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
2019 - 2020

B. E. (INFORMATION TECHNOLOGY)

Published by
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ISO 9001 : 2015 CERTIFIED ORGANISATION

About the department

The department, established in 2001 and accredited by National Board of Accreditation AICTE, in 2008 and 2014 respectively, has an excellent infrastructure and well qualified and experienced faculties with average teaching experience of 14 years. The curriculum is designed so as to cater to Core IT subjects as well as those related to current trends in IT Industries. The department has MOU's signed with leading software industries which gives inputs in curriculum development, conduction of guest lectures, summer / winter training for students. Option of full six months internship is provided, in reputed IT industries, for VIII semester students. Laboratories of the department are well equipped with computers of latest configuration and internet facility. Latest software, wireless access point, LCD projectors and separate router are used in the laboratories and for teaching purpose. Department takes pride in excellent placements of the final year students and has the distinction of consistently getting good results in all semesters. The department also coordinates Semicolon Tech Club of RCOEM, under which various technical and co-curricular activities are organized for the benefit of students.

Department Vision

To establish the department as a major source of manpower for the IT sector.

Department Mission

To produce engineering graduates with sound technical knowledge in Information Technology, good communication skills and ability to excel in professional career.

Program Educational Objectives

1. To produce Quality Manpower catering to the requirements of IT Industry with sound fundamentals and core Engineering knowledge along with adequate exposure to Emerging Technologies.
2. To develop graduates possessing abilities to Interpret, Analyse and Design effective solutions while working in a team and capable of adapting to current trends by engaging in Lifelong learning.
3. To imbibe in graduate an understanding of issue related to Environment, Society, Profession and Ethics along with importance of Effective Communication Skills.

Program Outcomes

Engineering Graduates will be able to :

1. **Engineering knowledge :** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis :** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design / development of solutions :** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems :** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage :** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society :** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability :** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of and need for sustainable development.

8. **Ethics :** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work :** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication :** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance :** Demonstrate knowledge and understanding of the engineering and managemnt principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning :** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes

ITPSO1 : Foundation of Logic development and Mathematical concepts : Demonstrate logic development ability along with mathematical concepts to solve real world problems.

ITPSO2 : Foundations of Computer Systems & Software development : Ability to understand the principles and working of computer systems, Software Engineering principles, Familiarity and practical competence with a broad range of programming language and open source platforms relevant to IT Industry.

ITPSO3 : Application of Computing knowledge and Research ability : Ability to work professionally in IT Industry, prepare for higher studies and to develop systems based on cutting edge technologies to solve the real world problems in IT Industry.

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 L	T	P	Credits	Maximum Marks Continual Assessment	End Sem Examination	Total	ESE Duration (Hours)
1.	PHT151	Mechanics	Civil; Industrial	3	1	0	4	40	60	100	03
	PHT152	Oscillations, waves & Optics	Electrical; Mechanical								
	PHT153	Semiconductor Physics	Electronics; EDT; Electronics & Comm; Computer Science Engg; Information Tech.								
2.	PHP151	Mechanics Lab	Civil; Industrial	0	0	3	1.5	25	25	50	–
	PHP152	Oscillations, Waves & Optics Lab	Electrical; Mechanical								
	PHP153	Semiconductor Physics Lab	Electronics; EDT; Electronics & Comm.; Computer Science Engg; Information Tech.								
3.	MAT152/ MAT151	Differential Equations, Linear Algebra, Statistics & Probability / Calculus	All Branches	3	0/1	0	3/4	40	60	100	03
4.	MAP151	Computational Mathematics Lab	All Branches	0	0	2	1	25	25	50	–
5.	EET151	Basic Electrical Engineering	All Branches	3	1	0	4	40	60	100	03
6.	EEP151	Basic Electrical Engineering Lab	All Branches	0	0	2	1	25	25	50	–
7.	MET151	Engineering Graphics & Design	All Branches	1	0	0	1	40	60	100	03
8.	MEP151	Engineering Graphics & Design Lab	All Branches	0	0	4	2	50	50	100	–
9.	HUT152	Constitution of India	All Branches	2	0	0	0	–	–	–	–
10.	PEP151	Yoga/Sports	All Branches	0	0	2	0	–	–	–	–
			Total	12	2/3	13	**17.5/18.5**			**650**	

GROUP 1: SEMESTER-II

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

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

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

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

Sr. No.	Course Code	Course Title	Hours per week L	T	P	Credits	Maximum Marks: Continuous Evaluation	End Sem Exam	Total	ESE Duration (Hrs)
1	ITT251	Object Oriented Programming	2	0	0	2	40	60	100	03
2	ITP251	Object Oriented Programming	0	0	4	2	25	25	50	–
3	ITT252	Data Structures	3	0	0	3	40	60	100	03
4	ITP252	Data Structures	0	0	4	2	25	25	50	–
5	ITT253	Digital Circuits & Fundamentals of Microprocessor	2	1	0	3	40	60	100	03
6	ITP253	Digital Circuits & Fundamentals of Microprocessor	0	0	4	2	25	25	50	–
7	ITP254	IT Workshop	0	0	4	2	25	25	50	–
8	MAT252	Linear Algebra & Statistics	3	0	0	3	40	60	100	03
9	HUT254	Technical Communication	3	0	0	3	40	60	100	03
10	CHT251	Environmental Science	2	0	0	0	–	–	–	–
		TOTAL	**32 Hrs**			**22**				

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

Sr. No.	Course Code	Course Title	Hours per week L	T	P	Credits	Maximum Marks: Continuous Evaluation	End Sem Exam	Total	ESE Duration (Hrs)
1	ITT255	Discrete Mathematics	2	1	0	3	40	60	100	03
2	ITT256	Computer Organization and Architecture	3	0	0	3	40	60	100	03
3	ITP256	Computer Organization and Architecture	0	0	2	1	25	25	50	–
4	ITT257	Software Engineering	3	0	0	3	40	60	100	03
5	ITP257	Software Engineering	0	0	4	2	25	25	50	–
6	ITT258	Design and Analysis of Algorithms	3	0	0	3	40	60	100	03
7	ITP258	Design and Analysis of Algorithms	0	0	4	2	25	25	50	–
8	HUT255	Organizational Behavior	3	0	0	3	40	60	100	03
9		Open Elective - I	3	0	0	3	40	60	100	03
10	HUT252	Essence of Indian Traditional Knowledge	2	0	0	0	–	–	–	–
		TOTAL	**30 Hrs**			**23**				

Open Elective - I	
Code	**Course Title**
ITT259	Linux Fundamentals

Scheme of Teaching & Examination of Bachelor of Engineering
V Semester B.E. (Information Technology)

Sr. No.	Course Code	Course Title	Hours per week			Credits	Maximum Marks			ESE Duration (Hrs)
			L	T	P		Continuous Evaluation	End Sem Exam	Total	
1	ITT351	Operating Systems	3	0	0	3	40	60	100	03
2	ITP351	Operating Systems	0	0	4	2	25	25	50	--
3	ITT352	Formal Languages and Automata Theory	2	1	0	3	40	60	100	03
4	ITT353	Computer Networks	3	0	0	3	40	60	100	03
5	ITP353	Computer Networks	0	0	4	2	25	25	50	--
6	HUT354	Managerial Economics	3	0	0	3	40	60	100	03
7	ITT354	Elective-I	3	0	0	3	40	60	100	03
8		Open Elective-II	3	0	0	3	40	60	100	03
		TOTAL	**26 Hrs**			**22**				

