RCOEM

Shri Ramdeobaba College of
Engineering and Management, Nagpur

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
2021-2022

B. E./ B. Tech. (INFORMATION TECHNOLOGY)

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 15 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 routers are used in the laboratories 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, Analyze 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 multi disciplinary 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 theengineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary 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 and 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 languages 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) Bachelor of Engineering
Group 1: Semester - I / Group 2: Semester – II

Sr. No.	Course Code	Course Name	Hours/week			Credits	Maximum marks			ESE Duration(Hrs.)
			L	T	P		Continuous Evaluation	End Sem Exam	Total	
1.	PHT156	Semiconductor Physics	3	1	0	4	40	60	100	03
2.	PHP156	Semiconductor Physics Lab	0	0	3	1.5	25	25	50	–
3.	MAT152/ MAT151	Differential Equations, Linear Algebra, Statistics & Probability/Calculus	3	0/1	0	3/4	40	60	100	03
4.	MAP151	Computational Mathematics Lab	0	0	2	1	25	25	50	–
5.	EET151	Basic Electrical Engineering	3	1	0	4	40	60	100	03
6.	EEP151	Basic Electrical Engineering Lab	0	0	2	1	25	25	50	–
7.	MET151	Engineering Graphics & Design	1	0	0	1	40	60	100	03
8.	MEP151	Engineering Graphics & Design Lab	0	0	4	2	50	50	100	–
9.	HUT152	Constitution of India	2	0	0	0	–	–	–	–
10.	PEP151	Yoga / Sports	0	0	2	0	–	–	–	–
		TOTAL	**12**	**2/3**	**13**	**17.5 /18.5**			**650**	

Group 2: Semester - 1 / Group 1 : Semester – II

Sr. No.	Course Code	Course Name	Hours/week			Credits	Maximum marks			ESE Duration (Hrs.)
			L	T	P		Continuous Evaluation	End Sem Exam	Total	
1.	CHT152	Chemistry	3	1	0	4	40	60	100	03
2.	CHP152	Chemistry Lab	0	0	3	1.5	25	25	50	–
3.	MAT151/ MAT152	Calculus/Differential Equations, Linear Algebra, Statistics	3	1/0	0	4/3	40	60	100	03
4.	CST151	Programming for Problem Solving	4	0	0	4	40	60	100	03
5.	CSP151	Programming for Problem Solving Lab	0	0	2	1	25	25	50	–
6.	IDT151	Creativity, Innovation & Design Thinking	1	0	0	1	20	30	50	1.5
7.	INT151	Workshop/Manufacturing Practices	1	0	0	1	20	30	50	1.5
8.	INP151	Workshop/Manufacturing Practices Lab	0	0	2	1	25	25	50	–
9.	HUT151	English	2	0	0	2	40	60	100	03
10.	HUP151	English Lab	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 (Information Technology)
Semester III

Sr. No.	Category	Course Code	Course Name	Hours/week			Credits	Maximum Marks			ESE Duration (Hrs.)
				L	T	P		Continuous Evaluation	End Sem Exam	Total	
01	PCC	ITT251	Object Oriented Programming	2	0	0	2	40	60	100	03
02	PCC	ITP251	Object Oriented Programming Lab	0	0	4	2	25	25	50	-
03	PCC	ITT252	Data Structures	3	0	0	3	40	60	100	03
04	PCC	ITP252	Data Structures Lab	0	0	4	2	25	25	50	-
05	PCC	AddITT253	Digital Circuits and Fundamentals of Microprocessor	2	1	0	3	40	60	100	03
06	PCC	ITP253	Digital Circuits and Fundamentals of Microprocessor Lab	0	0	4	2	25	25	50	-
07	PCC	ITP254	IT workshop Lab	0	0	4	2	25	25	50	-
08	BSC	MAT252	Linear Algebra and Statistics	3	0	0	3	40	60	100	03
09	HSSM	HUT254	Technical Communication	3	0	0	3	40	60	100	03
10	MC	CHT251	Environmental Science	2	0	0	0	-	-	-	-
TOTAL				**32 Hrs.**			**22**				

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

Sr. No.	Category	Course Code	Course Name	Hours/week			Credits	Maximum Marks			ESE Duration (Hrs.)
				L	T	P		Continuous Evaluation	End Sem Exam	Total	
01	PCC	ITT255	Discrete Mathematics	2	1	0	3	40	60	100	03
02	PCC	ITT256	Computer Organization and Architecture	3	0	0	3	40	60	100	03
03	PCC	ITP256	Computer Organization and Architecture Lab	0	0	2	1	25	25	50	-
04	PCC	ITT257	Software Engineering	3	0	0	3	40	60	100	03
05	PCC	ITP257	Software Engineering Lab	0	0	4	2	25	25	50	-
06	PCC	ITT258	Design and Analysis of Algorithms	3	0	0	3	40	60	100	03
07	PCC	ITP258	Design and Analysis of Algorithms Lab	0	0	4	2	25	25	50	-
08	HSSM	HUT255	Organizational Behavior	3	0	0	3	40	60	100	03
09	OEC	ITT299	Open Elective– I	3	0	0	3	40	60	100	03
10	MC	HUT252	Indian Traditional Knowledge	2	0	0	0	-	-	-	-
TOTAL				**30 Hrs.**			**23**				

Open Elective – I	
Code	**Course Title**
ITT299-01	Linux Fundamentals

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

Sr. No.	Category	Course Code	Course Name	Hours/week			Credits	Maximum Marks			ESE Duration (Hrs.)
				L	T	P		Continuous Evaluation	End Sem Exam	Total	
01	PCC	ITT351	Operating Systems	3	0	0	3	40	60	100	03
02	PCC	ITP351	Operating Systems Lab	0	0	4	2	25	25	50	-
03	PCC	ITT352	Formal Languages and Automata Theory	2	1	0	3	40	60	100	03
04	PCC	ITT353	Computer Networks	3	0	0	3	40	60	100	03
05	PCC	ITP353	Computer Networks Lab	0	0	4	2	25	25	50	-
06	HSSM	HUT354	Managerial Economics	3	0	0	3	40	60	100	03
07	PEC	ITT354	Elective-I	3	0	0	3	40	60	100	03
08	OEC	ITT398	Open Elective– II	3	0	0	3	40	60	100	03
			TOTAL	**26 Hrs.**			**22**				

Elective – I	
Code	**Course Title**
ITT354-01	Advance Data Structures
ITT354-02	Web Technologies

Open Elective – II	
Code	**Course Title**
ITT398-01	Python Programming
ITT398-02	Client Server Computing and Applications

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

Sr. No	Category	Course Code	Course Name	Hours/week			Credits	Maximum Marks			ESE Duration (Hrs.)
				L	T	P		Continuous Evaluation	End Sem Exam	Total	
01	PCC	ITT356	Information Security	3	0	0	3	40	60	100	03
02	PCC	ITT357	Compiler Design	3	0	0	3	40	60	100	03
03	PCC	ITP357	Compiler Design Lab	0	0	4	2	25	25	50	-
04	PCC	ITT358	Database Management System	2	1	0	3	40	60	100	03
05	PCC	ITP358	Database Management System Lab	0	0	4	2	25	25	50	-
06	PEC	ITT359	Elective-II	3	0	0	3	40	60	100	03
07	OEC	ITT399	Open Elective– III	3	0	0	3	40	60	100	03
08	PR	ITP361	Project-I	0	0	4	2	50	50	100	-
09	PCC	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**
ITT399-01 (Self-Study)	Cyber Security and Laws

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

Sr. No.	Category	Course Code	Course Name	Hours/week			Credits	Maximum Marks			ESE Duration (Hrs.)
				L	T	P		Continuous Evaluation	End Sem Exam	Total	
01	PCC	ITT451	Artificial Intelligence	2	0	0	2	40	60	100	03
02	PCC	ITP451	Artificial Intelligence Lab	0	0	2	1	25	25	50	-
03	PCC	ITT452	Cloud Computing	2	0	0	2	40	60	100	03
04	PCC	ITP452	Cloud Computing Lab	0	0	2	1	25	25	50	-
05	PEC	ITT453	Elective-III	3	0	0	3	40	60	100	03
06	PEC	ITT454	Elective-IV	3	0	0	3	40	60	100	03
07	OEC	ITT498	Open Elective-IV	3	0	0	3	40	60	100	03
08	PR	ITP455	Industry Internship Evaluation*	0	0	2	0	-	-	-	-
09	PR	ITP456	Project-II	0	0	12	6	75	75	150	-
			TOTAL	**31 Hrs.**			**21**				

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

Elective – III		Elective – IV	
Code	**Course Title**	**Code**	**Course Title**
ITT453-01	Image Processing	ITT454-01	Introduction to Machine Learning
ITT453-02	Wireless Communication	ITT454-02	Internet of Things

Open Elective - IV	
Code	**Course Title**
ITT498-01	Internet Technologies
ITT498-02	E-Commerce

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

Sr. No.	Category	Course Code	Course Name	Hours/week			Credits	Maximum Marks			ESE Duration (Hrs.)
				L	T	P		Continuous Evaluation	End Sem Exam	Total	
01	PEC	ITT457 /IDT457	Elective-V	3	0	0	3	40	60	100	03
02	PEC	ITT458	Elective-VI	3	0	0	3	40	60	100	03
03	PR	ITP459	Project-III	0	0	12	6	75	75	150	-
TOTAL				**18 Hrs.**			**12**				

Elective – V		Elective – VI	
Code	**Course Title**	**Code**	**Course Title**
ITT457-01	Data Warehousing and Business Intelligence	ITT458-01	Information Retrieval
IDT457	Computational Biology	ITT458-02	Distributed Systems

OR

Sr. No.	Category	Course Code	Course Name	Hours/week	Credits	Maximum Marks			ESE Duration (Hrs.)
						Continuous Evaluation	End Sem Exam	Total	
01	PR	ITP460	Full Semester Internship		12	100	100	200	-

The Scheme of Teaching & Examination of HONORS Specialization In Information Technology

Sr. No.	Course code	Course Name	Hours/week			Credits	Maximum Marks			ESE Duration (Hrs.)
			L	T	P		Continuous Evaluation	End Sem Exam	Total	
01	ITTH42	Scientific Computing for Programmers	2	2	-	4	40	60	100	03
02	ITTH52	Software Testing	2	2	-	4	40	60	100	03
03	ITTH62	Software Design and Architecture	2	2	-	4	40	60	100	03
04	ITTH72	NPTEL Course (12 Weeks)*	-	-	-	4	-	-	-	-
05	ITTH82	NPTEL Course (12 Weeks)*	-	-	-	4	-	-	-	-

Note:

1. **The courses for IV. V and VI semester will be conducted in Lab.**
2. **For Seventh and Eight semesters, students will have to opt for NPTEL course as suggested by the department, as per the availability of courses at the time of registration.**

Scheme of Teaching & Examination of MINORS Specialization In Information Technology

