong conceptual foundation of classical mechanics
2. To enhance the ability to use the mathematical techniques in its applications

Course Outcomes

The successful completion of the course will enable the students to,

1. Solve the problems in kinematics and dynamics
2. Apply concepts of oscillatory motion in solving engineering problems
3. Tounderstand themotionintwoandthreedimensions
4. To understand the central forces and conservation laws

Module 1: Vectors Calculus

Vectors: Algebra and Calculus, Unit Vectors, Directional Cosines, Vector Differential Operators, Coordinate Transformations

Module 2: Newton's Laws and Applications

Introduction to Newtonian Mechanics: Newton's Laws, Intertial and Non-intertial Systems, Simple applications of Newton's laws, Circular Motion and Gravitation

Particle Dynamics in One Dimension:

Constant Applied Force, Time Dependent Force, Velocity Dependent Force, Position DependentForce, Conservative Forces, Potential Energy, Motion undera Linear Restoring Force, GravitationalField

Module 3: Oscillators

Linear and Nonlinear Oscillations, Linear Harmonic Oscillator, Damped Oscillator, ForcedOscillator, Resonance, Applications, Oscillators in Electrical circuits, Non-linear Oscillating Systems

Module 4: Motion in 2-D and 3-D

Different Coordinate Systems, Kinematics in Cylindrical and Spherical Coordinates, Potential Energy Function, Torque, Dynamics in 3-dimensions, Harmonic Oscillators in 2 and 3-dimensions, Applications, Projectile motion

Module 5: Central Force

Central Force and Potential Energy, One-body problem involving central force, General propertiesand Equations of motion, Orbits in an Inverse Square Force Field, Applications,Kepler's laws ofPlanetary Motion

Module 6: Conservation Laws

System of Particles and Center of Mass, Conservation of Linear and Angular Momentum, Conservation of Energy, Two body problem in center of mass coordinate system, Applications, Rocket propulsion, Conveyor belt

Text Books

1. Introduction to Classical Mechanics, Atam P. Arya, 2nd Edition (McGraw-Hill)
2. AnalyticalMechanics,GrantR.Fowles,GeorgeL.Cassiday,7thEdition(ThomsonBrooks/Cole)

Reference Books

1. An introduction to Mechanics, Daniel Kleppner, Robert J. Kolenkow, 2nd Edition (Cambridge University Press)
2. Theory and Problems of Theoretical Mechanics, Murray R. Spiegel, Schaum's Outline Series (McGraw-Hill)
3. Engineering Mechanics(SecondEdition), MKHarbola, Cengagepublications, NewDelhi,2013.

Syllabus for Semester I/ II, B. E (Mechanical Engineering, Electrical Engineering)					
Course Code:	**PHP 152**			**Course:**	**Oscillations, Waves, Optics Lab**
L: 0 Hrs,	**T: 0 Hr,**	**P: 3 Hr,**	**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 theresults obtained with theoretical calculations.
3. Understand measurement technique, and report the results obtained through proper graphplotting and error analysis.

In addition to the demo experiments, the Lab turns will be utilized for performing the experimentsbased 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 minimumof 8 experiments are to be performed from the above list of experiments.

Syllabus for Semester II, B. E. CSE (Artificial Intelligence and Machine Learning) (Cyber Security)					
Course Code:	**PHP 154**			**Course:**	**Introduction to Quantum Computing Lab**
L: 0 Hrs,	**T: 0 Hr,**	**P: 3 Hr,**	**Per Week**	**Total Credits:**	**1.5**

Course Outcomes:

The physics laboratory will consist of experiments and programming exercises illustrating the principles of physics relevant to the study of computer science and engineering. During the training in the Physics Lab, the students will be able,

1. To develop skills for experimental verification of physics laws
2. To analyze the results using the mathematical tools
3. To learn the computational techniques
4. To write the project reports

The laboratory will consist of general physics experiments and computational physics practicals.

General Physics:

1. Measuring scales and error estimation
2. Verification of Ohm's law and linear least square fitting method
3. Verification of Newton's law of cooling
4. Simple harmonic motion
5. Magnetic flux measurement using the graphical method of integration
6. Measurement, analysis and fitting of non-linear IV characteristics of PN junction diode

Python based Computational Physics:

1. Introduction to Python programming, Environment, Syntax and Data Structures
2. Linear least square fit method for data analysis
3. Plotting of Plank's function and verification of Stefan's law
4. Finding inverse, norm and inner products, rank of a matrix
5. Introduction to quantum computing packages (GitHub repository)
6. Implementation of Deutsch-Josza algorithm using Cirq library

Project

A python based project on the applications of linear algebra, quantum mechanics or quantum computing to solve science and engineering problems.

Reference Books

1. Lab manual prepared by Physics Department, RCOEM, Nagpur
2. Introduction to Python for science and engineering, David Pine, CRC Press 2018

Syllabus for Semester I, B. E. (Biomedical Engineering)					
Course Code:	**PHP 155**			**Course:**	**Physics of Materials Lab**
L: 0 Hrs,	**T: 0 Hr,**	**P: 3 Hr,**	**Per Week**	**Total Credits:**	**1.5**

Course Outcomes

The physics laboratory will consist of general physics experiments and study of materials properties illustrating the principles of physics relevant to the study of biomedical engineering. During the training in the Physics Lab, the students will be able,

1. To develop skills for experimental verification of physics laws
2. To analyze the results using the mathematical techniques
3. To learn the measurement of materials properties
4. To synthesize the nanoparticles and write the project reports

The laboratory will consist of the following general physics experiments, the measurement of materials properties and the synthesis of the nanoparticles

General Physics

1. Measuring scales and error estimation
2. Verification of Ohm's law and linear least square fitting method
3. Verification of Newton's law of cooling
4. Simple harmonicmotion
5. Magnetic flux measurement using the graphical method of integration
6. Dispersive power of prism
7. Compound Microscopes Materials Lab:
8. Determination of energy gap of semiconducting materials
9. Seeback effect
10. Thermal Conductivity of Metals
11. Dielectric constant measurement
12. Magnetic materials and characterization
13. Hall effect

Synthesis of Nanoparticles for Biomedical Applications

1. Preparation of Magnetic oxide, Fe2O3,nanoparticles
2. Ferro fluid preparation methods
3. Preparation of Semiconducting nanoparticles (ZnO,Ti2O)
4. Preparation of Metallic (Au, Ag)nanoparticles

Reference Books

1. Lab manual prepared by Physics Department, RCOEM, Nagpur
2. Semiconductor Nanocrystals and Metal Nanocrystals, Physical Properties and Device Applications, Eds. Tupei Chen, Yang Liu, CRC Press2017
3. Clinical Applications of Magnetic Nanoparticles, Eds. Nguyên T. K. Thanh, CRC Press 2018

Syllabus for Semester I/II, B. E. (Electronics, EC, CS, IT and Data Science Engineering)					
Course Code:	**PHP156**			**Course:**	**Semiconductor Physics Lab**
L: 0 Hr	**T: 0 Hr,**	**P: 3 Hr,**	**Per Week**	**Total Credits:**	**1.5**

Course Outcomes

The Physics Lab course consists of experiments illustrating the principles of physics relevant to the study of science and engineering. 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 General physics experiments, the Lab turns will be utilized for performing the experiments based on the following lists as specific to Program