Elective - I	
Code	**Course Title**
ITT354 - 1	Adv. Data Structures
ITT354 - 2	Web Technologies

Open Elective - II	
Code	**Course Title**
ITT355 - 1	Python Programming
ITT355 - 2	Client Server Computing & Applications

Scheme of Teaching & Examination of Bachelor of Engineering
VI Semester B.E. (Information Technology)

Sr. No.	Course Code	Course Title	Hours per week			Credits	Maximum Marks			ESE Duration (Hrs)
			L	T	P		Continuous Evaluation	End Sem Exam	Total	
1	ITT356	Wireless Communication	3	0	0	3	40	60	100	03
2	ITT357	Compiler Design	3	0	0	3	40	60	100	03
3	ITP357	Compiler Design	0	0	4	2	25	25	50	--
4	ITT358	Database Management System	2	1	0	3	40	60	100	03
5	ITP358	Database Management System	0	0	4	2	25	25	50	--
6	ITT359	Elective - II	3	0	0	3	40	60	100	03
7		Open Elective-III	3	0	0	3	40	60	100	03
8	ITP361	Project-I	0	0	4	2	50	50	100	--
9	ITP362	Comprehensive Viva	0	0	2	1	25	25	50	--
		TOTAL	**26 Hrs**			**22**				

Elective - II	
Code	**Course Title**
ITT359 - 01	IT Infrastructure Services
ITT359 - 02	Mobile Application Development

Open Elective - III	
Code	**Course Title**
ITT360 (self study)	Cyber Security and laws

Scheme of Teaching & Examination of Bachelor of Engineering
VII Semester B.E. (Information Technology)

Sr. No.	Course Code	Course Title	Hours per week			Credits	Maximum Marks			ESE Duration (Hrs)
			L	T	P		Continuous Evaluation	End Sem Exam	Total	
1	ITT451	Artificial Intelligence	3	0	0	3	40	60	100	03
2	ITT452	Elective-III	3	0	0	3	40	60	100	03
3	ITT453	Elective- IV	3	0	0	3	40	60	100	03
4		Open Elective-IV	3	0	0	3	40	60	100	03
5	IDT452	Computational Biology	2	1	0	3	40	60	100	03
6	ITP455	Industry Internship Evaluation*	0	0	2	0	--	--	--	--
7	ITP456	Project - II	0	0	12	6	75	75	150	--
		TOTAL	**29 Hrs**			**21**				

*Industry Internship evaluation (6 - 8 weeks, undergone during 3rd to 6th semester)

Elective - III		Elective - IV	
Code	**Course Title**	**Code**	**Course Title**
ITT452 - 01	Distributed Systems	ITT453-01	Image Processing
ITT452 - 02	Virtualization and Cloud Computing	ITT453-02	Information Security

Open Elective - IV	
Code	**Course Title**
ITT 454-1	Internet Technologies
ITT 454-2	E-Commerce

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

Sr. No.	Course Code	Course Title	Hours per week			Credits	Maximum Marks			ESE Duration (Hrs)
			L	T	P		Continuous Evaluation	End Sem Exam	Total	
1	ITT457	Elective - V	3	0	0	3	40	60	100	03
2	ITT458	Elective-VI	3	0	0	3	40	60	100	03
3	ITP459	Project-III / One Semester Industry Project/Incubation	0	0	12	6	75	75	150	--
		TOTAL	**18 Hrs**			**12**				

Elective - V		Elective - VI	
Code	**Course Title**	**Code**	**Course Title**
ITT457 - 01	Information Retrieval	ITT458-01	Data Warehousing & Business Intelligence
ITT457 - 02	Machine Learning	ITT458-02	Internet of Things

Scheme of Teaching & Examination of Honors Specialization in Information Technology										
Sr. No.	Course Code	Course Title	Hours per week			Credits	Maximum Marks			ESE Duration (Hrs)
			L	T	P		Continuous Evaluation	End Sem Exam	Total	
1.	ITTH41	Foundation to Computer System Design	3	1	-	04				
2.	ITTH51-1	Applied data Science with Python	3	1	-	04				
3.	ITTH51-2	Capstone : Retrieving, Pro- - cessing and Visualizing Data using Python	3	1	-	04				
4.	ITTH61	Data Mining	3	1	-	04				
5.	ITTH71	Big Data Computing	3	1	-	04				
6.	ITTH81	Block Chain Architecture and use cases.	3	1	-	04				

Note: The above courses are to be opted as MOOC courses with prior permission and consultation with Head, Information Technology Department.

Scheme of Teaching & Examination of Minors Specialization in Information Technology										
Sr. No.	Course Code	Course Title	Hours per week			Credits	Maximum Marks			ESE Duration (Hrs)
			L	T	P		Continuous Evaluation	End Sem Exam	Total	
1.	ITTM41	Python for Everybody	3	1	-	04				
2.	ITTM51	Object Oriented Programming in Java	3	1	-	04				
3.	ITTM61	Web Design for Everybody	3	1	-	04				
4.	ITTM71-1	Machine Learning	3	1	-	04				
5.	ITTM71-2	The Bits and Bytes of Computer Networking	3	1	-	04				
6.	ITTM81	Emerging Technologies : IOT, Wireless and Cloud Computing	3	1	-	04				

Note: If any of the above course is accessible to a student in his / her parent branch or open elective then credit transfer against that course will be allowed subject to completion of a MOOC course with prior permission and consultation with Head, Information Technology Department.

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

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

Course Objectives:

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

Course Outcomes:

After successful completion of the course students will

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

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

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

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

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

Module 3: Conservative Forces (5L)

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

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

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

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

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

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

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

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

Text Book(s):

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

References:

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

Syllabus for Semester I / II BE

Bachelor of Mechanical Engineering, Electrical Engineering

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

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

Course Objectives:

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

Course Outcomes:

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

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

Module 1: Oscillations (8L)

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

Module 2: Waves - 1 (5L)

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

Module 3: Waves - 2 (5L)

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

Module 4: Wave Optics - 1 (6L)

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

Module 5: Wave Optics - 2 (6L)

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

Module 6: Matter Waves (8L)

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

Text Book(s):

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

References:

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

Syllabus for Semester I / II

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

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

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

Course Objectives:

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

Course Outcomes:

After successful completion of the course students will

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

Module 1: Quantum Mechanics Introduction (8L)

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

Module 2: Electronic Materials (8L)

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

Module 3: Electrons in Semiconductors (4L)

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

Module 4: Intrinsic and Extrinsic Semiconductors (6L)

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

Module 5: Light - Semiconductors Interaction (6L)

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

Module 6: Engineered Semiconductor Materials (6L)

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

Text Book(s):

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

References:

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

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

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

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

Course Outcomes

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

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

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

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

Suggested References:

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

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

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

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

Course Outcomes

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

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

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

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

Suggested References:

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

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

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

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

Course Outcomes

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

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

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

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

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

Syllabus for B.E. Semester I

Course Code: MAT151 | **Course: Mathematics-I: Calculus**
L: 3 Hrs., T: 1 Hrs., P: 0 Hrs., Per week | **Total Credits: 04**

Course Objective:

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

Course Outcomes

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

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

Syllabus

Module 1 Calculus: (6 hours)

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

Module 2: Calculus: (6 hours)

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

Module 3:Sequences and series: (10 hours)

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

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

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

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

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

Textbooks/References:

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

Syllabus for B.E. Semester II

Course No. MAT152 | **Course : Mathematics-II: Differential Equations, Linear Algebra, Statistics & Probability**
L: 3 Hrs., T: 0 Hrs., P: 0 Hrs., Per week | **Total Credits : 03**

Course Objective:

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

Course Outcomes

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

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

Syllabus

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

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

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

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

Module 3: Basic Statistics: (7 hours)

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

Module 4: Basic Probability: (8 hours)

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

Module 5: Matrices (10 hours)

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

Textbooks/References:

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

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

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

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

Course Outcomes

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

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

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

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

Suggested References:

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

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

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

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

Course Outcomes:

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

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

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

CO3: To study the working principles of power converters.