Sr. No.	Course code	Course Name	Hours/week			Credits	Maximum Marks			ESE Duration (Hrs.)
			L	T	P		Continuous Evaluation	End Sem Exam	Total	
01	ITTM42	Python Programming	3	1	-	4	40	60	100	03
02	ITTM52	Object Oriented Programming	3	1	-	4	40	60	100	03
03	ITTM62	Web Design	3	1	-	4	40	60	100	03
04	ITTM71-01	Introduction to Machine Learning	3	1	-	4	40	60	100	03
	ITTM71-02	Computer Networking	3	1	-	4	40	60	100	03
05	ITTM81	Introduction to Emerging Technologies	3	1	-	4	40	60	100	03

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

Syllabus for Semester BE I / II

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

Course Code: PHT156 **Category: Basic Science Course**

Course: PHYSICS: Semiconductor Physics (Theory)

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 semiconductordevices;
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 behaviour 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, on the properties of junctions between semiconductors and metals;
4. Have an elementary understanding of working of optoelectronic devices

Module 1: Quantum Mechanics Introduction

Wave-particle duality, Heisenberg uncertainty relations, the quantum state wave function and its probability interpretation, Schrodinger's equation, Energies and wave functions of a single electron in one-dimensional infinite potentials: formulae, function graphs, number of bound states, tunneling, One electron atom, periodic table, Quantum confinement effects in Nano systems

Module 2: Electronic Materials

Free electron theory, Extension of idea of energy level splitting in molecules to bonding in solids,Energy bands in solids, Kronig-Penny model (to better demonstrate origin of band gaps), Band gap based classification of electronic materials: metals, semiconductors, and insulators, E-k diagram, Direct and indirect bandgaps, Valence and conduction bands, Density of states, Fermi-Dirac statistics: Occupation probability of states, Fermi level, Effective mass.

Module 3: Intrinsic and Extrinsic Semiconductors

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

Module 4: Non-Equilibrium Semiconductors

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

Module 5: Junction Physics

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

Module 6: Light - Semiconductors Interaction

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

Text Book(s)

Modules 1-5

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

Reference

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

Modules 6

1. Online course: Semiconductor Optoelectronics by M. R. Shenoy on NPTEL
2. Optoelectronics and Photonics: Principles and Practices by S. O. Kasap, Prentice Hall 2001

Syllabus for Semester BE I / II

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

Course Code: PHP156 **Category: Basic Science**

Course: Semiconductor Physics Lab

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

Course Outcomes

The Physics Lab course consists of experiments illustrating the principles of physics relevant to the study of science and engineering. At the end of the Course the students will learn to:

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

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

General Physics

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

Semiconductor Physics and Devices

1. Energy gap of semiconductor/thermistor
2. Study of Hall Effect
3. Parameter extraction from I-V characteristics of a PN junction diode
4. Parameter extraction from I-V characteristics of a zener diode
5. Study of diode rectification
6. Parameter extraction from I-V characteristics of a transistor in common-emitter configuration.
7. V-I Characteristics of Light Emitting Diodes
8. Study of a photodiode

9. Solar Cell (Photovoltaic cell)
10. Resistivity measurement by Four Probe method

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

Syllabus for Semester II, B.E. Department of Information Technology

Course Code: MAT151 **Course: Calculus**

L: 03hrs., T: 1 Hrs.., P: 0 Hrs. Per Week **Total Credits: 4**

Course Objective

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

Course Outcomes

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

1. The fallouts of Mean Valve Theorems that is fundamental to application of analysis to Engineering problems, to deal with functions of several variables that are essential in most branches of engineering.
2. Basics of improper integrals, Beta and Gamma functions, Curve tool of power series and Fourier series for learning advanced Engineering Mathematics.
3. Multivariable Integral Calculus and Vector Calculus and their applications to Engineering problems.

Syllabus

Module 1: Calculus: (7 hours)

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

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

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

Module 3 Calculus: (6 hours)

Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Tracing of

curves(Cartesian form)

Module 4:Sequences and series: (7 hours)

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

Module 5: Multivariable Calculus (Integration) (7 hours)

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

Module 6 : Vector Calculus(7 hours)

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

Topics for self-learning

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

Textbooks/References:

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

Syllabus for B.E. Semester I

Department of Information Technology

Course Code: 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.

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

Exact,linearandBernoulli'sequations,Euler'sequations,Equationsnotoffirstdegree:equationssolvablef or 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, Schaumseries
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, AFirst Course in Probability, 6th Ed., Pearson Education India, 2002.

Syllabus of Mathematics Computational Lab for Semester I/II, B.E.

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

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

Course Outcomes

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

1. Develop skills to impart practical knowledge in real-time.
2. Understand principle, concept, working and application of areas in mathematics and comparethe results obtained with theoretical calculations.
3. Understand basics of mathematics, and report the results obtained through proper programming.The Lab turns will be utilized for performing the experiments based on the following list:

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

Suggested References

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

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

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

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

L: 3 Hrs. T: 0 Hrs. P: 0 Hrs. **Total Credit: 04**

Course Outcomes

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

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

CO2: Understand working principles of electrical machines: Transformer, Induction motor, DC machines

CO3: Apply the knowledge of power converter for suitable applications

CO4: Introduce and identify the components of power systems and low-voltage electrical Installations.

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

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

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

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

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

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

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

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

Module 5: Transformers (6 hours) - CO2:

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

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

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

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

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

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

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

Text / References

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", Mc Graw 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.

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

L: 0 Hrs. T: 0 Hrs. P: 2 Hrs. **Total Credit: 01**

Course Outcomes

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

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

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

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

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

List of Experiments

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

Demonstration/ Study experiment

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

Demonstration of cut out sections of machines:

i. DC Machine
ii. Three phase squirrel cage induction motor
iii. Synchronous machine

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

L: 1Hr., 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) Narayana K. L. & P. Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.

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

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

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

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

L: 0Hr., T: 0 Hrs. P: 4Hrs. 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 - Auxiliary 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, cross hairs, 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 entrymethods to draw straight lines, Applying various ways of drawing circles;

UNIT 8 : Annotations Layering & Other Functions

Applying dimensions to objects, applying annotations to drawings; Changing line lengths 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), Drafting and design Package, 3D Printing.

List of sheets

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

Suggested Text/ Reference Books

i) Bhatt N. D., Panchal V. M. & Ingle P.R.,(2014), Engineering drawing, Charotar Publishing 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) (Corresponding 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: 2Hrs. T:0Hrs. P:0Hrs. Per weeks **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 Presidentof India.
9. Union Executive: structure, functions
10. Judiciary: Structure, role with special reference to PIL, writ petitions, strengthening of democracy& social justice
11. Amendment of the Constitutional Powers and Procedure
12. Emergency Provisions: National Emergency, President Rule, Financial Emergency
13. Local Self Government – Constitutional Scheme in India
14. Provisions of civil services: Characteristics, functions, merits and demerits
15. Democratic principles in industry

Book

Durga Das Basu "An Introduction to Constitution of India" 22nd Edition, Lexis Nexis

Syllabus for B.E. Semester I, Department of Physical Education

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

L: 0Hrs. T: 0Hrs. P: 2Hrs. 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 ofRCOEM.
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. Theobjective would also be to make the all-round development with team spirit, social values as well as to identifyand 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 asto recommend and conduct specific Yoga and Sports activities. The emphasis is on participation, with healthy competition.

Program 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 andillness associated with sports.
3. Practicing the fundamental skills and bringing awareness of basic rules and regulations.
4. Conduction of small recreational games and activities.
5.

Yoga: Includes various sitting, standing and lying Asanas, Surya namaskars 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	Surya namaskars

Syllabus of Chemistry Course

[For Computer Science Engineering, Information Technology Engineering, Data Science,Artificial Intelligence and Machine Learning and Cyber Security Branches]

Course Code: CHT152 **L: 03, T: 01, P: 00**

Course Outcomes

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

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

Syllabus

Unit 1: Solid State Chemistry (7 Hours)

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

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

Unit 2: Nano-materials (7 Hours)

Basics of Nano chemistry: Definition of Nano, carbon age-new form of carbon (CNT to Graphene), One dimensional, Two dimensional and Three dimensional nanostructured materials, mechanical- physical-chemical, optical properties.

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

Unit 3: Advanced Materials: (7 hours)

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

Reinforcements: Fibres- Glass, Kevlar, Carbon, silicon carbide, boron carbide, Fibres.

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

Unit 4: Computational Chemistry [6 Hours]

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

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

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

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

Unit 6: Water Technology [8 Hours]

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

Suggested Books:

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

Syllabus of Chemistry Course

[For Computer Science Engineering, Information Technology Engineering, Data Science,Artificial Intelligence and Machine Learning and Cyber Security Branches]

Course Code: CHP152 **L: 00, T: 00, P: 03**

Course Outcomes

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

The students will learn to:

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

List of Experiments: [Any Eight from the List]

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

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

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

[4] Determination of rate of the reaction at room temperature and analysis of experimental data using Computational Software.

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

[6] Study of the optical property of Nano-materials.

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

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

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

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

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

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

Suggested Books/Reference Books

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

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

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

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

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

Syllabus 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 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, Passingar rays 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 f flush().

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 LabL: 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 tosolve 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.

List of Experiments

1. To study Unix/Linux Operating System Environment and demonstrate basic data types in C andimplementing arithmetic expressions.
   a) Write C Program to acquire name, roll number and fees paid for a student and display the contentson the screen.
   b) Write C Program to acquire radius of a circle at the terminal and compute area and circumference ofcircle.
   c) Write C Program to execute the expression for projectile

      motions = $ut+1/2\ at^2$

      where s: Displacement; u: initial velocity, a: acceleration t: time

2. To Study and Demonstrate Decision Control Structure.
   a) Write C Program to check whether entered 4-digit number is even, odd or zero.
   b) Write C Program to acquire total marks obtained by student (out of 500) and decide the passing division.

Marks	Division
>85	Distinction
>75 and <=85	First Class
>65 and<=75	Second Class
>=50 and <=65	Pass
<50	Fail

   c) Write C Program to accept year (4-digit>1900) and check whether it is a leap year or not.
3. To Study and Demonstrate Loop Control Structure
   a) Write C Program to compute sum of integers provided by user. Set the terminating condition for theprogram as number - 9999.
   b) Write C program using while loop to find n-digit Armstrong number where value of 'n' should be inthe range 2 to 6 (both inclusive)

c) Write C Program using for loop to print given pattern.

```
        1
      2 3 2
    3 4 5 4 3
  4 5 6 7 6 5 4
5 6 7 8 9 8 7 6 5
```

4. To Study and Demonstrate Multi-way Decision Control Structures (Switch Case)
   a) Write C Program which will accept a 4-digit number and depending on the user choice code willperform the following.