General Physics

1. Error analysis and graph plotting
2. Newton's law of cooling
3. Simple Pendulum
4. Magnetic flux using deflection magnetometer
5. Dispersive power and determination of Cauchy's constants
6. Data analysis using Mathematica.
7. Cathode Ray Oscilloscope

Semiconductor Physics and Devices

1. Energy gap of semiconductor/thermister
2. Study of Hall Effect
3. Parameter extraction from I-V characteristics of a PN junction diode
4. Parameter extraction from I-V characteristics of a zener diode
5. Study of diode rectification
6. Parameter extraction from I-V characteristics of a transistor in common-emitter configuration.
7. V-I Characteristics of Light Emitting Diodes
8. Study of a photodiode
9. Solar Cell (Photovoltaic cell)
10. Resistivity measurement by Four Probe method

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

Suggested References

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

Syllabus for Semester I/II, B. E. (Civil and Industrial Engineering)					
Course Code:	**PHP 157**			**Course:**	**Mechanics Lab**
L: 0 Hrs,	**T: 0 Hr,**	**P: 3 Hr,**	**Per Week**	**Total Credits:**	**1.5**

Course Outcomes

The Physics Laboratory course will consist of experiments illustrating the principles of physics relevant to thestudy 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 anderror 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 forceconstant
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 plateprinciple
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 8experiments to be performed from the list of experiments

Syllabus for Semester I, B. E. (All Branches)					
Course Code:		**MAT152**		**Course:**	**Differential Equations, Linear Algebra, Statistics & Probability**
L: 3 Hrs,	**T: 1 Hr,**	**P: 0Hr,**	**Per Week**	**Total Credits:**	**3**

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 wouldbe 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 thebasic 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 moregeneral 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; Eigen values and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, Orthogonal transformation and quadratic to canonical forms.

Topics for Self-Learning Application of

Differential Equations.

Textbooks/References

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. W. E. Boyce and R. C. DiPrima, 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 and Problems of probability and statistics : 2nded :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 for Semester I, B. E. (All Branches)					
Course Code:		**MAP152**		**Course:**	**Computational Mathematics Lab**
L:0 Hrs,	**T: 0Hr,**	**P: 3Hr,**	**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 comparethe 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 for Semester I/II, B. E. (CIVIL,CSE, IT, EC, EE, IND, MECH, EN)					
Course Code:	**EET151**			**Course:**	**Basic Electrical Engineering**
L: 3 Hrs,	**T: 1 Hr,**	**P: 0Hr,**	**Per Week**	**Total Credits:**	**4**

Course Outcomes

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

CO1: Understand and analyze basic ac and dc electric circuits and magnetic circuits

CO2: Understand working principles of electrical machines: Transformer, Induction motor, DC machines CO3: Apply the knowledge of power converter for suitable applications

CO4: Introduce and identify 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 for Semester I/II, B. E. CSE (Artificial Intelligence and Machine Learning, Cyber security, Data Science)					
Course Code:	**CAT/CCT/CDT 103**			**Course:**	**Digital Electronics**
L: 3 Hrs,	**T: 0 Hr,**	**P: 0Hr,**	**Per Week**	**Total Credits:**	**3**

Course Outcomes:

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

1. Understanding of various optimization techniques used to minimize and design digital circuits.
2. Analyze and design various combinational logic circuits.
3. Analyze and design various sequential circuits.
4. Design different microprocessor based components of computer system using combinational and sequential circuits.

Course Contents:

UNIT-I: **Basics of Digital Electronics**

Motivation for digital systems: Logic and Boolean algebra, Number Systems. Logic Gates & Truth Tables, Demorgan's law, Minimization of combinational circuits using Karnaugh maps up to five variable. Map manipulation-essential prime implicants, non-essential prime implicants.

UNIT-II: **Combinational Circuit Design**

Design procedure: Multiplexers, Demultiplexer, Encoders, Decoders, Code Converters, Adders, Subtractor (Half, Full), BCD Adder/ Subtractor, ripple and carry look-ahead addition.

UNIT-III: **Sequential circuit Design-I**

Storage elements, Flip-flops and latches: D, T, J/K, S/R flip-flops. Master Slave Conversion of one of type of F/F to another Sequential circuit. Analysis –Input equations, state table, and analysis with J-K Flip flops. Sequential circuit Design, Design procedure, designing with D & J-K Flip flop.

UNIT-IV: **Sequential circuit Design-II**

Counters, asynchronous and synchronous design using state and excitation tables. Registers & Shift registers.

UNIT-V: **Programmable logic Design**

Memory & Programmable logic Devices: RAM, Array of RAM IC's, Read only Memory, PLA, PAL, Flash Memories

UNIT-VI: **Fundamental of Microprocessor**

Introduction to µp 8085, Addressing modes, Instruction set, Programming of µp 8085.

Text Books:

1. Morris Mano; Digital Logic Design; Fourth edition, McGraw Hill
2. R.P.Jain; Modern Digital Electronic; Fourth edition; Tata McGraw-Hill.
3. V.J.Vibhute; 8-Bit Microprocessor & Microcontrollers; fifth edition.

Reference books:

1. A. Anand Kumar; Fundamental of Digital Electronics; Second Edition, PHI
2. A.P.Godse; Digital circuit & design; Technical Publications; 2009.
3. Ramesh Gaonkar; 8 bit Microprocessor; CBS Publishers; 2011.

Syllabus for Semester I, B. E. Biomedical Engineering					
Course Code:	**BMT101**			**Course:**	Fundamentals of Electrical and Electronics Engineering
L: 3 Hrs,	**T: 0 Hr,**	**P: 0Hr,**	**Per Week**	**Total Credits:**	**3**

Course Outcomes

Upon the completion of this course, students will demonstrate the ability to:

1. Understand DC and AC operations.
2. Design different Electric and Magnetic circuits.
3. Develop applications employing appropriate electrical machines.

Apply knowledge of two terminal semiconductor devices like diodes to develop applications.

Syllabus

Unit –I : Introduction to DC and AC circuits, Active and passive two terminal elements, Ohms law, Voltage- Current relations for resistor, inductor, capacitor , Kirchhoff's laws, Mesh analysis, Nodal analysis, Voltage and current sources, equivalent resistor, current division, voltage division, Superposition theorem, Thevenin's and Norton's theorems, Star- delta and Delta- star conversions, Maximum Power Transfer Theorem.

Unit –II : Sinusoids, Generation of AC, Average and RMS values, Form and peak factors, concept of phasor representation, J operator, Analysis of R-L, R-C, R-L-C circuits, Introduction to three phase systems - types of connections, relationship between line and phase values.

Unit –III : Single Phase Transformer: Analogy between electrical and magnetic circuits, solutions of magnetic circuits, Constructional details and Principle of transformer, EMF equation, Phasor diagram on no load and full load, Equivalent circuits, Open circuit and short circuit tests, regulation and efficiency, Hysteresis and eddy current losses.

Unit –IV : DC and AC Rotating Machines: Types, Construction, Principle, EMF and torque equation, Application Speed Control, Basics of Stepper Motor, Brushless DC motors, Servo Motors, Solenoid pump.