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

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

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

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

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

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

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

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

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

Module 5: Transformers (6 hours) - CO2:

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

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

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

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

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

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

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

Text / References:

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

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

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

Laboratory Outcomes: The students are expected to

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

CO2: Make electrical connections by wires of appropriate ratings.

CO3: Understand the usage of common electrical measuring instruments.

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

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

List of Laboratory Experiments/Demonstrations:

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

Syllabus of Department of Mechanical Engineering

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

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

Course Outcomes

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

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

UNIT 1 : Introduction to Engineering Drawing

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

UNIT 2 : Orthographic Projections

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

UNIT 3 : Projections of Solids

Inclined to both the Planes - Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include : windows, doors, and fixtures such as WC, bath, sink, shower, etc.

UNIT 4 : Sections and Sectional Views of Right Angular Solids

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

UNIT 5 : Isometric Projections

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

Suggested Text / Reference Books :

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

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

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

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

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

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

Syllabus of Department of Mechanical Engineering

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

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

Course Outcomes

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

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

UNIT 1 : Introduction to Engineering Drawing

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

UNIT 2 : Orthographic Projections

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

UNIT 3 : Projections of Solids

Inclined to both the Planes Auxiliary Views; Draw simple annotation, dimensioning and scale, Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.

UNIT 4 : Sections and Sectional Views of Right Angular Solids

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

UNIT 5 : Isometric Projections

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

UNIT 6 : Overview of Computer Graphics

Demonstrating knowledge of the theory of CAD software such as (the Menu System Toolbars Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, crosshairs, Coordinate Systems), Dialog boxes and windows, Shortcut menus (Button Bars), The command Line (wherever applicable), The Status Bar, Different methods of zoom as used in CAD, select and erase objects; Isometric Views of lines, Planes, Simple and compound solids);

UNIT 7 : Customization & CAD Drawing

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

UNIT 8 : Annotations Layering & Other Functions

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

UNIT 9 : Demonstration of a simple team design project that illustrates

Geometry And Topology Of Engineered Components Creation Of Engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; Meshed toplogies for engineering, Introduction to Building Information Modeling (BIM)

List of sheets

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

Suggested Text/ Reference Books :

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

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

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

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

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

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

Syllabus for B.E. Semester I Department of Humanities

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

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

Course outcome

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

Course content

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the Fundamental Rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Union Executive: structure, functions
10. Judiciary: Structure, role with special reference to PIL, writ petitions, strengthening of democracy & social justice
11. Amendment of the Constitutional Powers and Procedure
12. Emergency Provisions: National Emergency, President Rule, Financial Emergency
13. Local Self Government – Constitutional Scheme in India
14. Provisions of civil services: Characteristics, functions, merits and demerits
15. Democratic principles in industry

Book

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

Syllabus for B.E. Semester I Department of Humanities

Course Code : PEP151 **Course : Yoga / Sports**

L: 0 Hrs. T: 0 Hrs. P: 2 Hrs. 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.

Components	Name of Tests
Speed	50 mts Dash
Agility	Shuttle run
Cardiovascular Endurance	8 mins Run/Walk
Test Flexibility	Sit and Reach Test
Abdominal Strength (M) / shoulder strength (F)	Bent Knee Sit-ups (M)/ Modified Pull-ups (F)
Yogic exercises	Suryanamaskars

Syllabus for B.E. Semester I / II

Course Code : CHT151 **Course : Chemistry**

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

Course Outcomes

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

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

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

(i) Atomic and molecular structure (12 lectures)

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

(ii) Spectroscopic techniques and applications (8 lectures)

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

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

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

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

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and

solubility equilibria. Water chemistry. Corrosion. Use of free energy considerations in metallurgy through Ellingham diagrams.

(v) Periodic properties (4 Lectures)

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

(vi) Stereochemistry (4 lectures)

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

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

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

Suggested Text Books

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

Syllabus for B.E. Semester I / II

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

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

Laboratory Outcomes

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

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

List of Experiments for Chemistry Lab

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

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

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

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

Course Outcomes :

On successful completion of course student will learn:

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

UNIT-I: Introduction to Programming

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

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

UNIT-II: C Programming Language

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

UNIT-III: Arrays and Basic Algorithms

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

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

UNIT-IV: Functions and Recursion

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

UNIT-V: Pointers and Structures

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

UNIT-VI: File handling

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

Text Books:

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

Reference Books:

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

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

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

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

Course Outcomes :

On successful completion of course student will be able to:

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

CREATIVITY INNOVATION AND DESIGN THINKING
COURSE SYLLABUS

Course Code : IDT151 **Credits:1**

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

Course Outcomes

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

C2: Enhance their creative and innovative thinking skills

C3: Practice thinking creatively and innovative design and development

Detailed Topics

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

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

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

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

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

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

Reference Books and Text Book :

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

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

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

Syllabus Department of Industrial Engineering

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

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

Course Outcomes

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

Syllabus

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

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

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

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

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

Unit-6 Introduction to Plastic Injection Molding

Suggested Text Book

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

Reference Books

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

Syllabus Department of Industrial Engineering

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

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

Laboratory Outcomes

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

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

Contents

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

Suggested Text Book

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

Reference Books

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

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

Course Code: HUT151 **Course : English**

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

Course Objectives

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

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

Course Outcomes

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

SYLLABUS

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

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

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

4. Nature and Style of sensible Writing

4.1 Describing
4.2 Defining
4.3 Classifying
4.4 Providing examples or evidence

5. Writing Practices

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

6. Oral Communication

(This unit involves interactive practice sessions in Language Lab)

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

Books

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

Syllabus for B.E. Semester I

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

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

Course objective :

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

Course outcomes:

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

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

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

Syllabus for B.E. Semester III

Course Code: ITT251 **Course : Object Oriented Programming**

L: 2 Hrs., T: 0 Hrs., P: 0 Hrs., Per week **Total Credits : 02**

Course outcomes:

Upon completion of course, students will be able to

1. Understand the necessity of object oriented Programming features like encapsulation, data hiding and abstraction etc.
2. Analyze a problem statement and suggest appropriate object oriented concepts applicable to solve the problem.
3. Apply the concept of class, inheritance, interfaces, streams and exception handling to solve real life problems.
4. Write object oriented based solution for the given problem statement.
5. Implement data structures using object oriented programming.
6. Understand the significance of multithreaded programming, networking, Applet and Servlet in real life applications.