Choice Code	Action
1	Reverse of number
2	Sum of its digits
Otherwise	Exit with Error

   b) Write C Program that will accept number of sides from the user (sides >3 and side <5) and will compute the area and perimeter of the polygon described by the sides.
5. To Study and Demonstrate 1D and 2D Array.
   a) Write a C Program to implement Linear Search and Binary Search. Given a list of N Numbers. Search the existence of any number in the list. The list is initialized using array.
   b) Write a C Program to find transpose of a matrix.
   c) Write a C Program to implement Insertion Sort and Selection Sort. Create a vector (1-D Array) storingN integers in ascending sequence.
6. To Study and Demonstrate Function and Recursion.
   a) Write a C Program to create user defined function to reverse of a string. (Use Call by Reference)
   b) Write a C Program to create user defined function to compute surface area and volume of a right circular cylinder. Do not print the output in function body. Do not use global variable. (Use Call by Reference)
   c) Write a C Program using Recursive Function to compute
      1) GCG of two number
      2) Power of a number
      3) n^{th} Fibonacci terms (number) (n<=40)
7. To Study and Demonstrate Structure and Pointers.
   a) Write a C Program to define Structure to store information of five student. The Student record is comprised as Roll Number, Name, Mark 1, Mark 2, Mark 3. Compute and display the aggregated marks scored by each student.
   b) Write a C Program to create user defined function (by using pointer) to copy source string to target string.
8. To Study and Demonstrate File Handling in C.
   a) Write a C Program (Using Structure) to create a File named STUD_FL which will store information of 20 Students. (A class of B.E. First year has 20 student. Each student records comprised of Roll Number, Name, Fee Paid.)
   b) Write a C Program to read the STUD_FL file and print contents of it.

Creativity Innovation and Design thinking
Course Syllabus

Course Code: IDT151

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

Course Outcomes

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

C2: Enhance their creative and innovative thinking skills

C3: Practice thinking creatively and innovative design and development

Detailed Topics

UNIT 1. 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)

UNIT3. 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- Rout ledge Taylor &Francis Group
2. 101 Activities for Teaching creativity and Problem Solving- By Arthur B Vangundy- Pfeiffer
3. H. S. Fogler and S.E. Le Blanc, 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)

- Brainteasers (aka Puzzle Busters, to be solved individually)
- Cartoon captions (small teams)
- TRIZ, asystematic 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

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 equipment's to carry out different manufacturing processes accompanied by the inspection of the work part.

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

Unit-2 Introduction 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, mechanic soft welding, types of welding, soldering and brazing, typesof 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 Lind berg, "Process and Materials of Manufacture" 4th Edition, Prentice Hall India 1998.

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 safe type cautions

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.

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 wellas communication skills at workplace. 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 communications kills 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 Pushp Lata. 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

Humanities and Social Sciences including Management Courses

Course Code: HUP151 **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

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, datahiding 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 reallife 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, AddisonWesley
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

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

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

Minimum 10 Practical's based on 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.

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

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

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

Minimum 10 Practical's based on the course ITT 252

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 in to code.
3. Analyze and communicate the time and space complexities of given algorithm.
4. Write optimal programs.
5. Implementlinearandnonlineardatastructuresforsolvingrealworldproblems.
6. Document laboratory work in the form of lab report.

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

1. Upon completion of the course, students will be able to
2. Understand the fundamental concepts and techniques used in digital electronics.
3. Understand and examine the structure of various number systems and its applications in digital design.
4. Understand, analyze and design various combinational circuits.
5. Understand, analyze and design various sequential circuits using storage elements.
6. Identify timing problems in digital design.
7. 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 up to 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 ofF/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 and 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 8085.

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 Semester III, B.E. (Information Technology)

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

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

Minimum 10 Practical's based on the course ITT 253

Course Outcomes

1. Upon completion of the course, students will be able to
2. Design combinational circuits.
3. Design sequential circuits.
4. Design basic memory elements using flip-flops.
5. Write 8085 Assembly Language Programs.

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 popular IDEs 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.

Introduction to popular IDEs

Text Book

1. Linux Pocket guide- Daniel J. Barrett, O'Reilly Media
2. Linux: The Complete Reference, Sixth Edition- Richard Petersen, McGraw Hill Education

Reference Books

1. Linux Administration : A Beginner’s Guide – Wale Soyinka , McGraw Hill Publication
2. Linux Command Line and Shell Scripting Bible- Richard Blum, Wiley

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, eigen values and eigen vectors, orthogonality anddiagonalization.
2. Visualization, spatial reasoning, as well as geometric properties and strategies to model, solve problems and view solutions, especially in and, as well as conceptually extend these results to higherdimensions.
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; Sub spaces; 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 Rn 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; Ortho normal 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, DiscretetimeMarkovchain,ContinuoustimeMarkovchain.

Module 4 (6-lectures) :

Hypothesis testing for sampling distributions of means, proportions, sum and differences of means and proportions forlargeandsmallsamples.

Text Books

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

Reference Books

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

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 work placedocuments.
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

Course Code : CHT251 **Course : Environmental Science**

L :2 Hrs. T : 0 Hrs. P: 0 Hrs., 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 behavior and recent trends in environmental pollution control I- Air pollution and its control techniques: (4 lectures)

Contaminant behavior 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.

1. 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.

2. Soil pollution and its control techniques: (5 lectures)

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

Solid waste management: Composting, vermi culture, landfills, hazardous waste treatment, bio remediation technologies, conventional techniques (land farming, constructed wetlands), and phyto remediation.

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

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

4. E-wastes (2 lectures)

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

5. 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

6. Different government initiatives(2lectures)

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. PAarne 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, Environmental Sustainability: Role of Green technologies, Springer publications.

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

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

Course Outcomes

Upon completion of the course, students will be able to

1. Construct mathematical arguments using logical connectives and quantifiers.
2. Perform operations on discrete structures such as sets, functions and relations
3. Demonstrate understanding of various algebraic structures.
4. Apply the concept of lattices and Boolean algebra to switching circuits.
5. Model different problems in computer science using graphs.

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

Graph Theory: Properties, types of graphs, Operations of graphs, Subgraphs and Isomorphic graphs, Paths, cycles and connectivity, Eulerian and Hamiltonian graphs, shortest path problems, graph coloring, vertex coloring, edge coloring, graph covering, network flows.

Text Books

1. Combinatorial Mathematics: C. L. Liu& D. P. Mohapatra, 4th 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

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

L: 3Hrs. T: 0Hrs. P: 0Hrs. 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 systemand understand instruction set.
2. Design adder, sub tractor, 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, Logicdesign 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.

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

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

Minimum 8 Practical 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.

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 re-engineering, 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, Data flow 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.

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

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

Minimum 8 Practical based on the course ITT 257

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

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, Hamiltoni an 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. Carmen 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.

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

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

Minimum 10 Practical based on the course ITT 258

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

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

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

Course Outcomes

Upon completion of the course, students would be able to

1. Understand fundamentals of Organizational behaviour.
2. Understand the role and significance of values and motivation at workplace.
3. Become aware of individual differences and its impact at workplace.
4. Handle stress effectively at workplace.
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- Intra personal, 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.:Prentice Hall.
3. Eysenck, H. J.(1982).Quotedin Personality, Genetics and Behaviour, NewYork, Prager,1.
4. Schultz, D.P.&Schultz, S. E.(1990). Psychology and Industry Today: An Introduction Industrialand Organisational Psychology, 5thed., N.Y.: Macmillan.
5. Miner, J. P. (1992).Industrial Organisational Psychology, N.Y.: McGraw Hill.
6. McCormick, E. J.&Tiffin, J. Industrial Psychology, Prentice Hall, 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.

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

Syllabus

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. R R Gaur, Rajeev Sangal, G P Bagaria, Human Values and Professional Ethics (Excel Books, New Delhi, 2010)
2. V. Sivaramakrishanan (ed.), Cultural Heritage of India – Course material, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
3. Swami Jitatman and, Modern Physics and Vedant, Bharatiya Vidya Bhavan
4. Swami Jitatman and, Holistic Science and Vedant, Bharatiya Vidya Bhavan
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 Semester IV, B.E. (Information Technology)

Open Elective-I

Course Code: ITT299-01 **Course: 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 user, group management, package management through commands
4. Perform storage management and failure recovery through commands.
5. Automate tasks and write simple programs using shell scripts.

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 – password, Shadow, user add, user mod, user del, group add, group mod, group del.

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 f disk 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 Semester IV, B.E. (Information Technology)

HONORS COURSE

Course Code: ITTH42 **Course: Scientific Computing for Programmers**

L: 2 Hrs. T: 2 Hrs. P: 0 Hrs. Per week **Total Credits: 04**

Course Outcomes

Upon completion of course, students will be able to

1. Apply mathematics for solving computational problems.
2. Tabulate statistical information for interpretation
3. Analyze statistical data using frequency distributions and cumulative frequency distributions.
4. Model problems for providing solutions using multiple approaches.
5. Apply appropriate techniques of Data Compression.
6. Present the data using appropriate graphical representation

Syllabus

Unit I: Mathematics for Competitive Programming

Big Integer,GCD, LCM, Prime Factorization, Euclidean Algorithm, Extended Euclidean Algorithm,Sieve of Eratosthenes and Segmented Sieve,Modulo arithmetic, Modulo exponentiation and Modulo inverse,Lucas Theorem,Chinese Remainder Theorem,Catalan Numbers

Unit II: Descriptive Statistics for Programmers

Statistical thinking for programmers - Means and averages - Variance - Distributions - Representing histograms - Plotting histograms - Representing PMFs - Plotting PMFs - Outliers - Conditional probability

Unit III: Coding with Statistical Distributions

Cumulative distribution functions - Probability Mass Function - Percentiles - Conditional distributions - Random numbers - Continuous distributions - The exponential distribution - The Pareto distribution- The normal distribution

Unit IV: Computational Linear Algebra

Vectors, Matrices, and the Matrix-Vector Equation - Solving Equations - Orthogonality - Eigenvalues and Eigenvectors - Working with polynomials

Unit V: Data Compression Techniques

Motivation For Compression - Basic Definitions - Strategies For Compression - Information Theory Preliminaries - Huffman Coding - Run-Length Encoding - Golomb Coding -Arithmetic Coding - Lempel-Ziv Compression - Lossy compression - Quantization techniques

Unit VI: Digital Representation of Data

Drawing and interpretation of various types of graphs; histograms, pie charts, 2D graphs, 3D graphs, Bar charts, Scatter plots.

Text Books:

1. Elementary Number Theory, by David M. Burton, 6th edition, McGraw-Hill Higher Education.
2. Linear algebra, 3rd edition, Schaum's Outlines, Seymour Lipschutz, Marc Lipson, McGraw-Hill Higher Education.
3. Fundamentals of Mathematical Statistics (A Modern Approach), 10th Edition, Sultan Chand & Sons
4. Introduction to Cryptography with coding theory by Wade Trappe, Lawrence C. Washington, 2nd edition, Pearson Education International.

Syllabus for Semester IV, B.E. (Information Technology)

MINOR COURSE

Course Code: ITTM42 **Course: Python Programming**

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

Course Code: ITT351 **Course: Operating Systems**

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

Course Outcomes

Upon completion of course, Students will be able to

1. Describe the role of Operating Systems and their types.
2. Use the concept of a process, thread and scheduling algorithms.
3. Demonstrate the concept of process synchronization in real life problems.
4. Analyze the occurrence of Deadlock and handle it.
5. Differentiate and apply various memory management techniques in real life problems.
6. Recognize the concept of file system, Disk Scheduling, protection and security.