UNIT - V : PN diode operation- forward bias and reverse bias , Volt-Ampere characteristics of p-n diode, Temperature dependence of VI characteristics, Current components in p-n diode, Diode equation, Transition and Diffusion capacitances, Breakdown Mechanisms in Semi Conductor diodes,Rectifiers: half wave and full wave, Wave shaping circuits

UNIT - VI : Zener diode characteristics and application, Tunnel Diode, LED, LDR, Varactor, Photo diode, PIN diode, Schottky diode, LASER, Applications.

Text books

Basic Electrical and Electronics Engineering by S.K.Bhattacharya, Pearson Publications

Basic Electrical and Electronics Engineering by D.P. Kothari and I J Nagrath, TMH.

Reference Book

Basic Electrical Engineering by Fitzerald and Higginbotham, TMH.

Basic Electrical Engineering by I.J Nagrath, TMH.

Millman's Integrated Electronics: Jacob Millman, Christos Halkias, Chetan Parikh, McGraw Hill Education.

Syllabus for Semester I/II, B. E. (CIVIL,CSE, IT, EC, EE, IND, MECH, EN)					
Course Code:	**EEP151**			**Course:**	**Basic Electrical Engineering Lab**
L: 0 Hrs,	**T: 0Hr,**	**P: 2 Hr,**	**Per Week**	**Total Credits:**	**1**

Course Outcomes

Upon completion of this course, the students shall be able to,

CO1: Co-relate, analyze and apply the fundamental principles of science and engineering to understand the laboratory experimental work.

CO2: Connect the electric circuit, perform the experiment, analyze the observed data and make validconclusion.

CO3: Write report based on the performed experiments (journal) with effective presentation of diagrams and characteristics/graphs.

CO4: Carry out survey of electrical energy consumption at home and calculate monthly energy bill asper the tariff of power Distribution Company.

List of Experiments

1. To verify Kirchhoff's laws for D.C. Circuits
2. Verification of Kirchhoff's laws to AC circuit(RLC series)
3. Verification of Kirchhoff's laws to AC circuit (RLC parallel).
4. To study speed control of D.C. shunts motor by:
   a) Armature voltage Control method.
   b) Field current/flux control method.
5. To study the balanced Three phase system for star and delta connected balanced load.
6. Improvement of power factor by using static capacitors
7. To determine regulation and efficiency of a single phase transformer by open circuit (o.c) andshort circuit (s.c.) tests.
8. To determine regulation and efficiency of a single phase transformer by direct loading test

Demonstration / Study experiment

9. To study B-H curve for different magnetic material
10. To study Buck converter
11. To study Boost converter

Demonstration of cut out sections of machines:

i. DC Machine

ii. Three phase squirrel cage induction motor

iii. Synchronous machine

Syllabus for Semester II, B. E. (AI &ML , Cyber Security and Data Science)					
Course Code:	**CAP/CCP/CDP 103**			**Course:**	**Digital Electronics Lab**
L: 0 Hrs,	**T: 0 Hr,**	**P: 2Hr,**	**Per Week**	**Total Credits:**	**1**

Course Outcome:

On Successful completion of course, students will be able to:

1. Use logic gates for designing digital circuits
2. Implement combinational circuits using VHDL
3. Implement sequential circuits using VHDL
4. Apply the knowledge gained for their project work based on the hardware digital circuits

Practicals based on above theory syllabus.

Syllabus for Semester I, B. E. Biomedical Engineering					
Course Code:	**BMP101**			**Course:**	Fundamentals of Electrical and Electronics Engineering Lab
L: 0 Hrs,	**T: 0 Hr,**	**P: 2 Hr,**	**Per Week**	**Total Credits:**	**1**

Course Outcomes

Upon the completion of this course, students will demonstrate the ability to :

1. Understand DC and AC operations.
2. Design different Electric and Magnetic circuits.
3. Develop applications employing appropriate electrical machines.
4. Apply knowledge of two terminal semiconductor devices like diodes to develop applications.

List of Experiments

Practical are based on BMT101 Syllabus

Syllabus for Semester I, B. E. (CIVIL, IT, CSE,EC, EE, IND, MECH, EN, Biomedical Engineering)					
Course Code:	**MET101**			**Course:**	Fundamentals of Electrical and Electronics Engineering Lab
L: 1 Hrs,	**T: 0 Hr,**	**P: 0 Hr,**	**Per Week**	**Total Credits:**	**1**

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 toboth 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. Floorplans 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 ofSimple 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) Narayana K. L. & P. Kannaiah (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.

Corresponding set of CAD Software Theory and User Manuals

Syllabus for Semester II, B. E. CSE (Artificial Intelligence and Machine Learning, Cyber security, Data Science)					
Course Code:	**CAT/CCT/CDT 104**			**Course:**	**Object Oriented Programming**
L: 3Hrs,	**T: 0 Hr,**	**P: 0Hr,**	**Per Week**	**Total Credits:**	**3**

Course Objectives

1. To make students understand Fundamental features of an object oriented language like Java: object classes and interfaces, exceptions and libraries of object collections

2. Introduce students with fundamental concepts like exception handling, generics, multithreading and streams.

Course Outcomes:

On successful completion of the course, students will be able to demonstrate

1. Understand the principles of object-oriented programming; create classes, instantiate objects and invoke methods.

2. Understand concept of generics and implement collection classes. Use exception handling mechanism.

3. Efficiently work with streams, use multithreading for solving classic synchronization problems. Perform java database connectivity and execute basic SQL commands.

4. Understand characteristics and need of Design Pattern in Software Design Process.

SYLLABUS

UNIT I

Features of Object Oriented Programming languages, Abstraction, Encapsulation, Inheritance, polymorphism and late binding. Concept of a class, Access control of members of a class, instantiating a class, constructor and method overloading.

UNIT II

Concept of inheritance, methods of derivation, use of super keyword and final keyword in inheritance, run time polymorphism, abstract classes and methods, Interface, implementation of interface, creating packages, importing packages, static and non-static members, Lambda Expressions Introduction, Block, Passing Lambda expression as Argument.

UNIT III

Exceptions, types of exception, use of try catch block, handling multiple exceptions, using finally, throw and throws clause, user defined exceptions, Introduction to streams, byte streams, character streams, file handling in Java, Serialization.

UNIT IV

Generics, generic class with two type parameter, bounded generics. Collection classes: Arraylist, Linked List, Hashset, Treeset.

UNIT V

Multithreading: Java Thread models, creating thread using runnable interface and extending Thread, thread priorities, Thread Synchronization, InterThread communications. Basic SQL commands, DDL and DML commands, Java Database Connectivity, Working with Connection, Statement and Result set, Data Manipulation using JDBC, Data navigation.

UNIT VI

Introduction to Design Patterns, Need of Design Pattern, Classification of Design Patterns, and Role of Design Pattern in Software design, Creational Patterns, Structural Design Patterns and Behavioral Patterns.

Text Books:

1. Herbert Schildt; JAVA, the Complete Reference; Ninth Edition, Tata McGraw- Hill Publishing Company Limited.

2. Design Patterns by Erich Gamma, Pearson Education.

Reference Books:

1. Cay S. Horstmann and Gary Cornell; Core JAVA Volume-II Advanced Features; Eighth Edition; Prentice Hall, Sun Microsystems Press 2008.

2. Herbert Schildt and Dale Skrien; Java Fundamentals A Comprehensive Introduction; Tata McGraw- Hill Education Private Ltd 2013.