Unit I

Introduction to Object Oriented Programming: Features of object oriented programming languages like data encapsulation, inheritance, polymorphism and late binding.

Unit II

Basic Concept of OOP: Concept of a class, Access control of members of a class, instantiating a class, static and non-static members, overloading a method.

Unit III

Building the classes: Deriving a class from another class, access control of members under derivation, different ways of class derivation, overriding of a method, run time polymorphism.

Unit IV

Interfaces and Exception handling: Concept of an abstract class. Concept of an interface. Implementation of an interface. Exception and exception handling mechanisms. Study of exception handling mechanisms in object-oriented languages

Unit V

Streams: Introduction to streams, use of stream classes. Implementation of data structures like linked lists, stacks, queues, trees, graphs, hash table etc. using object oriented programming languages.

Unit VI

Introduction to modeling techniques like UML, Basics of multithreaded programming, networking, Applet and Servlet.

Text Books

1. The Complete Reference: Java 2: Herbert Schildt
2. Arnold Ken, Gosling J, "The Java Programming Language"5 edition, MGH, Addison Wesley
3. Matt Weisfeld, "The Object-Oriented Thought Process", Pearson

Reference Books

1. Cox Brad, "Object –Oriented Programming: An Evolutionary Approach", Addison –Wesley
2. Design Patterns By Erich Gamma, Pearson Education

Syllabus for B.E. Semester III

Course Code: ITP251 **Course : Object Oriented Programming**

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

Minimum 10 Practicals based on the course ITT251

Course Outcomes

Upon completion of course, students will be able to

1. Apply object-oriented concepts to solve the real life problems.
2. Write object-oriented programs in Java Language for the given problem statement.
3. Implement extensible and reusable programs.
4. Implement data structures using object oriented programming and will be able to make use of design patterns.
5. Create UML Diagrams using tools.
6. Document the lab work in the form of lab report.

Syllabus for B.E. Semester III

Course Code: ITT252 **Course : Data Structures**

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

Course outcomes:

Upon completion of the course, student will be able to

1. Understand important concepts of algorithm, complexity theory and design aspects of Algorithm.
2. Communicate about algorithm efficiency and recognize a better solution.
3. Understand the basic concepts of Linear Data Structures like Arrays and Link List, their representation in memory and applications in real life problems.
4. Appreciate the concept of dynamic memory allocation, its utilization and implementation.
5. Understand and analyze different Searching / Sorting Algorithms, their advantages and disadvantages and selection of appropriate algorithm as per the data given.
6. Demonstrate ability to apply knowledge of dynamic data structures like link lists, trees and graphs, formulate the problem and devise an algorithm.

Unit I

Introduction to Algorithms: Concept of data types, Algorithm and its features. Analysis of Algorithms, Asymptotic notations, Features of structured program, Recursion, Top-down and Bottom-up programming techniques, Divide & Conquer strategy.

Unit II

Arrays: Introduction, Memory Representation, Introduction to Stacks & Queues and basic operations. Use and Implementation of array in useful structures like stacks, queues, De-queues and Priority queues. Concept and representation of Sparse matrices and basic operations on them.

Unit III

Linked List: Purpose and representation in memory. Implementation of Single and doubly linked list and basic operations on them. Representation of array based structures using link lists.

Classical Applications of linked list: Polynomial addition, Equivalence relation and Generalized lists.

Unit IV

Sorting & Searching Methods: Purpose and types: Internal and External sorting, Study, Comparison and implementations of Bubble sort, Exchange sort, Insertion sort, Selection sort, Merge sort, Quick sort Heap sort and Radix sort.

Study, Comparison and implementations of Searching Methods: Sequential, Binary, Indexed search, Hashing techniques and Collision-handling mechanisms

Unit V

Trees: Purpose, types, definition and terminologies. Concept and memory representation of a binary tree.

Application of trees: Tree traversal techniques, Threaded binary trees, Binary search tree and Heap tree.

Use, concept and operations on Multi-way trees: B-Trees and B + Trees.

Unit VI

Graphs and their applications: Purpose, types, definition and terminologies. Implementation in memory. **Application of Graphs:** Traversal using Depth-first and Breadth-first search techniques, Minimum Cost Spanning Trees: Concept and implementation using Prims and Kruskals algorithms and Computation of Shortest Path using Dijkstra's algorithm.

Text Books

1. Fundamentals of Data Structures in C: E. Horowitz, S. Sahani and S.Anderson- Freed, University Press, 2nd Edition.
2. Data Structures and Program Design in C: Robert Kruse, G.L.Tondo and B.Leung, PHI-EEE.
3. An Introduction to Data Structures with Applications: J. P.Tremblay & P. G. Sorenson, 2nd Edition, MGH.

Reference Books

1. Data Structures: P.S.Deshpande, O.G.Kakde 1st Edition,Wiley Dream Tech.
2. Data Structures Using C/C++: Tanenbaum, 3rd Edition, Pearson.

Syllabus for B.E. Semester III

Course Code: ITP252 **Course : Data Structures**

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

Minimum 10 Practicals based on the course ITT252

Course outcomes:

Upon completion of the course, student will be able to

1. Appreciate and practice structured programming
2. Formulate the problem, devise an algorithm and transform into code.
3. Analyze and communicate the time and space complexities of given algorithm.
4. Write optimal programs.
5. Implement linear and non linear data structures for solving real world problems.
6. Document laboratory work in the form of lab report.

Syllabus for B.E. Semester III

Course Code: ITT253 **Course : Digital Circuits and Fundamental of Microprocessor**

L: 2 Hrs., T: 1 Hrs., P: 0 Hrs., Per week **Total Credits : 03**

Course outcomes:

Upon completion of the course, students will be able to

1. Understand the fundamental concepts and techniques used in digital electronics.
2. Understand and examine the structure of various number systems and its applications in digital design.
3. Understand, analyze and design various combinational circuits.
4. Understand, analyze and design various sequential circuits using storage elements.
5. Identify timing problems in digital design.
6. Describe 8085 architecture and use its instruction set for writing Assembly Language programs.

Unit I

Introduction to digital systems: Logic and Boolean Algebra, Number Systems, Logic Gates & Truth Tables, Demorgan's law, Minimization of combinational circuits using Karnaugh maps upto five variables, Quine - McCluskey minimization technique.

Unit II

Building Blocks of Digital System: Multiplexers, Demultiplexer, Encoders, Decoders, Code Converters, Adders, Subtractor.

Unit III

Storage Elements: Flip-flops and latches: D, T, S/R ,J/K & J/K Master Slave flip-flops, Conversion of one type of F/F to another. Sequential circuit Analysis -Input equations, state table, analysis and design.

Unit IV

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

Unit V

Microprocessor 8085: Introduction to p 8085, Addressing modes, Instruction set, Programming of p 8085.

Unit VI

Memory Mapping, Timing Diagrams , Interfacing of 8255 and 8257 with 8086.

Text Books:

1. Digital Logic Design: M. Mano, 2nd edition.
2. Modern Digital Electronic: R. P. Jain, 4th edition.
3. 8 bit Microprocessor: Ramesh Gaonkar.

Reference Books:

1. Fundamental of Digital Electronics: A. Anand Kumar.
2. Digital circuit & design: A. P. Godse.
3. 8 bit microprocessor & controller: V. J. Vibhute, 5th Edition.