Unit I

Introduction, Services provided by OS, System programs and System Calls - brief discussions of evolution of OS Multiprogramming systems, Time sharing, Real time systems, Multiprocessor system - and distributed systems: a brief overview of issues.

Unit II

Processes and 3 levels of scheduling, process control block and context switch, goals of scheduling and different scheduling algorithms, threads: user-level and kernel level.

Unit III

Process cooperation and synchronization, mutual exclusion, the critical section problem, semaphores, classical inter-process communication problems.

Unit IV

Deadlocks and strategies for handling them: Deadlock characterization, Deadlock prevention, Deadlock avoidance, Deadlock Detection and Recovery, Combined approach to deadlock handling.

Unit V

Memory management techniques, contiguous and non-contiguous, paging and segmentation, translation look-aside buffers (TLB) and overheads, virtual memory and demand paging, page faults and instruction restart, problems of large address spaces, page tables and page replacement algorithms, miscellaneous issues.

Unit VI

File systems, disk space management and space allocation strategies, directory structures, disk arm scheduling strategies.

Protection and security: protection and security issues, cryptographic techniques

Text Books

1. Operating System Concepts: Silberchatz & Galvin, 6th Edition, Addison Wesley.
2. Operating Systems: Internals and Design Principles, William Stallings, 5th Edition, Pearson Education.

Reference Books:

1. Operating System by Concept & Design: Milan Milenkovic, 2nd Edition, MGH.
2. Operating System: Madnick & Donovan, 1st Edition, MGH.
3. Modern Operating Systems: Tanenbaum 2nd Edition, PHI.

Course Code: ITP351 **Course: Operating Systems Lab**

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

Course Outcomes

Upon completion of the course the students will be able to

1. Defend the appropriate algorithm for designing CPU scheduler for the given operating system.
2. Demonstrate programs consisting of cooperating processes.
3. Execute program for deadlock avoidance.
4. Execute the programs for memory management.
5. Demonstrate virus programs and their countermeasures.

Course Code: ITT352 **Course: Formal Languages and Automata Theory**

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

Course Outcomes

At the end of the course students will be able to

1. Design Finite automata for real life problems.
2. Understand concepts of grammars and formal languages.
3. Analyze the problem and apply appropriate computational model to solve it.
4. Understand the concepts of undecidable problems.
5. Understand the concepts of recursive function theory.

Unit I

Introduction: Strings, Alphabet, Language, Operations, Finite state machine, Definitions, Finite automation model (FA), Acceptance of strings and languages, Non-deterministic finite automation, Deterministic finite automation, Equivalence between NFA & DFA, Conversion of NFA into DFA, Minimization of FSM, Equivalence between two FSM's, Two Way finite automata, Myhill-Nerode Minimization theorem, Moore & Mealy machines.

Unit II

Regular Expressions: Regular sets, Regular expressions (RE), Identity rules, Manipulation of regular expressions, Equivalence between RE and FA, Pumping lemma, Closure properties of regular sets, Regular grammars (RG), Right linear and Left linear grammars, Equivalence between regular linear grammar and FA, Interconversion between RE and RG.

Unit III

Grammars: Context-free grammar, Derivation trees, Chomsky normal form, Greibach normal form, Push down Automata, Definition, Model, Acceptance of CFL, Equivalence of CFL & PDA, Interconversion, Enumeration of properties of CFL.

Unit IV

Push down automata (PDA): Non determinism, acceptance by two methods and their equivalence between PDA and CFG, closure and decision properties of CFLs.

Unit V

Turing machine: variants, recursively enumerable set; recursive sets TM as a computer function, decidability and solvability, Halting Problem, Post correspondence Problems (PCP) and unsolvability of ambiguity problem of CFGs, Church's hypothesis.

Unit VI

Computable Functions: Partial, total, constant functions, Primitive Recursive Functions, Bounded Mineralization, Regular function, Recursive Functions.

Text Books

1. An Introduction to Formal Languages and Automata: Peter Linz, 3rd Edition, Narosa Pub.
2. Theory of Computer Science: K. L. P. Mishra & N. Chandrasekaran, PHI.
3. Theory of Computation: Michael Sipser, India Edition, Cengage Learning.

Reference Books

1. Introduction to Languages and the Theory of Automata: John C.Martin, 3rd Edition, MGH
2. Introduction to Automata Theory, Languages and Computation: J. E. Hopcroft, Rajeev Motwani, 2nd Edition, Pearson Education.

Course Code: ITT353 **Course: Computer Networks**

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

Course Outcomes:

At the end of the course students will be able to

1. Understand the hardware and software aspects of networking.
2. Apply the layered functionality for solving networking related issues.
3. Analyze the protocols w.r.t their performance at different layers.
4. Apply different algorithms in each layer of network architecture.
5. Design TCP/IP based networking systems for solving real world problems.

Unit I

Introduction: Network hardware, Network software, Protocol hierarchies, Design issues for layers. The ISO-OSI reference model, TCP/IP model.

Physical Layer: Issues, Transmission Impairments, Data Rate Limits, Performance. Bandwidth Utilization: Multiplexing, Transmission Media: Guided and Unguided.

Unit II

Data Link Layer - Design issues, Services, Error Detection and Correction, Data Link Control, Elementary Data Link Layer protocols.

The Medium Access Sub Layer: Multiple Access Protocols, IEEE standards: Ethernet (802.3), Wireless LAN (802.11).

Unit III

Network Layer: Design issues, Comparison of Virtual Circuit and Datagram subnets, Routing algorithms, Congestion control algorithms, Congestion control in Virtual Circuit subnets.

Unit IV

IPv4 Addressing, Datagram forwarding in IP4, Subnetting, CIDR Notation. Address Translation (ARP), Host Configuration (DHCP), Error Reporting (ICMP), Introduction to IPv6.

Unit V

Transport layer: Services, Addressing, Establishing and Releasing a connection, Flow control/buffering, Multiplexing and Crash recovery. Congestion control and Quality of Service. Introduction to UDP and TCP.

Unit VI

Application Layer: Name Service (DNS) application, Introduction to Electronic Mail System and World Wide Web.

Text Books

1. Computer Networks: Andrew Tanenbaum, 4th Edition, PHI.
2. Data Communication and Networking: Behrouz Forouzan, 4th Edition, TMH.
3. Computer Networks and Internet: Douglas Comer, 5th Edition, PHI.

Reference Books

1. Introduction to Data Communications and Networking: Wayne Tomasi, 1st Edition, Pearson Education.
2. Computer Networks: A systems approach: Larry. L. Peterson, Bruce. S. Davie, 3rd Edition, Morgan Kaufmann publishers.

Course Code: ITP353 **Course: Computer Networks Lab**

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

A total of 8-10 Practical's, based on course ITT353, would be conducted using simulation tools suchas Wireshark, Cisco Packet Tracer and Programming.

Course Outcomes

At the end of the course students will be able to

1. Demonstrate the functionality of various software and hardware components of networking.
2. Differentiate and demonstrate various algorithms at different layers.
3. Configure different devices like routers, host machines for setting up a network.
4. Use different networking tools like Wire shark and Network Visualizer.

Course Code: HUT354 **Course: Managerial Economics**

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

Course Outcomes

1. Students will understand and apply the basic knowledge of Economics to take managerial decisions.
2. Students will understand various concepts of demand and supply.
3. Students will apply various theoretical concepts of Utility, Indifference curve and revealed preference to take decisions related to consumer behaviour.
4. Students will be able to carry analysis of process of production and cost.
5. Students will be able to evaluate various forces impacting price and output in different markets.
6. Understanding and recalling the concepts and issues of macroeconomics will enable thestudents todischargetheirdutieseffectivelyasmanagers.

Unit I: Nature and scope of Managerial Economics

Introduction: Meaning of Managerial Economics, Managerial Economics and Economic Theory, Types of business decisions, Managerial decision process, Firm as an agent of production, business and social responsibility.

Unit II: Demand and Supply

Demand: Meaning of Demand, determinants of demand, types of demand, Law of demand, Movements and shifts of demand curve, Elasticity of demand, types of elasticity of demand, Measurement of elasticity of demand, application of elasticity of demand.

Supply: Concept of supply and its use in business, Distinction between Supply and Stock, Law ofsupply, Movements and shifts of supply curve, Elasticity of supply, types of elasticity of supply, factors that determine elasticity of supply, Measurement of elasticity of supply.

Unit III: Theory of Consumer Behaviour

Nature of Human wants, Marginal Utility Analysis, Indifference Curve Analysis, Revealed preference theory of demand.

Unit IV: Theory of Production and cost

Meaning of Production, factors of Production, Law of variable proportions, Economies and Diseconomies of scale.

Theory of Cost: Cost Analysis and Cost Concepts.

Unit V: Price and output Determination in Different Markets

Meaning of Market, types of market, Price and output determination under different market forms.

Unit VI: Macroeconomics for management

Concepts and issues: Consumer Price Index, Wholesale Price Index, BOP, Current and Capital account, GDP, GNP, PI, Inflation, Business cycles, Monetary policy

Text Books

1. Ahuja H.L., (2017) Managerial Economics, Analysis of managerial Decision making, S. Chandand company Limited, New Delhi, 9th ed.
2. Dwivedi D.N., (2015). Managerial Economics, Vikas publishing house Pvt. Ltd, Nodia, 8th ed.

Reference Books

1. Mankiw G., (2008) Principles of Economics (Kindle Edition) South Western Cengage Learning, Nodia 6th ed.
2. Salvatore, D., (2007) Managerial Economics. London: Oxford University Press, 6th ed.

ELECTIVE - I

Course Code: ITT354-01 **Course: Advance Data Structures**

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

Course Outcomes

At the end of the course students would be able to

1. Demonstrate the concepts of algorithm design and complexity theory.
2. Exhibit an understanding of application of Link List and Binary search trees.
3. Analyze all types of Binary trees and Multi-ways tree.
4. Implement hash tables, including collision avoidance and resolution schemes.
5. Apply various Text processing techniques.
6. Gain familiarity with skip lists.

Unit I

Performance of algorithms: Space and Time complexity, Asymptotic notations. Dictionaries: Definition, Dictionary Abstract Data Type, Implementation of Dictionaries.

Unit II

Introduction to Data Structures: Link lists: Single, doubly and Circular linked list, Stack and Queue, Binary search tree (BST): Insertion and deletion of nodes in BSTs, Querying a BST, AVL Tree

Unit III

Multi-way Search Trees: B Tree, B+ Trees. Red-Black Trees: Insertion and all Rotations, deletion and all Rotations, Complexity Analysis of all operations, Comparison between AVL tree and RB tree, Binary heap, Binomial Heaps: insertion and deletion of elements, finding maximum and minimum element. Fibonacci Heaps: insertion and deletion of elements, finding maximum and minimum element.