Syllabus for Semester I, B. E. (CIVIL, IT, CSE,EC, EE, IND, MECH, EN, Biomedical Engineering)

Course Code:	**MEP151**			**Course:**	**Engineering Graphics & Design Lab**
L: 0Hrs,	**T: 0 Hr,**	**P: 4Hr,**	**Per Week**	**Total Credits:**	**02**

Course Outcomes

Students are prepared for actual work situations through practical training in a new state of the artcomputer 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 bothplanes; Projections of planes - Auxiliary Planes.

UNIT 3 : Projections of Solids

Inclined to both the Planes Auxiliary Views; Draw simple annotation, dimensioning and scale, Floorplans 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 ofSimple 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 eraseobjects; 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 Drawinglimits; ISO and ANSI standards for coordinate dimensioning; Orthographic constraints, map to objects, manually and automatically, Producing drawings by using various coordinate input entrymethods 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 throughmodifying 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), drafting and design package, 3D printing.

List of sheets

1. Curves (ellipse, Parabola, hyperbola, Cycloid, involute)
2. Line, Planes, Solids
3. Application of Section and development of solids
4. Orthographic Projection
5. Isometric
6. Auto CAD practice 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 Semester II, B. E. (Artificial Intelligence and Machine Learning, Cyber Security, Data Science)					
Course Code:	**CAP/CCP/CDP 104**			**Course:**	**Object Oriented Programming Lab**
L: 0Hrs,	**T: 0 Hr,**	**P: 2Hr,**	**Per Week**	**Total Credits:**	**1**

Course Objectives

1. To develop ability of students to implement basic concepts and techniques of object oriented programming paradigm like encapsulation, inheritance, polymorphism, exception handling.

2. Develop solution to problems using collection classes, generics, streams, multithreading and JDBC.

Course Outcomes:

On completion of the course the student will be able to

1. Design solution to problems using concepts of object oriented programming like classes, objects, inheritance with proper exception handling.

2. Use collection classes, generic classes to design programs and perform database connectivity.

3. Implement programs based on streams and multithreading.

SYLLABUS

Experiments based on above Syllabus.

Syllabus for Semester II, B. E. (All Branches)					
Course Code:	**HUT152**			**Course:**	**Constitution of India**
L: 2Hrs,	**T: 0 Hr,**	**P: 0Hr,**	**Per Week**	**Total Credits:**	**0**

Syllabus for B.E. Semester I Department of Humanities

Course Code : **Course :**

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 theStates
8. Parliamentary Form of Government in India – The constitution powers and status of the Presidentof 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

Durga Das Basu “An Introduction to Constitution of India” 22nd Edition, LexisNexis

Syllabus for Semester II, B. E. (All Branches)					
Course Code:	**PEP151**			**Course:**	**Physical and Mental Health using Yoga/Sports**
L: 0Hrs,	**T: 0 Hr,**	**P: 2Hr,**	**Per Week**	**Total Credits:**	**0**

Course outcome

On successful completion of the course, students will be able to:_

1. Understand fundamental skills and basic rules of games offered by the Physical Education Department of RCOEM.
2. Obtained health related physical fitness.
3. Develop body-mind co-ordination through games and yoga.
4. Changed sedentary life styles towards active living.

Brief Objectives of Sports/Yoga Practical Classes:

It has long been proven that a healthy body leads to a healthy mind. With a strong belief in this, Physical Education Department at RCOEM will conduct Sports/Yoga Classes with the objective of maintaining health, fitness and wellness of students as well as create awareness about need for good health and physical fitness. The objective would also be to make the all-round development with team spirit, social values as well as to identify and develop leadership qualities in students through various sports activities. Sports activities would also be conducted with the objective to provide better interaction and recreation to the students which is an important neutralizer for stress. Additionally, the objective would be to evaluate the health related fitness of students so as to recommend and conduct specific Yoga and Sports activities. The emphasis is on participation, with healthy competition.

Programme Outline:

Sports:

1. Introduction to sports, offered by the department.
2. Health and safety issues related to sports; knowledge, recognition and ability to deal with injuries and illness associated with sports.
3. Practicing the fundamental skills and bringing awareness of basic rules and regulations.
4. Conduction of small recreational games and activities.

Yoga: Includes various sitting, standing and lying Asanas, Suryanamaskars and Pranayamas.

Physical Efficiency Tests: This includes 6 health related physical fitness tests.

Syllabus for Semester II, B. E. (CIVIL,EC, EE, IND, MECH, EN)					
Course Code:	**CHT151**			**Course:**	**Chemistry**
L: 3 Hrs,	**T: 1 Hr,**	**P: 0Hr,**	**Per Week**	**Total Credits:**	**4**

Course Outcomes

The concepts developed in this course will aid in quantification of several concepts in chemistry thathave been introduced at the 10+2 levels in schools. Technology is being increasingly based on theelectronic, atomic and molecular level modifications. Quantum theory is more than 100 years old and to understand different phenomena; one has to base the description of all chemical processes atmolecular levels.

The course will enable the student to:

- Rationaliseperiodic properties such as ionization potential, electro-negativity, oxidation states and electronaffinity.
- Analyse microscopic chemistry in terms of atomic and molecular orbitals and to apply this knowledge for understanding the band structure of different types of solids.
- Understand different types of molecular interactions, 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
- List major chemical reactions that are used in the synthesis of molecules and to understand structural aspect of organic compounds.
- Analyse impurities present in the water and suggest the methodology for its removal.

Chemistry (Concepts in Chemistry for Engineering)

(1) Periodic properties (6 Lectures)

Variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, Effective nuclear charge, atomic and ionic sizes, ionization energies, electron affinity, electronegativity, and polarizability, Fajan's rule, Hard soft acids and bases theory and its applications.

(2) Atomic and molecular structure (8 lectures)

Schroedinger equation. Particleinboxsolutions,Formsofthehydrogen atom wavefunctionsandthe plotsofthesefunctionstoexploretheirspatial variations. Equationsforatomicandmolecular orbitals. Molecular Orbital Theory and Molecular orbital diagrams of different homo-nuclear and hetero-nuclear diatomic molecules. Pi-molecular orbital diagramof butadiene and benzene.

Crystalfield theoryandtheenergyleveldiagramsforoctahedral andtetrahedral complexes of transition metal ions and their magnetic properties.

Band structure of solids and the role of doping on band structures.

(3) Spectroscopic techniques and applications (8 lectures)

Electromagnetic Spectrum, Principles of spectroscopy.

Electronic spectroscopy – Basic Principles, Lambert-Beer's Law, Woodward-Fisher Rule for conjugated dienes. Fluorescence and its applications in medicine.

Nuclear magnetic resonance – Basic Principles, Chemical Shift, Spectral interpretation of some simple compounds.

(4) Chemical Thermodynamics and Electrochemistry (8 lectures)

Ionic, dipolar and van Der Waals interactions. Equations of real gases and critical phenomena.Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. The Nernst equationandapplications, Corrosion—Basic principle andmechanism of corrosion.

(5) Stereochemistry and Organic Reactions (8 lectures)

Stereoisomers, configurations and symmetry & chirality, enantiomers, diastereomers, optical activity. Introduction to reactions involving substitution, addition, elimination, oxidation, reduction. Synthesis of acommonly used drug molecule such as Ibuprofen, Aspirin, Paracetamol, Chloroquine, etc.