Syllabus for B.E. Semester III

Course Code: ITP253 **Course : Digital Circuits and Fundamental of Microprocessor**

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

Minimum 10 Practicals based on the course ITT253

Course Outcomes

Upon completion of the course, students will be able to

1. Design combinational circuits.
2. Design sequential circuits.
3. Design basic memory elements using flip-flops.
4. Write 8085 Assembly Language Programs.

Syllabus for B.E. Semester III

Course Code: ITP254 **Course : IT Workshop**

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

Course outcomes:

Upon completion of the course, students will be able to

1. Understand the architecture and use of Linux operating system.
2. Effectively use different services provided by Linux operating system.
3. Automate tasks and write simple programs using shell scripts.
4. Use tools for debugging, testing and maintaining programs.
5. Use NetBeans IDE for program development.

Linux Operating System:

Introduction and history of Linux OS
Basic commands
File system and file handling commands
User ,Group management commands
Process handling commands
Package management
Shell and shell script
Introduction to using different tools for identification of possible errors in C program: gdb, concept of “core dump”, backtracking using “bt”, using “info” to dump all registers, creating watch list/ watch variables.

IDE for Project Development: Net Beans IDE

Introduction
Understanding environment settings
Creation of Project
Compilation of Project

Text Books

1. Unix and Shell Programming – B. M. Harwani , OXFORD University Press.

Reference Books

1. Linux Administration : A Beginner's Guide – Wale Soyinka , McGraw Hill Publication
2. Unix Concepts and Applications – Sumitabha Das, McGraw Hill Publication

Syllabus for B.E. Semester III

Course Code: MAT252 **Course : Linear Algebra & Statistics**
L: 3 Hrs., T: 0 Hrs., P: 0 Hrs., Per week **Total Credits : 03**

Course Outcomes

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

1. Computational techniques and algebraic skills essential for the study of systems of linear equations, matrix algebra, vector spaces, eigenvalues and eigenvectors, orthogonality and diagonalization.
2. Visualization, spatial reasoning, as well as geometric properties and strategies to model, solve problems, and view solutions, especially in R^2 and R^3, as well as conceptually extend these results to higher dimensions.
3. To prepare the background of students to pursue statistical theory or methodology and analyze data in any stream of computer science and information technology.

Module 1 (10-Lectures) : Vector Space; Subspaces; Linear Dependence/Independence; Basis; Dimension; Linear transformation; Range Space and Rank; Null Space and Nullity; Rank nullity theorem, Matrix Representation of a linear transformation; Linear Operators on R^n and their representation as square matrices; Invertible linear operators; Inverse of a non-singular matrix.

Module 2 (8-Lectures): Eigen values and eigenvectors of a linear operator; Inner Product Spaces, Norm; Orthonormal Sets, Gram Schmidt orthogonalisation process; projections, positive definite matrices, and Singular Value Decomposition.

Module 3 (13-Lectures): Review of Discrete and continuous random variable, joint probability function, Introduction to stochastic process, random walk, stationary and auto regressive process, transition probability Matrix, Discrete time Markov chain, Continuous time Markov chain.

Module 4 (6-lectures): Hypothesis testing for sampling distributions of means, proportions, sum and differences of means and proportions for large and small samples.

Text Books:

Hoffman and Kunze : Linear Algebra, Prentice Hall of India, New Delhi
Gilbert Strang : Linear Algebra And Its Applications (Paperback) , Nelson Engineering (2007)
M R. Spiegal : Theory and Problems of probability and statistics :,2nd ed :,*Schaum series*

Reference Books :

Seymour Lipschutz et al: Linear Algebra, 3rd ed:*Schaum series*.
V. Krishnamoorthy et al : An introduction to linear algebra , Affiliated East West Press, New Delhi
P. G. Bhattacharya, S. K. Jain and S.R.
Nagpaul : First course in Linear Algebra, Wiley Eastern Ltd., New Delhi
K. B. Datta : Matrix and Linear Algebra, Prentice Hall of India, New Delhi
W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.
S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.

Syllabus for B.E. Semester III

Course Code: HUT254 **Course : Technical Communication**
L: 3 Hrs., T: 0 Hrs., P: 0 Hrs., Per week **Total Credits : 03**

Course outcomes:

1. Students will understand the process and types of communication.
2. Students will understand the objectives of technical communication and role of audience in effective communication.
3. Students will learn basic grammar rules, develop technical writing skills and produce effective workplace documents.
4. Students will understand the process of research writing and develop skills to write documents for higher studies.
5. Students will develop skills to enhance visual appeal of documents.
6. Students will understand strategies for effective oral communication for professional needs.

Unit 1.Technical communication

Definition, Barriers of Communication, Objectives of technical communication, Producing the product, Audience recognition and involvement.

Unit 2. Technical Writing

Process of Technical Writing, Types of Technical Writing Letters: Job application, Job Description and Resume, Sales, enquiry, complaint, order, follow-up letters, Organizational announcement, Minutes of the Meetings. Reports: Trip, Progress, Incident, Investigative, Feasibility/Recommendation reports

Unit 3. Grammar and Editing

Functional Grammar: Punctuations, Mechanics, Active/ Passive, Transformation of sentences

Unit 4.Orientation in Research

Writing proposals, SOP, writing articles for journals and conferences, abstract and executive summary, thesis writing

Unit 5. Preparation of Documents

Visual appeal: Document design, graphics, tables, poster presentations User manuals, Brochures, Fliers

Unit 6.Effective Oral Communication

Non- Verbal Communication, Public speaking, Presentations, Group Discussion and Interviews

Text Books:

1. Gerson and Gerson,"Technical Communication: Process and Product", 2018, Pearson
2. Meenakshi Raman and Sangeeta Sharma, "Technical Communication: Principles and Practice", 2015, Oxford University Press

Reference Books

1. S. Kumar and Pushplata, "Communication Skills", 2016, Oxford University Press
2. C. Muralikrishna and Sunita Mishra, "Communication Skills for Engineers", 2016, Pearson
3. Andrea Rutherfoord, "Basic Communication Skills for Technology", 2012, Pearson
4. Barun K Mitra, "Effective Technical Communication: A Guide for Scientists and Engineers", 2006, Oxford

Syllabus for BE, Semester III

Course Code: CHT251 **Course: Environment Science**

L:2 Hrs.,T:0Hrs.,P:0Hrs.,Per week **Total Credits: 00**

Course Outcomes:

On successful completion of the course, the students:

1. Will get sufficient knowledge regarding different types of environmental pollutions, their causes, detrimental effects on environment and effective control measures.
2. Will realize the need to change an individual's outlook, so as to perceive our environmental issues correctly, using practical approach based on observations and self learning.
3. Will become conversant with recent waste management techniques such as E-wastes, its recycling and management.
4. Will gain knowledge about the modes for sustainable development, importance of green energy and processes.
5. Will be able to identify and analyze environmental problems as well as risks associated with these problems and greener efforts to be adopted, to protect the environment from getting polluted.

Principle of contaminant behaviour and recent trends in environmental pollution control

I- Air pollution and its control techniques: (4 lectures)

Contaminant behaviour in the environment, Air pollution due to SOx, NOx, photochemical smog, Indoor air pollution

Natural pathways for degradation: Carbon cycle, Sulphur cycle, Nitrogen cycle, Oxygen cycle.