Unit IV

Hashing: Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.

Unit V

Text Processing: String Operations, Brute-Force Pattern Matching, The Boyer-Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix Tries, The Huffman Coding Algorithm, The Longest Common Subsequence Problem (LCS), Applying Dynamic Programming to the LCS Problem.

Unit VI

Skip Lists: Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists

Text Books

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, Introduction to Algorithms, MIT Press.
2. A V Aho, J. D Ullman and J. E Hopcroft, Data Structures and Algorithms, Addison Wesley.
3. E. Horowitz, S. Sahni and S. Rajasekeran, Fundamentals of Computer Algorithms, UniversityPress

Reference Books

1. E. Horowitz, S. Sahni and S. Anderson-Freed, Fundamental of data Structure in C, W.H. FreenCo.
2. Data Structures & Program Design in C: Robert Kruse, G. L. Tondo and B. Leung PHI-EEE.
3. Aaron M. Tenenbaum, Y. Langsam, Moshe J. Augenstein, Data Structures Using C.

ELECTIVE - I

Course Code: ITT354-02 **Course : Web Technologies**

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

Course Outcomes

At the end of the course students will be able to

1. Design, develop and organize the web pages into website for different domains.
2. Apply the concepts of Socket and CGI.
3. Design and develop static and dynamic web pages using HTML.
4. Develop XML document for Internet and use it in HTML pages.
5. Create dynamic web site using PHP and MySQL language.

Unit I

Basic tools of Internet accesses: email, ftp, www. Standard use for www documents on Internet:HTTP, MIME, SGML, DTD, URL.

HTML Programming: Tags, Special Characters, Heading, Paragraph, List, Images, Tables, Forms, Hyperlinks, Cascading style sheet (CSS).

Unit II

Sockets: Connections, domains, Types and protocols (sockets), Different routines for socket programming. Creating and closing sockets, Socket communication.

CGI: Understanding CGI, CGI Environmental variables, CGI Applications. XML : XML Basics , DTD , XML processor, XML namespaces.

Unit III

Introducing PHP and MySQL: History, Features, and architecture. Learning PHP: Using variables, Statements, and Operators. Using conditional statements and loops.

Unit IV

Using Arrays and Custom functions: Using Arrays to Group Related Values. User defined function: Defining and Invoking Functions, Using arguments and return values, Defining global and local variables, Importing function definitions.

Unit V

String and regular expression: Determining length, Comparing strings Manipulating string case, Padding and striping a string. Counting characters and words.

Using Files, Sessions, cookies: Reading and Writing Files, Managing sessions and Using session variables, Storing data in Cookies.

Unit VI

Learning MySQL: Understanding RDBMS, Using MySQL command line client. Using PHP with MySQL: Managing database connection, performing queries, Processing result sets. Validating user input: Setting constraints at the database layer, Validating input at the application layer.

Text Books:

1. The Complete Reference HTML & XHTML :Thomas Powell, 3rd Edition, TMH.
2. PHP and MySQL : Vikram Vaswani, 1st Edition ,MGH
3. XML in action web technology: William J. Pardi, 1st Edition, PHI.
4. CGI Programming on the World Wide Web : Shishir Gundavaram , 1st Edition , O' oReilly Associates

Reference Books

1. PHP 5 / MySQL Programming for the Absolute Beginner: Andy Harris, 1s edition, THOMSON Publication
2. MYSQL : The Complete Reference : Vikram Vaswani, 1st Edition, TMH
3. www.php.net

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OPEN ELECTIVE-II

Course Code: ITT398-01 **Course: Python Programming**

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

Course Outcomes

1. To understand the basic concepts in Python programming.
2. Learn how to write , debug and execute Python program.
3. Understand and demonstrate the use of advanced data types such as tuples, dictionaries and list.
4. To design solutions for real time problems using object oriented concepts in Python.
5. Use and apply the different libraries available in python

Unit I

Introduction to Python Programming, History of Python, its features, Scope of Python, Downloading and installing Python, Python code execution process, run a simple program on Python interpreter and IDLE.

Unit II

The concept of data types; variables, assignments; immutable variables; numerical types; arithmetic operators and expressions; comments in the program; understanding error messages; Illustrative programs.

Unit III

Conditions, Boolean logic, logical operators; ranges; Control statements: if-else, loops (for, while); short-circuit(lazy) evaluation. Illustrative programs

Unit IV

Lists, tuples, and dictionaries; basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries. Illustrative programs

Unit V

Classes and OOP: classes, objects, attributes and methods; defining classes; design with classes, data modeling, inheritance, polymorphism, operator overloading (_eq_, _str_, etc); exception handling, try block. Illustrative programs

Unit VI

Installing and exploring different python libraries used in Graphical User Interface designing (tkinter), databaseconnectivity using Python (pymysql), and Illustrative programs.

Text Books

1. Fundamentals of Python: First Programs Author: Kenneth Lambert Publisher: Course Technology, Cengage Learning, 2012 ISBN-13: 978-1-111-82270-5
2. 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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OPEN ELECTIVE-II

Course Code: ITT398-02 **Course : Client Server Computing and Applications**

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

Course Outcomes

Upon completion of course, students will be able to

1. Recognize and describe the working of Computer Networks, Client server computing.
2. Illustrate reference models with layers, protocols and interfaces.
3. Summarize functionalities of different Layers.
4. Combine and distinguish functionalities of different Layers.
5. Model the Client- Server computing using different media.
6. Apply client –server computing in real life application development.

Unit I

The business opportunity driving forces, major issues in information technology right sizing - reviewof host and non-distributed computing. Basis of distributed computing decomposition approaches layers vs tiers.

Unit II

Networking, Types of network, Basis of client / server computing components. Benefits, Evaluation of Client-server computing, Client / server computing approaches, applications development, cost implementation. TCP/IP Protocol suit.

Unit III

Open System Standards For Client/Server Computing:

Understanding Client / Server computing, Dispelling the Myths, Obstacles Upfront and Hidden Open system and standards, Factors for success. Socket programming and socket API.

Two Tier Computing:

Introduction client Tier, Hardware and Software requirements operating system services, Types of Client Server-Tier, Types of Server-Eight layers of Software.

Unit IV

Three-Tier Computing:

Introduction and comparison of two and three tier- Client side, server side and middleware side, Hardware and Software requirements, Transaction servers, TP lite Vs TP Heavy. CGI scripting.

Middleware:

Hardware and Software requirements, Netware connectivity, Types of Middleware, Data Base middleware Standards.

Unit V

Multi-Tier Computing:

Overview, Benefits, Disadvantages, Components, Tier separations and interactionThin Client Computing:

Introduction to computing models – Comparison, Components, environments.

Unit VI

Front End Tools:

Overview, The Client components, Essential features of a front end tools. Case Studies Account and Financial system, Sales automation and courseware system.

Text Books

1. Dawana Travis Dewire, "Client/Server Computing", Tata McGraw -Hill Publishing Company Limited, New Delhi, 2003.
2. Patrick Smith and Steve Guengesich, "Client/Server Computing", Prentice Hall of India, New Delhi, 2002.

References

1. Robert Orfali, Dan Harkey and Jeri Edwards, "Essential Client/Server Survival Guide", Galgotia Publications, New Delhi, 2001.
2. Joel P Kaster, "Understanding Thin Client/Server Computing", Prentice Hall of India, New Delhi,2001.
3. Jein Edwards, "3 tier Client/server at Work", Wiley Computer Publishing, USA, 1999.
4. Ashhofaiol Tomy Martin, "Building N - tier Applications with COM and VB 6.0", Wiley Computer Publishing, Singapore, 1999.
5. Travis Derive D, "Second - generation Client/Server Computing" McGraw Hill, New Delhi, 1997.
6. Karen Watterson, "Client/Server Technology for "Managers " Addition -Wesley, USA, 1996.
7. Larry J Vaughn, "Client/Server System Design and implementation", Mc Graw Hill inc, USA, 1995

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HONORS COURSE

Course Code: ITTH52 **Course: Software Testing**

L: 2 Hrs. T: 2 Hrs. P: 0 Hrs. Per week **Total Credits: 04**

Course Outcomes

Upon completion of course, students will be able to

1. Demonstrate software testing knowledge.
2. Apply techniques of software testing and review.
3. Design test cases for the given problem
4. Generate a test report.
5. Demonstrate the concepts of automation and web-based testing.

Unit I:

Introduction to Testing: What is Testing? Why is testing necessary? Role of Tester, Testing, and Quality, Overview of STLC.

Unit II:

Business to Businessman Electronic-commerce: Inter-organizational transactions, electronic markets, electronic data interchange (EDI), EDI-technology, EDI and business, inter-organizational e-com.

Unit III:

Software Testing Life Cycle - V model: SDLC vs STLC, different stages in STLC, document templates generated in different phases of STLC, different level testing, different types of testing.

Unit IV:

Test Design: Various test categories, test design techniques for different categories of tests

Unit V:

Test Management: Documenting test plan and test case, effort estimation, configuration management, Introduction to TestLink. Defect Management: Logging defects, defect lifecycle, fixing/closing defects. Introduction to Bugzilla

Unit VI:

Automation Testing: Introduction to automation testing, why automation, what to automate, tools available for automation testing. Automation testing using Selenium: Introduction to Selenium, using Selenium IDE for Automation testing and Selenium Web driver for automation testing.

Text Books:

1. Software Testing: Ron Palton, 2nd Edition, Pearson Education
2. Managing the Testing Process: Rex Black (2001), 2nd Edition, John Wiley & Sons
3. Foundations of Software Testing: Dorothy Graham, Erik van Veenendaal, Isabel Evans, Rex Black, 2nd Revised Edition, Cengage Learning

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MINOR COURSE

Course Code: ITTM52 **Course: Object Oriented Programming**

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

Course Outcomes

Upon completion of course, students will be able to

1. Understand the necessity of object oriented Programming features like encapsulation, abstraction etc.
2. Implement programs based on if-else, switch and loop structure.
3. Apply the concept of class, inheritance to solve real life problems.
4. Write object oriented based solution for the given problem statement.
5. Implement data structures using object oriented programming.

Unit I

Introduction to Object Oriented Programming: Basic concepts and features of Object Oriented Programming like abstraction and encapsulation.

Unit II

Data types, Operators and Control Statements: Different Data Types in Java, Type Conversion and Casting, Operators, Conditionals and Loops in Java.

Unit III

Arrays and Classes in Java: Arrays, Types of Arrays, Class Fundamentals, Declaring Objects.

Unit IV

Methods and Constructors in Java: Introducing Methods, Default Constructor and Parameterized Constructor, Passing objects as Parameters, Returning Objects, Method Overloading and Constructor Overloading.

Unit V

Inheritance: Derived Class declaration, Types of Inheritance, Member Accessibility, Method Overriding, Concept of abstract class, Run time Polymorphism.

Unit VI

Streams: Introduction to Streams, Working with Streams, Implementation of data structures like array, list, linked list using Object Oriented Programming Languages.