(6)Water Technology (6 lectures)

Impurities in natural water, hardness and alkalinity, Disadvantages of hardness i. e. sludge and scale formation, softening of water using lime-soda, zeolite and ion-exchange method, advantages and limitations of these water softening processes, Desalination of water using Reverse Osmosis.

Suggested Text Books

(i) A Textbook of Engineering Chemistry by Dr. Rajshree Khare, S. K. Katariaand Son's Publisher.

(ii) Selected topics in Inorganic Chemistry byW. U. Malik, R. D. Madan& G. D. Tuli, S. Chand Publications.

(iii) Engineering Chemistry by A. Pahari, B. Chauhan, Firewall Media, Infinity Science Press LLC.

(iv) A Textbook of Engineering Chemistry by S. S. Dara, S. Chand Publications.

(v) Applied Chemistry by V. K. Walekar, A. V. Bharati, Tech-Max Publications.

(vi) Organic Chemistry by R. L. Madan, Mc-Graw Hill Publications.

(vii) Elementary Organic Spectroscopy, Revised Editionby Y. R. Sharma, S. Chand Publications.

(viii) Organic Chemistry –Reactions and ReagentsbyO.P. Agrawal, GoelPublishing House Publications.

(ix) Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan

Reference Books

(i) Physical Chemistry, by Robert G. Mortimer, Elsevier Academic Press Publications.

(ii) Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane, Mc-Graw Hill Publications.

(iii) Organic Chemistry by Paula Y. Bruice, Pearson India.

(iv) Physical Chemistry, Third Edition by Gilbert W. Castellan, Adison-Wesley Publishing company.

(v) Physical Chemistry, by P. W. Atkins, Oxford University Press Publications.

(vi) Chemical Principles, Eight Edition, Steven S. Zumdahl, Donald J. DeCoste, Cengage LearningPublications.

(vii) Chemistry – The Molecular Nature of Matterand Change, Fifth Editionby Martin S. Silberberg, Mc-Graw Hill Publications.

(viii) Chemistry, An Introduction to Organic, Inorganic and Physical Chemistry, Third Edition by Catherine E.Housecroft, Edwin C. Constable, Pearson Prentice Hall Publications.

(ix) Organic Chemistry, Third Edition, William Kemp, Palgrave Publications.

(x) Concise Inorganic Chemistry, Fourth Edition by J. D. Lee, Chapman and Hall Publications.

Syllabus for Semester II, B. E. CSE (AI&ML, Cyber Security, Data Science, , IT, CSE)					
Course Code:	**CHT152**			**Course:**	**Chemistry**
L: 3 Hrs,	**T: 1 Hr,**	**P: 0Hr,**	**Per Week**	**Total Credits:**	**4**

Course Outcomes:

After the successful completion of the course, students shall be able to

- Predict the properties and interactions of chemical substances by understanding their composition at the atomic level. [**CO for Unit – 1**]
- Conversant in applying unique properties of nano-materials to solve challenges in our life. [**CO for Unit – 2**]
- Explain the differences in the mechanical behavior of engineering materials based upon bond type, structure, composition, and processing. [**CO for Unit – 3**]
- Study chemical kinetics using concepts of computational chemistry. [**CO for Unit – 4**]
- Discuss how spectroscopic methods are used for qualitative and quantitative analyses. [**CO for Unit – 5**]
- Analyse impurities present in the water and suggest the methodology for its removal. [**CO for Unit – 6**]

Syllabus:

Unit 1: Solid State Chemistry (7 Hours)

Bondings in atoms: Primary bonding: ionic, covalent, metallic. Secondary bonding: dipole-dipole, induced dipole-induced dipole, London dispersion/van der Waals, hydrogen. Shapes of molecules: hybridization, LCAO-MO, VSEPR theory.

Electronic material: Band theory: metals, insulators, and semiconductors. Band gaps, doping. Silicon wafer production.

Unit 2: Nano-material-I (7 Hours)

Basics of Nano chemistry: Definition of Nano, Scientific revolution-Atomic Structure and atomic size, emergence and challenges of nanoscience and nanotechnology, carbon age-new form of carbon (CNT to Graphene), One dimensional, Two dimensional and Three dimensional nanostructured materials, mechanical-physical-chemical properties.

Application of Nanomaterial: Molecular electronics and nano electronics, Nanotechnology for waste reduction and improved energy efficiency, Carbon Nanotubes for energy storage, Hydrogen Storage in Carbon Nanotubes, nanotechnology based water treatment strategies.

Unit 3: Advanced Materials: (7 hours)

Composite materials: Introduction, Classification: Polymer Matrix Composites, Metal Matrix Composites, Ceramic Matrix Composites, Carbon–Carbon Composites, Fiber- Reinforced Composites and Applications.

Reinforcements: Fibres- Glass, Kevlar, Carbon, Silicon Carbide, and Born Carbide Fibres.

Industrial Polymer: Thermoplastics, Thermosetting Plastics, Polymers used in electronic industries, Piezo and pyroelectric polymers, Polymers in optical media data storage devices.

Unit 4: Computational Chemistry [6 Hours]

Rate of the reaction, Order and Molecularity of the reaction, Rate expression for Zero Order, First Order and Second Order Reactions, Effect of the temperature, Use of Mathematica for determining rate of the reaction, etc.

Unit 5: Material Characterization using different Spectroscopic Techniques [7 Hours]

Fundamentals of spectroscopy, Infrared Spectroscopy, Electronic Spectroscopy, Nuclear Magnetic Resonance Spectroscopy.

Fundamentals of X-Ray Diffractions (XRD), X-Ray Fluorescence (XRF) spectroscopy.

Unit 6: Water Technology [8 Hours]

Impurities in natural water, hardness and alkalinity, Disadvantages of hardness i. e. sludge and scale formation, softening of water using lime-soda, zeolite and ion-exchange method, advantages and limitations of these water softening processes, Desalination of water using Reverse Osmosis.

Text Books:

1. J. Michael Hollas, Modern Spectroscopy, Fourth Edition, John Wiley and Sons, 2004.
2. William Kemp, Organic Spectroscopy, Third Edition, Palgrave Publication, 1991.
3. Bradley D. Fahlman, Materials Chemistry, Third Edition, Springer Nature, 2018.
4. Brian W. Pfennig, Principles of Inorganic Chemistry, John Wiley and Sons, 2015.
5. Steven S. Zumdahl, Donald J. DeCoste, Chemical Principles, Eighth Edition, Cengage Learning, 2017.
6. Catherine E. Housecroft and Edwin C. Constable, Chemistry: An Introduction to Organic, Inorganic and Physical Chemistry, Third Edition, Pearson Education Limited, 2006.
7. Michael J. Moran and Howard N. Shapiro, Fundamentals of Engineering Thermodynamics, Fifth Edition, John Wiley and Sons, 2006.
8. Donald L. Pavia, Gary M. Lampman, George S. Kriz, and James R. Vyvyan, Introduction to Spectroscopy, Fifth Edition, Cengage Learning, 2009.
9. C. N. R. Rao, A. Muller and A. K. Cheetham, The Chemistry of Nanomaterials: Synthesis, Properties and Applications, Wiley-VCH, 2004.
10. P. C. Jain and Monica Jain, Engineering Chemistry, DhanpatRai Publication.
11. S. S. Dara, A Textbook of Engineering Chemistry, S. Chand Publications.
12. J. D. Lee, Concise Inorganic Chemistry, Fourth Edition, Chapman and Hall Publications.