Factors responsible for altering the composition of atmosphere (deforestation, burning of fossil fuels, industrial and vehicular emissions, CFCs).

Techniques to control Air pollution, ambient air quality and continuous air quality monitoring, Control measures at source, Kyoto Protocol, Carbon Credits.

II- Noise pollution and its control techniques: (2 lectures)

Introduction to noise pollution and its causes

Noise pollution control: Recent advances in noise pollution control and benefits.

III- Soil pollution and its control techniques: (5 lectures)

Soil pollution: Soil around us, Soil water characteristics, soil pollution.

Solid waste management: Composting, vermiculture, landfills, hazardous waste treatment, bioremediation technologies, conventional techniques (land farming, constructed wetlands), and phytoremediation.

Degradation of xenobiotics in environment: Petroleum hydrocarbons, pesticides, heavy metals

IV-Water pollution and its control techniques: (8 lectures)

Major sources of water pollution: Eutrophication, acid mine drains, pesticides and fertilizers, dyeing and tanning, marine pollution, microplastics

Techniques to control water pollution: Conventional waste water treatment-types of sewage, sewerage system, alternative systems, primary, secondary and tertiary processes including aerobic and anaerobic techniques, safe disposal.

Case studies:

Treatment schemes for waste water from dairy, textile, power plants, pharmaceutical industries, and agro based industries such as rice mills

V- E-wastes (2 lectures)

Introduction, types of e-wastes, environmental impact, e-waste recycling, e-waste management rules.

VI- Environmental Sustainability: Role of Green technology (5 lectures)

Concept of green technologies, categories, goals and significance, sustainability

Green energy, green chemistry, challenges to green technology, advantage and disadvantages of green processes, Eco mark certification- its importance and implementation

VII-Different government initiatives (2 lectures)

National ambient air quality standard 2009, Swacch bharat abhiyan, National afforestation program and Act-2016, National river conservation plan, Formation of National Green Tribunal

Books suggested:

1. Benny Joseph, Environmental Studies, Mc Graw Hill Education (India) Private Limited
2. B. K. Sharma, Environmental Chemistry, Goel Publishing House, Meerut
3. P Aarne Vesilind, J. Jeffrey Peirce and Ruth F. Weiner, Environmental Pollution and Control, Butterworth -Heinemann
4. D. D. Mishra, S. S. Dara, A Textbook of Environmental Chemistry and Pollution Control, S. Chand & Company Ltd. Sultan Chand & Company.
5. Shree Nath Singh, Microbial Degradation of Xenobiotics, Springer-Verlag Berlin Heidelberg
6. P. T. Anastas & J. C. Warner, Green Chemistry: Theory & practice, Oxford University Press
7. P. Thangavel & Sridevi, Environemental Sustainability: Role of Green technologies, Springer publications

Syllabus for BE, Semester IV

Course Code: ITT255 **Course: Discrete Mathematics**

L:2 Hrs.,T:1Hrs.,P:0Hrs.,Per week **Total Credits: 03**

Course Outcomes:

Upon completion of the course, students will be able to

1. Demonstrate knowledge of Set theory and its applications in real life.
2. Analyze discrete data structure such as sets, relations and mathematical logic.
3. Show understanding of Algebraic structures.
4. Apply the algebraic structures in solving different problems.
5. Demonstrate understanding of generating functions and solving recurrences.

Unit I

Relation and Function: Basic concepts of Set theory, Power set, some operations on Sets, Venn diagram, some basic set identities, Cartesian products. Properties of binary relation in a set, Relation matrix and the graph of the relation, Partition and covering of a set. Equivalence relations, Compatibility relations, Compositions of binary relations. Definition and composition of functions, inverse functions and characteristic function of a set.

Unit II

Mathematical Logic: Statement and notations, connectives, Negation, conjunction, disjunction, conditional & biconditional, statement formulas & truth tables. Tautologies, equivalence of formulas, Duality law, Tautological implications. Normal Forms -Principal disjunctive and principal conjunctive normal forms. Theory of inference for statement calculus. Theory of inference for predicate calculus.

Unit III

Algebraic Structures: Semigroups, monoids - (definition and examples), Group definitions and examples, Cyclic group, permutation groups, subgroups and homomorphism, co sets and Lagrange's theorem and Normal subgroup.

Unit IV

Rings and field: Ring (definition and examples), sub-rings, Ring homomorphism, ideals and Quotient rings, polynomial rings. Finite field, Galois field, Integral domain.

Unit V

Lattice theory and Boolean Algebra: Lattices as partially ordered set, Definitions and examples, some properties of Lattices, Lattices as algebraic system, sub lattices, direct product, homomorphism, some special Lattices. Boolean Algebra: Definitions and examples, Application of Boolean Algebra to switching circuits.

Unit VI

Advanced counting Techniques: Pigeonhole principle, Generating functions, Binomial identities using generating functions, Solutions of Recurrence relations using generating functions.

Text Books

1. Combinatorial Mathematics: C. L. Liu & D. P. Mohapatra, 4rd edition, Tata McGraw Hill.
2. Discrete Mathematics and Its Applications, Kenneth Rosen, 7th Edition, Tata McGraw Hill.
3. Discrete Mathematical Structures with Applications to Computer Science: J. P. Tremblay and R. Manohar , Tata McGraw-hill.

Reference Books

1. Discrete Mathematics: Babu Ram, Pearson Publication.
2. Discrete Mathematics: Kolman, Busby & Ross, Pearson Publication

Syllabus for BE, Semester IV

Course Code: ITT256 **Course: Computer Organization and Architecture**

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

Course Outcomes:

Upon completion of the course, student will be able to

1. Describe the role, organization and interaction of different hardware units of a computer system and understand instruction set.
2. Design adder, subtractor, multiplication and division circuits and apply it for signed and unsigned numbers represented as integers and floating point.
3. Design memory system and analyze its performance.
4. Understand different bus structures and designs of control unit.
5. Describe different techniques for handling I/O.
6. Apply design techniques to enhance performance using pipelining and analyze it.

Unit I

Basic Structure of Computer Hardware & Software: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU - registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Introduction to 8086.

Unit II

Data Representation and Arithmetic: Number representation, Addition of positive numbers, Logic design of fast adders, Addition & subtraction, Arithmetic & branching conditions, Multiplication of positive numbers, Signed operand multiplication, Fast multiplication, Integer division, Floating point numbers & operations, IEEE standard.

Unit III

Processing Unit: Some fundamental concepts, bus architecture, execution of complete instruction, hardwired control, micro programmed control, microinstruction format, microinstruction sequencing.

Unit IV

Memory System Design: Semiconductor RAM memories, Memory system considerations, Semiconductor ROM memories, Multiple-module memories and interleaving, Cache memories, mapping functions, replacement algorithms.

Unit V

I/O Interfacing: Input-output organization, I/O mapped I/O and memory mapped I/O, Direct Memory Access, interrupts and interrupts handling mechanisms, device identification, vectored interrupts, interrupt nesting, I/O interfaces, synchronous vs. asynchronous data transfer, I/O channels, USB

Unit VI

Pipelining: RISC philosophy, pipelining, basic concepts in pipelining, delayed branch, branch prediction, data dependency, multiple execution units, performance considerations, basic concepts in parallel processing & classification of parallel architectures.