Text Books

1. The Complete Reference: Java 2: Herbert Schildt, 5th Edition, Tata McGraw-Hill
2. Arnold Ken, Gosling J, "The Java Programming Language", 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. Core and Advanced Java, Black Book, dreamtech press.

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Course Code: ITT356 **Course: Information Security**

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

Course Outcomes

Upon completion of the course, students would be able to

1. Gain familiarity with different types of attacks and defenses against them.
2. Apply knowledge of Mathematics required for cryptography.
3. Develop an understanding of conventional and modern ways of providing information security.
4. Understand and analyze various standard security protocols.
5. Get acquainted with the concept of Blockchain

Unit I

Types of Attacks and Software Vulnerabilities, Mathematics of Cryptography

Unit II

Classical Ciphers, Modern Block ciphers: DES, Triple DES, Blowfish, AES and modes of operation, Asymmetric key ciphers: RSA, Rabin, ElGamal

Unit III

Message Integrity and Authentication: Requirements of Hash functions and MAC, Algorithms: MD5, SHA-1, Whirlpool, HMAC..

Digital Signatures: Algorithms: RSA, ElGamal, Schnorr, DSS, Attacks, variations and applications.

Unit IV

Key Management: Symmetric key distribution, Symmetric key agreement, Public key distribution.

Entity Authentication: Password based, Challenge Response protocols, Zero knowledge protocols, Biometrics.

Unit V

Security at Application layer: PGP, SET Security at Network layer: IPSec Security at Transport layer: SSL and TLS

Unit VI

System Security: Buffer overflow and malicious software, Intrusion detection system, Fire walls. Introduction to Block chain: Concepts, Private Vs Public Block chain, Various consensus mechanisms.

Text Books

1. Cryptography & Network Security: Behrouz A. Forouzan, Debdeep Mukhopadhyay, 3rdEdition MGH.
2. Cryptography & Networks Security Principles & Practice: William Stallings,5th Edition, PearsonEducation.

Reference Books

1. Network Security and Cryptography: Bernard Menezes, 1st Edition, Cengage Learning.
2. NPTEL videos on the course Block chain Architecture Design and Use cases.

Course Code: ITT357 **Course: Compiler Design**

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

Course Outcomes

At the end of the course, student will

1. Understand the terminology translator, compiler and Interpreter and exhibit working of different phases of compiler.
2. Understand the concepts of different parsing techniques and their issues and apply this parsing techniques to programming language.
3. Understand the concepts syntax directed translation and semantic analysis and apply it .
4. Describe the concept of storage management, symbol table management, error handling and error recovery techniques.
5. Understand and evaluate different Code optimization techniques.
6. Understand and apply the techniques to generate target code in terms of speed and space.

Unit I

Introduction to Compilers: Compilers and Translators, Phases of compilation and overview, cross compiler, Bootstrapping, Design of Lexical analyzer, study of Lex / Flex.

Unit II

Syntax Analysis: Specification of syntax of programming languages using CFG, Top-down parser technique, design of LL (1) parser, bottom up parsing technique, LR parsing algorithm, Design of SLR, LALR, CLR parsers. Study of Yacc / Bison.

Unit III

Syntax directed translation: Study of syntax directed definitions & syntax directed translation schemes, implementation of SDTS, intermediate code notations: postfix, syntax tree, TAC. Using SDTS for translation of expression, controls structures, declarations, procedure calls, and Array reference.

Unit IV

Storage allocation & Error Handling: Run time storage administration, stack allocation, symbol table management, Error detection and recovery in scanning and parsing phase.

Unit V

Code optimization: Analysis of code using basic blocks, Important code optimization techniques, loop

optimization, control flow analysis, data flow analysis, Loop invariant computation, Induction variable removal, Elimination of Common sub expression.

Unit VI

Code generation: Problems in code generation, Simple code generator, Register allocation and assignment, Code generation from DAG, Peephole optimization.

Text Books

1. Principal of Compiler Design : Alfred V. Aho & Jeffery D. Ullman, Narosa Pub.
2. Compilers: Principles, Techniques and Tools: A. Aho, Ravi Sethi, Jeffrey D. Ullman, Addison-Wesley Pub.

Reference Books

1. Compiler Design : O. G. Kakde, 4th Edition, University Science Press.
2. Principles of Compiler Design : V. Raghavan, MGH.

Course Code: ITP357 **Course: Compiler Design Lab**

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

Practical would be conducted based on the syllabus of ITT357

Course Outcomes

On completion of course, students would be able to

1. Design Finite Automata
2. Design and Implement scanner for the programming language.
3. Design and implement parsers.
4. Use Lex tool for Scanner design
5. Use Yacc / Bison for parsers
6. Study various code optimization techniques and Implement it.

Course Code: ITT358 **Course: Database Management System**

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

Course Outcomes

At the end of the course students will be able to

1. Identify various data models, their advantages and disadvantages along with characteristics and architecture of DBMS.
2. To learn and practice DDL and DML queries.
3. Design good database.
4. Describe various file organizations and indexing techniques.
5. Defend optimal query processing.
6. Demonstrate knowledge of various con currency and recovery techniques.

Unit I

Introduction to database systems: Overview, File systems Vs DBMS, Various data models, Levels of abstraction, Structures of DBMS, Relational model, Relations and Integrity constraints, Relational algebra.

Unit II

SQL-basics, SQL query, Nested queries, Aggregate operators, Embedded SQL, Dynamic SQL, Security, Views

Unit III

Database design: Overview of database design, ER model, Features of ER model, Conceptual design using ER model, Scheme refinement and normal forms, Scheme refinement, Use of decompositions, Functional dependencies, Multi-valued dependencies

Unit IV

File organization: Storage media, Buffer management, Record and page formats, File organizations, various kinds of indexes and external sorting.

Unit V

Query optimization and evaluation: Introduction to query processing, Selection operation, Projection operation, Join operation, Set operation and Aggregate operation, Relational query optimization, Translating SQL queries, estimating the cost, Relational algebra equivalence.

Unit VI

Concurrency control and recovery: Concepts of transaction, Transactions and schedules, Lock based concurrency control, Lock management, specialized locking techniques, Concurrency control without locking, Crash recovery, Introduction to crash recovery, Log recovery, Check pointing.

Text Books

1. Database Systems Concepts - Henry Korth & Others, 6th Edition, TMH.
2. Fundamental of database system - Elmasiri, Navathe & Gupta, 4th Edition, Pearson Education.

Reference Books

1. Raghu Ramakrishnan and Johannes Gehrke; "Database Management Systems"; Third Edition;Tata McGraw Hill Publication, 2003.
2. C.J. Date; "Database in Depth – Relational Theory for Practitioners"; O`Reilly Media, 2005.

Course Code: ITP358 **Course: Database Management System Lab**

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

Course Outcomes

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

1. Understand concept of DML and DDL commands.
2. Master the basics of SQL and construct queries using SQL.
3. Learn and practice various functions and clauses in SQL,
4. Apply the concept of index and transaction on database.
5. Understand and practice the concept of PL/SQL

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ELECTIVE -II

Course Code: ITT359-01 **Elective-II: IT Infrastructure Services**

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

Course Outcomes

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

1. Identify, compare and install Linux distributions as per requirement.
2. Configure GRUB loader services, manage, schedule the system and user processes.
3. Manage the users and groups on system.
4. Apply the concept of Package management,
5. Apply the concept of LVM for dynamic storage management and do failure recovery.
6. Configure important services like FTP, DNS, MAIL and WEB.
7. Perform Backup and recovery in Linux using backup and recovery tools.

Unit I

Introducing Linux: History, Linux distribution, Linux basics: Linux Vs Microsoft Windows, Linux Basiccommands, Linux file system, File handling commands, file permission, Users and groups:

Working with Users and Groups.

Unit II

Startup and services: Services and Processes, GRUB boot loader, Managing services, Networking andFirewalls: Introduction to Network and Networking, General Network troubleshooting.

Unit III

Package Management: Introduction to Package management, Package Management commands, Storagemanagement: Storage basics, Logical volume management, recovering from failure.

Unit IV

Infrastructure services: NTP, DNS, Mail services: Configuring email, Configuring IMAP and POP3 Virtualdomain and Users.

Unit V

Web services: Apache web Server, File and print sharing: File sharing with Samba and NFS, managingdocuments, Print servers.

Unit VI

Backup and Recovery: Disaster recovers planning, Backup process, Network backups, Using Rsync, Using Bacula.

Text Books

1. Linux Administration: A Beginner's Guide, Seventh Edition, by Wale Soyinka, McGraw Hill Publicati
2. Pro Linux System Administration: James Turnbull, Peter Lieverdink and Dennis Matotek, Ap Publication

Reference Books

1. Linux - The Complete Reference, TMH Publication

Course Code: ITT359-02 **Elective-II: Mobile Application Development**

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

Course Outcomes

At the end of the course students will be able to

1. Analyze the different aspects of Mobile apps development.
2. Design and develop mobile apps using android as development platform with key focus on user experience design, native data handling and background tasks and notifications.
3. Apply the concepts of native hardware, location awareness, graphics and multimedia in building real world applications.
4. Apply techniques of software testing and review
5. Perform testing signing, packaging and distribution of mobile apps.

Unit I

Getting started with Mobility: Mobility landscape, Mobile platforms, Mobile apps development, Overview of Android platform, setting up the mobile app development environment along with an emulator, a case study on Mobile app development.

Unit II

Building blocks of mobiles apps: App user interface designing –mobile UI resources (Layout, UI elements, Draw-able, Menu), Activity-state and life cycle, interaction amongst activities. App functionality beyond user interface – Threads, Async task, Services – States and life cycle, Notification, Broadcast receivers, Telephony and SMS APIs.

Unit III

Native data handling: On device file I/O, shared preferences, Mobile databases such as SQLite, and enterprise data access (via Internet /Internet)

Unit IV

Sprucing up mobile apps: Graphics and animation – custom views, canvas, animation APIs, multimedia – audio/video playback and record, location awareness and native hardware access (sensors such as accelerometer and gyroscope)

Unit V

Testing of Mobile App: Different levels of testing, different types of testing, Static Testing types, Dynamic Testing types, Debugging mobile apps , Test automation of mobile apps, JUnit for Android.

Unit VI

Publishing Mobile Apps: Robotium, Monkey Talk ,Taking apps to market, Versioning, signing and packaging mobile apps, distributing apps on mobile market place, Localization, Prework for publishing app

Text Books

1. Mobile Apps Development : Anubhav Pradhan , Anil V. Deshpande, 1st Edition, Wiley India
2. Android Application Development all in one for Dummies - Barry Burd, 1st Edition, John Wiley & Sons.
3. Foundations of Software Testing: Dorothy Graham, Erik van Veenendaal, Isabel Evans,Rex Black, 2nd Revised Edition, Cengage Learning

Reference Books

1. Teach Yourself Android Application Development 24 Hours- Lauren Darcy, 1st Edition, Pearson.

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OPEN ELECTIVE -III

Course Code: ITT399-01 (Self Study) **Open Elective-III: Cyber Security and Laws**

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

Course Outcomes

Upon completion of the course, students would be able to

1. Differentiate between various security threats and computer attacks.
2. Assess the current cyber security landscape.
3. Appraise the interrelationships among elements that comprise a modern security system.
4. Critique the current legal and regulatory environment as it applies to cyber security.