Syllabus for Semester II, B. E. (Biomedical Engineering)					
Course Code:	**CHT153**			**Course:**	**Biochemistry**
L: 3 Hrs,	**T: 1 Hr,**	**P: 0Hr,**	**Per Week**	**Total Credits:**	**4**

Course Outcomes

After the successful completion of the course, students will be able;

1. To understand the basic concepts of the quantitative analysis.
2. To apply the knowledge to understand the structure and function of biological molecules.
3. To understand the role of bio-molecules in biological system.
4. Demonstrate an understanding of the principles of a wide range of biophysical and biochemical techniques.
5. To understand spectroscopic methods used for qualitative and quantitative analyses.
6. To gain the information about role of water in biological system.

Syllabus

Module 1: Introduction to Biochemistry [6 Hours]

Introduction to Biochemistry, weak acid and bases, pH, buffers, Handerson - Hasselbalch equation, physiological buffers in living systems, Energy in living organism, Kinetics of biological systems; Michaelis- Mentenequation.

Module 2: Introduction to Biomolecules [8 Hours]

Carbohydrates: Chemistry of few carbohydrates , Glycolysis and glycogenolysis, glycogensis, Amino Acid:

Chemistry properties and metabolism.

Proteins: primary, Secondary, tertiary and quaternary structure, Isoenzymes.

Lipids: Chemistry, Metabolism of fatty acids, Phospholipids, Cholesterol regulation of metabolism.

Nucleic Acid: Chemistry of DNA and RNA, Enzymes: Classification and role in biological system Vitamins: Structure and functions of some vitamins

Module 3: Fundamental Biochemical Concepts [7 Hours]

Basic concept in Techniques – Different methods of concentration calculations, Purification techniques, Centrifugation, Filtration, Dialysis, Homogenization, Adsorption, Absorption, Partition, Centrifuge- types & application, Density Gradient centrifugation, Sedimentation, Sedimentation coefficient.

Module 4: Biophysical and Biochemical Techniques [7Hours]

General principles and application of Paper chromatography, Thin layer chromatography, Gas chromatography, High performance liquid chromatography.

Module 5: Material Characterization using different Spectroscopic Techniques [7 Hours]

Fundamentals of spectroscopy, concept of photochemical reaction, absorption, Beers Lamberts law, Infrared

Spectroscopy, Electronic Spectroscopy, Nuclear Magnetic Resonance Spectroscopy, MRI.

Fundamentals of X-Ray Diffractions (XRD), X-Ray Fluorescence (XRF) spectroscopy.

Module 6: Role of water in biological systems[7 Hours]

Impurities in natural water, hardness and alkalinity, Desalination of water using Reverse Osmosis. Properties of water and their applications in biological systems, Weak Interactions in Aqueous Systems, Hydrogen Bonding, Hydrophilic and Hydrophobic Interactions, van der Waals Interactions, Colligative Properties of Aqueous Solutions, Osmosis, Water as a reactant.

Suggested Books

1. J. Michael Hollas, Modern Spectroscopy, Fourth Edition, John Wiley and Sons,2004.
2. William Kemp, Organic Spectroscopy, Third Edition, Palgrave Publication,1991.
3. S. S. Dara, A Textbook of Engineering Chemistry, S. ChandPublications.
4. P. C. Jain and Monica Jain, Engineering Chemistry, Dhanpat RaiPublication.
5. Y. Keith Wilson and J. Walkar, Principles and Techniques of Biochemistry and Molecular Biology, Seventh edition, Cambrige University Press,2007.
6. Satyajit D. Sarker and Lutfun Nahar, Chemistry for Pharmacy Students General, Organic and Natural Product Chemistry, Wiley-Interscience and Sons Limited,2007.
7. Thomas M. Devlin, Textbook of Biochemistry with Clinical Correlations, Fourth Edition, Wiley-LISS,1977.
8. A. Upadhayay, K. Upadhayay, N. Nath, Biophysical Chemistry (Principles and Techniques),Himalaya Publishing House,2009.
9. David L. Nelson and Michael M. Cox, Lehninger Principles of Biochemistry, Fifth Edition, W. H. Freeman and Company, New York, 2008.
10. Elsa Lundanes, Léon Reubsaet and Tyge Greibrokk, Chromatography Basic Principles, Sample Preparations and Related Methods, Wiley-VCH.

Syllabus for Semester II, B. E. (CIVIL,EC, EE, IND, MECH, EN)					
Course Code:	**CHP151**			**Course:**	**Chemistry Lab**
L: 0Hrs,	**T: 0Hr,**	**P: 3Hr,**	**Per Week**	**Total Credits:**	**1.5**

Laboratory Outcomes

The chemistry laboratory course will consist of experiments illustrating the principles of chemistryrelevant to the study of science and engineering.

The students will learn to:

- Estimate the amount of different impurities in water/waste water samples.
- Estimate rate constants of reactions and order of the reaction from concentration of reactants/products as a function of time and to validate adsorption isotherms.
- Measure molecular/system properties such as surface tension, viscosity of aqueous or other industrially important liquids/mixtures etc.
- Synthesize a polymer or drug molecule or nano-material.

List of Experiments for Chemistry Lab

1. Determination of Surface tension of a given liquid/mixture.
2. Determination of Viscosity of a given liquid/mixture.
3. Estimation of total, temporary andpermanent hardness present ina given water sample.
4. Estimation of type and extent of alkalinities present in a given water sample.
5. Estimation of Cu and Zn in a brass sample.
6. Study of chemical oscillations or iodine clock reaction and determination of rate constant of the reaction.
7. Estimation of acid value of oil.
8. Estimation of saponification value of oil.
9. Ion Exchange column for removal of hardness.
10. Study of adsorption of acetic acid by charcoal.
11. Synthesis a polymer / drug molecule / nano-material.

Suggested Books/Reference Books

(1) A Textbook on Experiments and Calculationsin Engineering Chemistry by S. S. Dara, S. Chand Publications.

(2) Advanced PracticalPhysical ChemistrybyJ.B.Yadav,Krishna's PrakashanMedia(P)Limited.

(3) Collection of Interesting General Chemistry Experiments, A by A. J. Elias, Universities Press Publications.

(4) College Practical Chemistry by V. K. Ahluwalia, S. Dhingra and A. Gulati, Universities Press Publications.

(5) Advanced Practical Medicinal Chemistry by Ashutosh Kar, New Age International Publisher.

Syllabus for Semester I, B. E. CSE (AIML, Cyber Security, Data Science, , IT, CSE)					
Course Code:		**CHP152**		**Course:**	**Chemistry Lab**
L: 0 Hrs,	**T: 0 Hr,**	**P: 3Hr,**	**Per Week**	**Total Credits:**	**1.5**

Course 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 the amount of different impurities in water/waste water samples.
- Estimate rate constants of reactions and order of the reaction from concentration of reactants/products as a function of time and to validate adsorption isotherms.
- Measure molecular/system properties such as surface tension, viscosity of aqueous or other industrially important liquids/mixtures etc.
- Synthesize a polymer or drug molecule or nano-material.
- Use principle of spectroscopic techniques for structural determination.

List of Experiments: [Any Eight from the List]

[1] Preparation of different Solutions: Molar solution, Normal solution and percent solution and Determination of concentration.