Text Books

1. Computer Organization: Carl Hamacher, Z Vranesic, S Zaky , 5th Edition, MGH.
2. Structured Computer Organization: Tanenbaum A.S, 4th Edition, PHI.

Reference Books

1. Computer Architecture & Organization : J.P.Hayes, 3rd Edition MGH.
2. Computer Organization and Architecture: Designing for Performance, William Stallings, 8th Edition, PHI.

Syllabus for BE, Semester IV

Course Code: ITP256 **Course: Computer Organization and Architecture**

L: 0 Hrs.,T: 0 Hrs.,P: 2 Hrs.,Per week **Total Credits: 01**

Minimum 10 Practicals based on course ITT256

Course Outcomes

Upon completion of course, students would be able to

1. Understand and write assembly language programs.
2. Design register array and RAM using simulator.
3. Designing instructions using microinstructions.
4. Design new machine from existing machine using simulator
5. Understand the representations of Integer and Floating point numbers

Syllabus for BE, Semester IV

Course Code: ITT257 **Course: Software Engineering**

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

Course Outcomes

Upon completion of course, students would be able to

1. Identify different software development process models for projects.
2. Evaluate best estimation regarding cost, time and effort of the project and also identify different risk associated with project.
3. Apply different graphical tools like DFD, Flowchart for presenting their project.
4. Determine Quality Assurance parameters and respective methodologies.
5. Evaluate Software design fundamentals for software building.
6. Determine best testing methodology to test their project for required output.

Unit I : Introduction to Software Engineering, Software Myths, Software Engineering a Layered Technology, Software Process Framework, Software Process Models, The Waterfall Model, Incremental Process Models, Evolutionary Process Models, Specialized Process Models, The Unified Process Model, Agile Development: Agility, XP (Extreme Programming), Other Agile process models.

Unit II: Risk management - Risk strategies, Software risks, Risk identification, Risk refinement, RMMM Software project estimation and planning, Decomposition techniques, LOC and FP estimation, Effect estimation, Identification, Projection, Assessment, Management and monitoring, Software reengineering, Requirement analysis, Tasks, Analyst, Software prototyping, Specification, Principles, Representation and the software requirements specification.

Unit III : UML diagrams for designing: Use case Diagram, Sequence diagram, Activity diagram, Data Flow Diagram, ER Diagram, Class Diagram and their usage. Case studies.

Unit IV: Quality Management - Quality Concepts, Software Quality Assurance, Software Reviews, Formal Technical Review, Statistical Software Quality Assurance, Software Reliability, Change Management - Software Configuration Management, SCM Repository, SCM Process

Unit V : Software design fundamentals- process, fundamentals, Effective modular Design, Dataflow oriented design, Transform analysis, Transaction analysis, Design heuristics, Object oriented- design, concepts, methods, Refining operations, Program components and interfaces, Implementation detail design, User interface design, Human factors, Human computer interface design, guidelines, standards, Case study.

Unit VI : Software quality assurance, Software quality factors, Quality metrics, Halstead's S/W science, Software testing - techniques, fundamentals, White box testing, Black box testing, Validation testing, System testing, Debugging software maintenance maintainability, Maintenance tasks.

Text Books

1. Software Engineering: Roger S. Pressman, 7th Edition, TMH.
2. Software Engineering, Principles and Practices: Rajesh Narang, MGH.

Reference Books

1. Software Engineering: Kassem A. Saleh, India Edition, Cengage Learning.
2. Software Engineering: Schach, Special Indian Edition, TMH.

Syllabus for BE, Semester IV

Course Code: ITP257 **Course: Software Engineering**

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

Minimum 8 Practicals based on the course ITT257

Course Outcomes

Upon completion of course, students would be able to

1. Build different software development process for projects.
2. Determine different risks and can apply different estimation method for the project.
3. Associate with Rational Rose Software (IBM-RSA) to create different UML Diagrams.
4. Define different testing strategies and can recall best testing strategy to be applied.

Group activity : Mini Project Designing & Prototype

Syllabus for BE, Semester IV

Course Code: ITT258 **Course: Design and Analysis of Algorithms**

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

Course Outcomes

Upon completion of course, students would be able to

1. Understand and appreciate the fundamental needs of algorithms and reason for their analysis
2. Analyze the time and space complexity of various algorithms
3. Know the standard algorithm design techniques
4. Apply different algorithm design techniques for problem solving and know when to apply which technique
5. Design efficient algorithms for various computing problems
6. Know the limitations on time complexity of algorithms for problem solving

Unit I

Mathematical foundations, Summation of arithmetic and geometric series, Asymptotic notations for analysis of algorithms, Recurrence relations, Amortized analysis and application. Review of Basic Tree and Graph Traversal and Search Techniques.

Unit II

Divide and Conquer: basic strategy. Case studies of Binary Search, Quick sort, Merge sort and Matrix operations. Other applications.
Greedy method basic strategy: Case studies of Job Sequencing problem, Minimum Cost Spanning Trees and Single Source Shortest path.

Unit III

Dynamic Programming: basic strategy. Concept of Multistage Graphs. Case studies of All Pairs Shortest Path Algorithm, Optimal Binary Search Trees, Traveling Salesman Problem, Longest Common Subsequence Problem and its variations. Other applications.

Unit IV

Backtracking: basic strategy. Case studies of n-Queen's problem, Graph Coloring Problem, Hamiltonian Cycles. Other applications.

Unit V

Branch and Bound: basic strategy. Implementations of some of the above problems using Branch and Bound Technique. Other applications.

Unit VI

Non-deterministic algorithms, NP-hard and NP-complete problems, Decision and Optimization problems, Graph based problems on NP Principle. Introduction to Approximation algorithms.

Text Books

1. Introduction to Algorithms: Thomas H. Cormen et.al, 2nd Edition, MIT Press.
2. Fundamentals of Computer Algorithms: Horowitz, Sahani, Rajsekharam, 2nd Edition, Computer Science Press .
3. Fundamentals of Algorithms : Brassard, Bratley, 1st Edition. Prentice Hall India.

Reference Books

1. Foundations of Algorithms: Dr. S. R. Sathe, 1st Edition Penram Publications.
2. The Design and Analysis of Algorithms: Dexter C. Kozen, Springer.

Syllabus for BE, Semester IV

Course Code: ITP258 **Course: Design and Analysis of Algorithms**

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

Minimum 10 Practicals based on the course ITT258

Course Outcomes

Upon completion of course, students would be able to

1. Describe the functional requirements of algorithms for solving the problems
2. Understand the importance of optimal and standard ways of implementation
3. Demonstrate the knowledge of complexity, compare and analyze the algorithms
4. Demonstrate the knowledge of different programming paradigms
5. Apply different paradigms to solve well known problems

Syllabus for BE, Semester IV

Course Code: HUT255 **Course: Organizational Behaviour**

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

Course Outcomes

Upon completion of course, students would be able to

1. Understand fundamentals of Organizational behaviour.
2. Understand the role and significance of values and motivation at work place.
3. Become aware of individual differences and its impact at work place.
4. Handle stress effectively at work place.
5. Work effectively in a professional group, as a team member or a leader.
6. Develop the capacity of conflict resolution.

Unit I: Fundamentals of Organizational Behaviour:

Nature, Scope, Definition and Goals of Organizational Behaviour; Fundamental Concepts of Organizational Behaviour; Models of Organizational Behaviour; Emerging aspects of Organizational Behaviour.