Unit I

Overview of Cyber Security, Internet Governance – Challenges and Constraints, Cyber Threats, Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, Need for a Comprehensive Cyber Security Policy, A global perspective on cybercrimes.

Unit II

Cyber stalking, Phishing, virus and worms, keyloggers and spywares, Trojan horses and backdoors, Steganography, DoS attacks, SQL injection, Buffer Overflow, Attacks on wireless networks, attacks on mobile/cell phones, security challenges posed by mobile devices.

Unit III

Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Security Protocols: PGP, IPSec and SSL

Unit IV

Cyber security: Organizational Implications- Web Threats for Organizations: The Evils and Perils, security and Privacy Implications from Cloud Computing, Social Media Marketing: Security Risks and Perils for Organizations, Social Computing and the Associated Challenges for Organizations, Protecting People's Privacy in the Organization, Organizational Guidelines for Internet Usage, Safe Computing Guidelines and Computer Usage Policy, Incident Handling, Best Practices for Organizations

Unit V

Cyber security: The Legal Perspective – Legal landscape around the world, The Indian context of Cyber laws, The Indian IT act and amendments, cybercrimes and punishments.

Computer Forensics: Digital forensics science, Cyber forensics and digital evidence, digital forensics life cycle, forensics of email, network forensics, challenges in computer forensics.

Unit VI

Cybercrime and Cyber terrorism: Social, Political, Ethical and Psychological Dimensions, Intellectual Property in the Cyberspace, The Ethical Dimension of Cybercrimes, The Psychology, Mindset andSkills of Hackers and Other Cybercriminals, Sociology of Cybercriminals, Information Warfare: Perception or An Eminent Reality?

Cybercrime: Real-Life Examples, Mini-Cases, Illustrations of Financial Frauds in Cyber Domain, Digital Signature-Related Crime Scenarios, Digital Forensics Case Illustrations

Text and Reference books

1. Cyber security: Nina Godbole, Sunit Belapure, Wiley
2. Information Security and Cyber Laws: Sanjeev Kumar Sharma, Ankur Shree Aggarwal, AnuradhaTyagi
3. Fundamental of Cyber Security: Mayank Bhushan, Rajkumar Singh Rathore, Aatif Jamshed.

Course Code: ITP361 **Course: Project-I**

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

Course Outcomes

Upon completion of the course, students would be able to

1. Demonstrate a sound technical knowledge of their selected project topic.
2. Undertake problem identification, formulation and solution.
3. Design engineering solutions to complex problems utilizing a systems approach.
4. Communicate with engineers and the community at large in written and oral forms.
5. Demonstrate the knowledge, skills and attitudes of a professional engineer.
6. Learn to work as a team for timely completion of project work.

Course Code: ITP362 **Course: Comprehensive Viva**

L: 3 Hrs. T: 1 Hrs. P: 0 Hrs. Per week **Total Credits: 01**

Course Outcomes:

Upon completion of the course, students would be able to

1. Demonstrate the knowledge of important concepts of core courses studied in the curriculum.
2. Recognize, Visualize, Criticize and Appraise the aspects of IT engineering systems and the interaction among them.
3. Apply the knowledge acquired to propose solutions to real world problems.

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HONORS COURSE

Course Code: ITTH62 **Course: Software Design and Architecture**

L: 2 Hrs. T: 2 Hrs. P: 0 Hrs. Per week **Total Credits: 04**

Course Outcomes

Upon completion of course, students will be able to

1. Demonstrate the understanding of software designs
2. Differentiate between the various design patterns
3. Apply appropriate design for a given problem
4. Demonstrate the software testing skills
5. Apply the best practices for software documentation

Syllabus

UNIT I: Principles of Software Design

Cohesion, Coupling, Abstraction, Modularity, Reusability, Flexibility, Portability, Testability, Extension without Modification, Role of object oriented design, class diagrams using UML

UNIT II

Creational Design pattern : Introduction, Role of Creational pattern, instantiation of objects using creational patterns, Types (Factory method, Abstract Factory, Builder, Prototype, Singleton), Structure and comparison of various types of creational patterns, Examples of creational patterns.

UNIT III

Structural Design Pattern: Introduction, Role of Structural pattern, creating flesxible and efficient arrangement of objects and Classes using structural patterns, Types (Adapter, Bridge, Composite, Decorator, Facade Proxy), structure and comparison of various types of structural patterns, Examples of structural patterns, Comparative study of Creational and Structural Design patterns, Comparative study of Creational and Structural Design patterns

UNIT IV Patterns – I

Behavioural Design Pattern: Introduction, Role of Behavioural pattern, Types: Interpreter Design pattern, Language grammar handling using interpreter design pattern, Template method, implement run- time variable on template design pattern, lterator design pattern, Handling aggregate objects, using lterator design pattern, Chain of Responsibility principle , Methodology of responsibility sharing using request passing approach, Example of functional responsibility of object.

UNIT V

Test-driven development, design for testability, Unit testing vs integration testing, model-view-controller model, unit testing frameworks, design patterns for testing

UNIT VI

Documentation and Visualization of Software Architecture - Architecture views - Sequence diagrams - Diagramming tools - Best practices for documentation

Text Books:

1. Design Patterns by Erich Gamma, Pearson Education
2. Design Patterns Explained by Alan Shalloway and James Trott, Addison-Wesley; 2nd edition

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MINOR COURSE

Course Code: ITTM62 **Course: Web Design**

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

Course Outcomes

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

1. Understand the basic Internetworking concept and technologies
2. Create web pages using HTML.
3. Plan, design and publish websites.
4. Write PHP scripts to handle HTML forms
5. Create PHP programs that use various PHP library functions, and that can work with files.

Unit I

Introduction, Network hardware, LAN, MAN, WAN, Network topologies: Bus, Star and Ring. Basic tools of Internet accesses: Email, FTP, WWW etc, Internet Protocol- HTTP, FTP, SNMP, Emailprotocols–SMTP, POP3, IMAP, MIME

HTML Programming: Tags, Special Characters, Heading, Paragraph, creation of List.

Unit II

Tables in HTML: Creation of tables, Including Images in Web Pages: Image Tag, Image mapping, Frames in HTML, creation of Forms, Introduction to Cascading style sheet (CSS).

Unit III

Introducing PHP and MySQL: History, Features, and architecture. Learning PHP: Using variables, Statements, and Operators. Using conditional statements.

Unit IV

Understanding and using different loops- for, while, do while. Understanding and using Arrays: Using Arrays to Group Related Values.

Unit V

User defined function: Defining and Invoking Functions, Using arguments and return values, Defining global and local variables, Importing function definitions.

String and regular expression: Determining length, Comparing strings Manipulating string case, Padding and striping a string. Counting characters and words.

Unit VI

Using Files, Sessions, cookies: Reading and Writing Files, Managing sessions and Using session variables, Storing data in Cookies.

Text Books

1. The Complete Reference HTML &XHTML :Thomas Powell, 3rd Edition, TMH.
2. PHP and MySQL : VikramVaswani, 1st Edition ,MGH

Reference Books

1. PHP 5 / MySQL Programming for the Absolute Beginner: Andy Harris, 1st Edition ThomsonPublication
2. Web Design: A Beginners Guide: Wendy Willard, 2nd Edition, MGH.
3. www.php.net

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Course Code: ITT451 **Course: Artificial Intelligence**

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

Course Outcomes

At the end of the course students will be able to

1. Ability to formulate an efficient problem space for a problem expressed in natural language.
2. Select a search algorithm for a problem and estimate its time and space complexities.
3. Demonstrate knowledge representation using the appropriate technique for a given problem.
4. Possess the ability to apply AI techniques to solve problems of game playing and machine learning.
5. Understand the concepts of Natural Language Processing and applying the different machine learning algorithms.

Syllabus

Unit-I

Introduction: Introduction, What Is AI?, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art.

Intelligent Agents: Agents and Environments Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

Unit- II

Problem-solving: Solving Problems by Searching, Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions.

Beyond Classical Search: Local Search Algorithms and Optimization Problems: Hill-climbing search Simulated annealing, Local beam search, Genetic algorithms, Local Search in Continuous Spaces, Searching with Non-deterministic Actions: AND-OR search trees, Searching with Partial Observations

Unit-III

Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Constraint Propagation: Inference in CSPs, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems.

Game Playing: Adversarial Search, Games, Optimal Decisions in Games, The minimax algorithm, Optimal decisions in multiplayer games, Alpha–Beta Pruning.

Unit-IV

Logic and Knowledge Representation: Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic: A Very Simple Logic, Propositional Theorem Proving, Effective Propositional Model Checking, Agents Based on Propositional Logic

First-Order Logic: Representation Revisited Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic, Inference in First-Order Logic, Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

Unit-V

Natural Language Processing: Introduction, Syntactic Analysis, Semantic Analysis, Discuses and Pragmatic Processing.

Introduction and Fundamentals of Artificial Neural Networks: Biological prototype, Artificial Neuron, Single layer Artificial, Neural Networks, Multilayer Artificial Neural Networks, Training of Artificial Neural Networks.

Unit-VI

Machine Learning: Probability basics, Bayes Rule and its Applications, Bayesian Networks, Exact and Approximate Inference in Bayesian Networks, Hidden Markov Models, Forms of Learning, Supervised Learning, Learning Decision Trees, Regression and Classification with Linear Models,, Artificial Neural Networks, Nonparametric Models, Support Vector Machines Statistical Learning, Learning with Complete Data, Learning with Hidden Variables, EM Algorithm, Reinforcement Learning.

Text Books

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, Prentice-Hall.
2. David L. Poole, Alan K. Mackworth, Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, 2010.
3. Natural Language processing and Information Retrieval: U.S. Tiwary, Tanveer Siddique, 1st edition, Oxform University Press.

Reference Books

1. Nils J. Nilsson, Artificial Intelligence: A New Sythesis, Morgan-Kaufmann.
2. Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning series), The MIT Press; second edition, 2009
3. Introduction to Artificial Intelligence & Expert System: D. Patterson 1st Edition, PHI.

Course Code: ITP451 **Course: Artificial Intelligence Lab**

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

Course Outcomes

At the end of the course students will be able to

1. Analyze and specify software requirements for a given problem
2. Simulate given problem scenario and analyze its performance
3. Apply AI techniques to solve problems of machine learning using a Programming tool.
4. Develop programming solutions for given problem scenario.

Course Code: ITT452 **Course: Cloud Computing**

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

Course Outcomes:

At the end of the course students will be able to

1. Apply the concepts and benefits of virtualization technology to solve real world Problems.
2. Analyze and apply the existing virtualization technologies for design implementation of real-world systems.
3. Understand and analyze architecture, services and challenges in cloud computing.
4. Analyze and deploy services on AWS platform.
5. Understand and deploy services on Microsoft Azure platform.