[2] To find out types of alkalinity and estimation of their extent in the water sample.

[3] Estimation of temporary, permanent and total hardness present in the water sample using complexometric titration method.

[4] Spectroscopic/Colorimetric determine of wavelength of maximum absorption of chemical/biological compound in solution and determination of concentration using Lambert-Beer's Law.

[5] Determination of rate of the reaction of hydrolysis of ethyl acetate at room temperature and analysis of experimental data using Computational Software.

[6] To study chemical kinetics of peroxydisulphate and iodide ions reactions and to find out order of the reaction and analysis of experimental data using Computational Software.

[7] Synthesis of Nano-material/Polymer and its study.

[8] Determination of relative and kinematic viscosities of aqueous solutions of Poly-ethylene glycol (Polymeric Liquid) using Redwood Viscometer (type I or II) at different temperatures.

[9] To study effect of bondings of water molecules with electrolyte (NaCl/KCl) and non-electrolyte solute (Soap) in the solution through Surface Tension Determination.

[10] Study of ion-exchange column for removal of hardness in the water sample.

[11] Demonstrations of organic spectral techniques: IR, NMR.

[12] Demonstration of in-organic spectral techniques: XRD, XRF.

Text Books/Reference Books:

(1) S. S. Dara, **A Textbook on Experiments and Calculations in Engineering Chemistry**, S. Chand Publications.

(2) J. B. Yadav, **Advanced Practical Physical Chemistry**, Krishna's Prakashan Media (P) Limited.

(3) A. J. Elias, **Collection of Interesting General Chemistry Experiments**, Universities Press Publications.
(4) V. K. Ahluwalia, S. Dhingra and A. Gulati, **College Practical Chemistry**, Universities Press Publications.
(5) Ashutosh Kar, Advanced **Practical Medicinal Chemistry**, New Age International Publisher.

Syllabus for Semester II, B. E. (Biomedical Engineering)					
Course Code:	**CHP153**			**Course:**	**Biochemistry Lab**
L: 0 Hrs,	**T:0 Hr,**	**P: 3Hr,**	**Per Week**	**Total Credits:**	**1.5**

Course 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:

1. Estimate the amount of different impurities in water/waste water/food samples.
2. Measure molecular/system properties such as surface tension, viscosity of aqueous or other industrially important liquids/mixtures etc.
3. Synthesize a polymer or drug molecule or nano-material.
4. Use principle of spectroscopic and chromatographic techniques.

List of Experiments: [Any Eight from the List]

1. Preparation of different Solutions: Molar solution, Normal solution and percent solution and Determination ofconcentration.
2. To find out types of alkalinity and estimation of their extent in the watersample.
3. Estimation of hardness present in the water sample by complexometric titration method using EDTA.
4. DeterminationofCODinwastewatersample.
5. DeterminationofBODinwastewatersample.
6. To study effect of bondings of water molecules with electrolyte (NaCl/KCl) and non- electrolyte solute (Soap) in the solution through Surface TensionDetermination.
7. Synthesis of Drug/Polymer and itsstudy.
8. Separation of different organic compounds by paperchromatography.
9. Estimation of urea inblood.
10. Estimation of carbohydrate in blood.
11. Determination of Fe content in foodsample.
12. Demonstrations of laminar flowequipment
13. Spectroscopic/Colorimetric determine of wavelength of maximum absorption of chemical/biological compound in solution and determination of concentration using Lambert- Beer's Law.
14. Demonstration of chromatographic techniques: Gas chromatography,HPLC
15. Demonstrations of organic spectral techniques: IR,NMR.

Suggested Books/Reference Books

1. S. S. Dara, A Textbook on Experiments and Calculations in Engineering Chemistry, S.ChandPublications.

2. J.B. Yadav, Advanced Practical Physical Chemistry, Krishna's Prakashan Media (P) Limited.
3. A. J. Elias, Collection of Interesting General Chemistry Experiments, Universities Press Publications.
4. V. K. Ahluwalia, S. Dhingra and A. Gulati, College Practical Chemistry, Universities Press Publications.
5. Ashutosh Kar, Advanced Practical Medicinal Chemistry, New Age International Publisher.
6. D. M. Vasudevan and Subir Kumar Das, Practical Textbook of Biochemistry for Medical Students, Jaypee Brothers Medical Publishers (P) Ltd., 2013.

Geetha Damodaran K, Practical Biochemistry, Jaypee Brothers Medical Publishers (P) Ltd., 2011

Syllabus for Semester II, B. E. (All Branches)					
Course Code:		**MAT151**		**Course:**	**Calculus**
L: 3 Hrs,	**T: 1 Hr,**	**P: 0Hr,**	**Per Week**	**Total Credits:**	**4**

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 and applications that they would find useful in their disciplines.

Course Outcomes

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

1. The fallouts of Mean Valve Theorems that is fundamental to application of analysis to Engineering problems, to deal with functions of several variables that are essential in most branches of engineering.

2. Basics of improper integrals, Beta and Gamma functions, Curve Tracing, tool of power series and Fourier series for learning advanced Engineering Mathematics.

3. Multivariable Integral Calculus and Vector Calculus and their applications to Engineering problems.

Syllabus

Module 1: ***Calculus:*** (7 hours)

Rolle's theorem, Mean value theorems, Taylor's and Maclaurin series expansions; Indeterminate forms and L'Hospital's rule; radius of curvature (Cartesian form), evolutes and involutes

Module 2:***Multivariable Calculus (Differentiation)*** (8 hours)

Limit, continuity and partial derivatives, Eulers Theorem, chain rule, total derivative, Jacobians, total derivative, Maxima, minima and saddle points; Method of Lagrange multipliers.

Module 3 ***Calculus:*** (6 hours)

Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Tracing of curves (Cartesian form)

Module 4:***Sequences and series:*** (7 hours)

Convergence of sequence and series, tests for convergence, power series, Fourier series: Half range sine and cosine series, Parseval's theorem.

Module 5: ***Multivariable Calculus (Integration)*** (7 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).

Module 6: Vector Calculus (7 hours)

Vector Differentiation, Directional derivatives, total derivative, Gradient, curl and divergence. Vector integration, Theorems of Green, Gauss and Stokes.

Topics for self-learning

Maxima and minima for function of one variable, Geometrical interpretation of Partial Differentiation (Tangent plane and Normal line), Applications of definite integrals to evaluate perimeter, area, surface areas and volumes of revolutions.

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 Semester II, B. E. (All Branches)					
Course Code:	**CST/CDT/CCT/CAT 101/ CST 151**			**Course:**	**Programming for Problem Solving**
L: 4 Hrs,	**T: 0 Hr,**	**P: 0Hr,**	**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 /Pseudo code with examples. Arithmetic expressions and precedence

UNIT-II: C Programming Language

Introduction to C language: Keywords, Constant, Variable, Data types, Operators, Types of Statements, Pre-processor 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 for Semester II, B. E. (All Branches)					
Course Code:	**CSP/CDP/CCP/CAP 101/ CSP 151**			**Course:**	**Programming for Problem Solving Lab**
L: 0 Hrs,	**T: 0 Hr,**	**P: 2Hr,**	**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.