Unit II: Values and Motivation:

Nature, role and importance of perception, attitude and values at work place. Concept and Theories of Motivation: Maslow' Need Hierarchy Theory McGregor's Theory 'X' and Theory'Y', Johari Window, Left – Right brained people

Unit III: Identifying and Measuring Individual Differences in Job:

Individual differences in personality: Big five personality factor, Self Esteem, Locus of Control and Goal Orientation. Individual Differences in Cognitive Moral Development; **Abilities and Skills:** Aptitude and Emotional Intelligence, Persuasive Communication, PAC concept

Unit IV: Work Stress:-

Meaning and definition of stress: Symptoms of Stress: Individual Level, Group Level, Organizational Level, Stressors, Extra Organizational Stressors, Effect of stress- Burnouts, Stress Management- Individual Strategies, Organizational strategies; Employee Counseling.

Unit V: Group Behaviour and Leadership:

Nature of Group, Types of Groups, Nature and Characteristics of team; Team Building, Effective Teamwork; Nature of Leadership, Leadership Styles; Traits of effective Leaders, Use of Leadership Matrix.

Unit VI: Conflict in Organization:

Nature of Conflict, Process of Conflict; Levels of Conflict- Intrapersonal, Interpersonal, Sources of Conflict, Effects of Conflict, Conflict Resolution, Meaning and types of Grievances and Process of Grievances Handling.

Reference Books:

1. Robbins, Stephen, "Organizational Behaviour" Tata Mac Graw Hill Publishing Co. Ltd
2. Ajzen, I.& Fishbein, M.(1980).Understanding Attitudes and Predicting Social Behaviour. Englewood Cliffs, N.J.:PrenticeHall.
3. Eysenck, H. J.(1982).QuotedinPersonality,GeneticsandBehaviour,NewYork, Prager,1.
4. Schultz, D.P.&Schultz, S. E.(1990). Psychology and Industry Today: An Introduction Industrial and Organisational Psychology, 5th ed., N.Y. : Macmillan.
5. Miner, J. P. (1992).IndustrialOrganisationalPsychology,N.Y.: McGrawHill.
6. McCormick, E. J.&Tiffin, J. Industrial Psychology, PrenticeHall, Latest Edition.
7. Hellrieget, D., Slocum, J.W. Jr. & Woodman, R.W. (2001). Organisational Behaviour, 9th Ed., South-Western College Publishing.
8. Newstrom. J. W, (2007) Organizational Behaviour and Human Behaviour at Work, 12th ed Tata McGraw Hill Publishing Company Limited, New Delhi.

Syllabus for BE, Semester IV

Course Code: HUT252 **Course: Indian Traditional Knowledge**

L:2 Hrs.,T:0Hrs.,P:0Hrs.,Per week **Total Credits: 00 (Audit Course)**

Course Outcomes:

Students will have increased ability to understand the importance and application of:

1. Indian Knowledge system and its scientific approach
2. Indian philosophical tradition
3. Indian artistic tradition.
4. Traditional knowledge and protection of nature
5. The legality and its importance for the protection of Indian traditional knowledge

1. **Basic Structure of Indian Traditional Knowledge:** *Vedas, Upavedas, Vedang, Upadang,* scientific approach
2. **Ecology and Indian Traditional Knowledge:** Meaning, role, case studies
3. **Intellectual Property Rights and Indian traditional Knowledge:** Meaning, role in protection of Indian traditional knowledge, cases studies
4. **Indian Philosophical traditions:** *Nyay, Sankaya, Yog, Mimansa,* Jainism, Buddhism, Sikhism, and other approaches
5. **Indian Artistic Traditions:** *Chitrakala, Murtikala, Vastukala, Sangeet, Sthpatya, Nrityaevam Sahitya,* case studies

Reference material

1. RR Gaur, Rajeev Sangal, GP Bagaria, *Human Values and Professional Ethics* (Excel Books, New Delhi, 2010)
2. V. Sivaramakrishanan (ed.), *Cultural Heritage of India – Course material,* BharatiyaVidyaBhavan, Mumbai, 5th Edition, 2014
3. Swami Jitatmanand, *Modern Physics and Vedant,* BharatiyaVidyaBhavan
4. Swami Jitatmanand, *Holistic Science and Vedant,* BharatiyaVidyaBhavan
5. S.C. Chatterjee and D.M. Datta, *An introduction to Indian Philosophy,* University of Calcutta, 1984
6. Pramod Chandra, *Indian Arts,* Howard University Press, 1984
7. Krishna Chaitanya, *Arts of India,* Abhinav Publications, 1987

Syllabus for BE, Semester IV (Open Electives)

Course Code: ITT259 **Open Elective-I: Linux Fundamentals**

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

Course Outcomes:

Upon completion of course, students would be able to

1. Understand Linux Architecture, different Linux installation and Linux commands.
2. Effectively use Linux Environment using shell, file system, scripts, filters and program development tools
3. Perform file I/O management through commands and perform package management, storage management and failure recovery.
4. Create backup and do recovery using tools like Rsync and Bacula
5. Automate tasks and write simple programs using scripts
6. Configure important services like FTP, DNS, MAIL and WEB

Unit I

History of Linux OS, Architecture of Linux OS, Linux Distributions, Installation of Linux OS

Unit II

Introduction to terminal, Basic commands, File system, File handling commands, process and process management commands, VI editor.

Unit III

Users and Group management- Creation, Updating, Deletion of user and group, Commands – passwd, Shadow, useradd, usermod, userdel, groupadd, groupmod, groupdel.

Unit IV

Package Management - Introduction to package manager, function of package manager, Package management commands – rpm, yum.

Unit V

Storage management- Types of storages, creating partitions using fdisk command, Logical volume management (LVM), Creating file system, mounting file system.

Unit VI

Shell and Shell script.

Text Book

1. Unix and Shell Programming – B. M. Harwani, OXFORD University Press.

Reference Books

1. Linux Administration : A Beginner's Guide – Wale Soyinka , McGraw Hill Publication
2. Unix Concepts and Applications – Sumitabha Das, McGraw Hill Publication

Syllabus for BE, Semester IV

Course Code: ITTM41 **Course : Python for Everybody**

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

Course Outcomes:

Upon completion of course, students will be able to

1) Understand why Python is a useful scripting language for developers.
2) Learn how to design and program Python applications.
3) Write loops and decision statements in Python.
4) Write functions and pass arguments in Python.

Unit I

Introduction: Why Program, Hardware Overview, Python as a Language,

Unit II

Installing and Using Python: Installing Python and Writing A Program, Writing Paragraphs of Code, Doing the "Hello World" Assignment

Unit III

Variables and Expressions: Declaring variables, working with data types and variables, working with numeric data, working with string data, Expression

Unit IV

Conditional Code and Decision: Conditional Statements, Defining and writing decision statements, Illustrative programs

Unit V

Functions: Define and use functions and modules, recursive functions, Illustrative programs

Unit VI

Loops and Iteration: Loops and iteration, defining loops, working with recursion, Illustrative programs

Text Books

1. Michael Urban and Joel Murach, Python Programming, Shroff/Murach, 2016

Reference Books

1. Mark Lutz, Programming Python, O`Reilly, 4th Edition, 2010

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