Syllabus for Semester II, B. E. (All Branches)					
Course Code:	**IDT151**			**Course:**	**Creativity, Innovation & Design Thinking**
L: 1 Hrs,	**T: 0 Hr,**	**P: 0Hr,**	**Per Week**	**Total Credits:**	**1**

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/Brain writing, 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 group's hands-on projects

• Eight-dimensional (8D) ideation method examples• Large teams videos

Syllabus for Semester II, B. E. (CIVIL,EC, EE, IND, MECH,CS,IT,EN)					
Course Code:	**INT151**			**Course:**	**Workshop/ Manufacturing Practices**
L: 1 Hrs,	**T: 0 Hr,**	**P: 0Hr,**	**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 metalcutting, fitting operations, and associated measuring and marking tools

Unit-2 Introduction topattern making for metal casting, different types of carpentry tools, measuringtools 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, mechanicsofwelding, typesofwelding, soldering andbrazing, typesofjoints.

Unit-5 Introduction tofoundries, Metal Casting, types of sand, Introduction to Molding tools& castingprocess.

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 EngineeringandTechnology"4th Edition, PearsonIndia Education2008
2. Roy A. and Lindberg, "Process and Materials of Manufacture"4th Edition, Prentice Hall India1998.

Syllabus for Semester II, B. E. CSE (AIML, Cyber security, Data Science)					
Course Code:	**CAT/CCT/CDT 102**			**Course:**	**Computer Workshop**
L: 1 Hrs,	**T: 0 Hr,**	**P: 0Hr,**	**Per Week**	**Total Credits:**	**1**

Course Objectives

1. Understand the definition and principles of UI/UX Design in order to design with intention.
2. Achieve a deep understanding of the entire life-cycle of design—the process, purpose, and tools.
3. Learn the basics of HCI (human-computer interaction) and the psychology behind user decision-making.
4. Discover the industry-standard tools and specific project deliverables in UI/UX.
5. Explain why you made design decisions, through presentations of assignments and your personal portfolio.

Unit 1:

UI/UX Overview: Intro to UI/UX, Notion & Figma Setup, Design Thinking.
User Research: How to identify stakeholders, Figma Basics, How to identify user needs.

Unit 2:

User Journeys: Mapping the user journey, Figma Grayscales, Finding solutions & constraint cards, **Grayscales & User Testing:** UX Principles, Figma Prototype, Understanding user testing.

Unit 3:

UI Principles: UI Principles, Color and Font.
Style Guide: Components, Responsive Design.

Course Outcomes

On successful completion of the course, students will be able to:
1. Understand basics of UI/UX
2. Find solutions and constraint cards.
3. Design responsive UI.

Text Books

1. UI/UX design for designer and developers: by Nathan Clark
2. User Story mapping software for agile age [Paid subscription on yearly basis]
3. User story mapping by Jeff Patton, O'Reilly Publication

Syllabus for Semester II, B. E. (Biomedical Engineering)					
Course Code:	**BMT 102**			**Course:**	**Human Anatomy and Physiology for Engineers -I**
L: 3 Hrs,	**T: 0 Hr,**	**P: 0Hr,**	**Per Week**	**Total Credits:**	**3**

Course Outcomes

After completion of the course student will be able to:

1. Understand human physiology at a cellular, tissue, and organ systems level.
2. Recognize the integration and control of the different physiological systems and their roles in maintaining homeostasis.
3. Appreciate the structural and functional aspects of Human Anatomy
4. Understand the process of development and aging of organ systems

Syllabus

Module – 1 Fundamentals of Anatomy, Cells and Tissues

Introduction to Human Body; Cell Level Organization; Types of cell and their function; Tissue Level Organization; Types of Tissue and there function

Module – 2 Integumentary System and Special senses

Structure and Function of Skin; Accessory structures of skin; Skin Wound Healing; Development and Aging of Integumentary System; Anatomy and Physiology of Olfaction, Gustation, Vison, Hearing and Equilibrium senses; Aging of senses

Module – 3 Skeletal System

Structure and Function of Bone and the Skeletal System; Bone formation; Fracture and Repair; Types of Bones; Structure and Function of Axial and Appendicular Skeleton; Joint and its classification; Types of Movements at Synovial Joints and Types of Synovial Joints; Aging of Joints

Module – 4 Muscular System

Overview of Muscular Tissue; Skeletal Muscle Tissue; Working of Muscle Fibers; Metabolism; Control of Muscle Tension; Types of Muscle Fiber and Tissue; Regeneration; Development and Aging of Muscle.

Module – 5 Digestive System

Overview of the Digestive System; Layers of the GI Tract; Neural Innervation of the GI Tract; Structure and Function of Organs of Digestive system; Phases of Digestion; Development and Aging

Module – 6 Excretory system

Overview of Renal Physiology; Anatomy and Physiology of the Kidney; Glomerular Filtration; Reabsorption and Secretion; Waste Management of in other body system; Aging of Urinary System

Text Book

1. Principles of Anatomy & Physiology, 13th Edition, Gerard J. Tortora and Bryan Derrickson, John Wiley & Sons, Inc

2. Human Anatomy & Physiology Standalone Book, Marieb, Human Anatomy & Physiology, 11th Edition, Pearson.

Reference Books

1. Atlas of Human Anatomy Professional Edition, 7th Edition, Frank H. Netter
2. Ross & Wilson Anatomy and Physiology in Health and Illness, 13th Edition.
3. Clinical Anatomy: Applied Anatomy for Students and Junior Doctors, 14th Edition.
4. Gray's Anatomy for Students, 4th Edition.

Syllabus for Semester II, B. E. (CIVIL,EC, EE, IND, MECH,CS,IT,EN)					
Course Code:	**INP 151**			**Course:**	**Workshop/ Manufacturing Practices Lab**
L: 0 Hrs,	**T: 0 Hr,**	**P: 2Hr,**	**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, PearsonIndia Education2008
2. Roy A. and Lindberg, "Process and Materials of Manufacture", Prentice hall India 1998.

Syllabus for Semester II, B. E. CSE (AIML, Cyber security, Data Science)					
Course Code:	**CAP/CCP/CDP 102**			**Course:**	**Computer Workshop Lab**
L: 0 Hrs,	**T: 0 Hr,**	**P: 2Hr,**	**Per Week**	**Total Credits:**	**1**

Course Objectives

Throughout the course, students will be expected to learn Python Language basics to do the following:

1. Understand UI/UX basics and its use in software industry
2. Understand basic use cases of UI/UX.
3. Develop small utilities using UI/UX tools
4. Develop and integrate UI/UX with basic programs

Syllabus

Programs based on:

1. Illustration tool box
2. Storytelling and typography tools
3. UX writing and AR/VR tools
4. Voice technology tools
5. Motion Design, Animated graphics

Course Outcomes

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

1. Design UI/UX use cases using Illustration tool box
2. Design and use storytelling and typography for requirement specification.
3. Use UX writing, AR and VR models to develop interfaces for use cases
4. Develop small applications using voice technology, motion design, and animation.

Syllabus for Semester II, B. E. (All Branches)					
Course Code:	**HUT151**			**Course:**	**English**
L: 2 Hrs,	**T: 0 Hr,**	**P: 0Hr,**	**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 Precise 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 Semester II, B. E. (All Branches)					
Course Code:	**HUP151**			**Course:**	**English Lab**
L: 0 Hrs,	**T: 0 Hr,**	**P: 2Hr,**	**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