Syllabus

Unit I

Introduction: Traditional server concept: pros and cons. Need of Virtualized Technology, Benefits of Virtualization. Privileged instructions, Binary translation, Hypervisors, Types of Hypervisors, Hypervisor architecture, Full Virtualization, Para Virtualization, Hardware Assisted Virtualization, Implementation of Hardware Assisted Virtualization Types of virtualizations: Various forms of virtualization: Desktop, Application, Server, Hardware, Storage, Memory and I/O virtualization. Virtualization at different levels.

Unit II

Virtualization Technologies: Software Virtualization, Hardware Virtualization, Application Virtualization, Storage Virtualization, OS Virtualization. Accomplishing Virtualization: Things to do before migration, Things to do after migration, Migration consideration, Risk associated with Virtualization.

Unit III

Cloud Computing Fundamental: Cloud deployment models, Cloud service models. Benefits and challenges of cloud computing. Regions, Availability zones, Edge locations. Fundamentals of pricing: Total cost of ownership (TCO) and monthly calculator.

Unit IV

Amazon Web services (AWS) : AWS core services : Storage: Simple Storage service (S3), Elastic Block Store (EBS), Elastic File Store (EFS), Content Delivery Network (CDN), Cloudfront, Snowball, Snowmobile, Route53.

Unit V

Compute: Elastic Compute (EC2), Virtual Machine creation in Windows and Linux platform, Remote Desktop Protocol (RDP), Secure Socket Protocol (SSH), Security Groups, Load balancer, Auto scaling.

Unit VI

Introduction to Microsoft Azure, Subscription, Resource Group, Resource Deployment Models, Different methods of creating resources: Azure portal, Cloud shell, ARM templates Compute services: VM, WebApps.

Text Books:

1. Distributed and Cloud Computing : Kai Hwang, Geoffrey C. Fox, Jack J. Dongarra, 1st Edition Elsevier
2. Cloud Computing Basics: A Non-Technical Introduction, Anders Lisdorf, Apress Publication.
3. Cloud Computing Bible : Barrie sosinsky, Wiley- India Edition
4. Cloud Computing : A Practical approach for learning and Implementation, A. Srinivasan, J. Suresh, 1stEdition, Pearson Publication

Reference Books:

1. The Complete Cornerstone Guide to Virtualization Best Practices :Ivanka Menken, Paperback, 2ndEdition, Emereo Pty Ltd.
2. Cloud Computing Explained: Implementation Handbook for Enterprise, 2013 Edition, Recursive Press Publication.
3. Enterprise Cloud Computing : Technology, Architecture, Applications, Gautam Shroff, 1st Edition, Cambridge University Press
4. Cloud Computing : Dr. Kumar Saurabh, 2nd Edition, Wiley- India Edition

Course Code: ITP452 **Course: Cloud Computing Lab**

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

Course Outcomes

At the end of the course students will be able to

1. Identify and use the appropriate cloud service for a given application.
2. Understand and assess the comparative advantages and disadvantages of Virtualization technology.
3. Apply the existing virtualization technologies for design implementation.
4. Create Virtual Machine in Windows and Linux environments.
5. Deploy services on Cloud platform.

Syllabus VII Semester, B.E. (Information Technology)

ELECTIVE-III

Course Code: ITT453-01 **Course: Image Processing**

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

Course Outcomes:

At the end of the course students will be able to

1. Exhibit the understanding of fundamentals of Image processing techniques.
2. Apply different image enhancement techniques.
3. Understand the concept of different transformations in time and frequency domain and apply it for image processing.
4. Describe the utility of image compression and its issues and analyze the performance of each of the techniques with respect to space.
5. Understand the basics of Image segmentation and apply it on gray and color images.
6. Analyze the use of color image processing and understand the concept of image representation and Descriptors.change to ITT

Syllabus

Unit I

Introduction to Image Processing: Fundamental Steps in Image Processing, Image representation, Components of digital image processing systems, Sampling and Quantization, Relationship between pixels – neighborhoods, adjacency connectivity, regions, boundaries and distance measures.

Unit II

Image Enhancement in the Spatial Domain: Introduction to Spatial and Frequency methods, Basic Gray Level Transformations, Histogram Equalization, Histogram Processing, Local Enhancement, Image Subtraction, Image Averaging, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters.

Unit III

Image Transforms: Introduction to the Fourier Transform, Discrete Fourier Transformation, Fast Fourier Transformation, Fourier Properties, 2DFT, inverse Fourier transform, Image Enhancement in frequency domain.

Unit IV

Image Compression: Coding Redundancy, Interpixel redundancy, fidelity criteria, Image compression models, Error-free compression, Variable length coding, Bit-plane coding, Lossless predictive coding, Lossy compression, Image compression standards JPEG and MPEG.

Unit V

Image Segmentation: Image segmentation fundamentals, Point , Line and edge detection, Edge linking and Boundary Detection, Thresholding techniques, Region Based Segmentation.

Unit VI

Color Image Processing and Representation: Color Image Processing Fundamentals, Color Models, Chain Code Representation, and Boundary & Regional Descriptor.

Text Books:

1. Digital Image Processing: Rafael Gonzalez and Richard Woods, 3Ed., Pearson Pub.

Reference Books:

1. Fundamentals of Digital Image Processing: A.K.Jain, Prentice Hall.
2. Image Processing Principles & Applications: Tinku Acharya & Ajoy K. Ray, Willey Inter-Science

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Course Code: ITT453-02 **Course: Wireless Communication**

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

Course Outcomes:

At the end of the course students will be able to

1. Understand the basic concepts and principles of wireless communication.
2. Gain familiarity with Cellular technologies like GSM and GPRS.
3. Differentiate between various wireless communication Protocols
4. Get acquainted with Ad Hoc and Sensor networks.
5. Understand various wireless security protocols

Syllabus

Unit I:

Introduction to wireless communication, Introduction to cellular system, Spread Spectrum technique.MAC protocols for wireless communication.

Unit II:

Digital Cellular Technologies: GSM: System Architecture, protocols, localization and calling, handover. General Packet Radio Service: Architecture, Mobility management, Location management.

Unit III:

Wireless Communication Protocols: IEEE 802.11, Bluetooth, Zigbee, RFID.

Unit IV:

Support for Mobility: Mobile-IP protocol, Dynamic Host Configuration Protocol, Mobile Ad-hoc network: Introduction, Routing protocols

Unit V:

Wireless Sensor Network: Introduction, Applications, Types of WSN, Challenges.

Wireless Sensor Network Architecture: Protocols and Standards

MAC and Routing Layer Design Issues: 802.15.4 for Wireless Sensor Networks, Routing, Clustering Algorithms.

Unit VI:

Wireless security: Introduction, Case study: Security in GSM, IEE802.11. Wireless security Protocols: WEP, WPA, WPA2, WPA3, Wireless Encryption Methods.

Text Books:

1. Mobile Communication: Jochen Schiller, 2nd Edition, Pearson Education.
2. E. H. Callaway, Jr. E. H. Callaway, Wireless Sensor Networks Architecture and Protocols:, CRC Press
3. Wireless Network: The Definitive Guide by Matthew Gasi, O'relly.

References

1. Wireless Communication: Theodore S. Rappaport, 2nd Edition, Pearson Education.
2. F. Zhao and L. Guibas, Wireless Sensor Network: Information Processing Approach, Elsevier, 2009
3. Videos of Swayam course on Wireless Ad Hoc and Sensor Networks

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ELECTIVE - IV

Course Code: ITT454-01 **Course: Introduction to Machine Learning**

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

Course Outcomes

At the end of the course students will be able to

1. Understand the basic concept and need of machine learning.
2. Analyze different models of learning.
3. Apply learning models to various real life problems.
4. Design systems with different System Learning paradigms.
5. Understand unsupervised learning paradigms.

Syllabus

Unit-I

Basics of Machine Learning, Supervised Learning, Unsupervised Learning, Cost Function,

Regression. Linear Regression, Loss function. Least-squares fit. Parameter estimation. Statistical view on the regression. Gradient descent. Gradient Descent for Linear Regression. Logistic Regression.

Unit-II

Instance-Based Learning: k-Nearest neighbor algorithm, Decision Tree Learning, Case-based learning. Rule Learning: Propositional and First-Order, Over-fitting.

Unit- III

Artificial Neural Networks: Types of Learning, Introduction of Multilayer networks and back-propagation, Recurrent networks.

Unit- IV

Probabilistic Machine Learning Maximum Likelihood Estimation, MAP, Bayes Classifiers Naive Bayes. Bayes optimal classifiers. Minimum description length principle.

Unit- V

Bayesian Networks, Inference in Bayesian Networks, Bayes Net Structure Learning Unlabelled data: EM, preventing over fitting

Unit- VI

Introduction and implementations: Clustering, Hierarchical Clustering, K-means Clustering, Hidden Markov Models, Reinforcement Learning, Support Vector Machines.

Text Books:

1. Mitchell Tom. Machine Learning. McGraw Hill, 1997.
2. Richard O. Duda, Peter E. Hart, David G. Stork. Pattern classification, Wiley, New York, 2001.
3. Christopher Bishop, Pattern Recognition and Machine Learning (Information Science and Statistics)

Reference Books:

1. Earl Gose, Richard Johansabaugh, Steve Jost, Pattern Recognition and Image Analysis. Prentice-Hall of India Pvt.Ltd.

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Course Code: ITT454-02 **Course: Internet of Things**

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

Course Outcomes

At the end of the course students will be able to

1. Understand the basic concepts and benefits of Internet of Things in real world applications.
2. Identify and use different IoT components for design IoT applications.
3. Analyze different protocols for used in IoT framework.
4. Design IoT applications for different domain using standard hardware/software platform.
5. Exhibit knowledge on constraints and current developments in the IoT domain.

Syllabus

Unit-I

Introduction to Internet of Things: IoT basics, Connected devices evolution, Introduction to Communication mechanisms in IoT, Challenges with IoT, Applications of IoT.
IoT Reference Architecture - Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.

Unit-II

Hardware in IoT: Sensors, Actuators, Beacons, Smart boards: Arduino, Raspberrry Pi. Implementation of simple IoT system using Arduino / Raspberrry Pi.

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Unit-III

Communication in IoT: Physical layer protocols used in IoT communication. IPv6. HTTP based protocols - CoAP and MQTT, Specific aspects ofprotocols covering IoT communication.

Unit-IV

Sensor networks and M2M Architecture: High level M2M requirements, ETSI M2M services architecture, ZigBee network and its architecture. 6LoWPAN related standards.

Unit-V

Real-World Design and Constraints: Introduction, Technical Design constraints-hardware is popular again, Data representation, analysis and visualization, Interaction and remote control, Standard Communication protocols. Concepts of Sensor cloud, Fog computing and SDN.

Unit-VI

Case studies of IoT systems: IoT in Cities/Transportation, IoT in the Home, IoT in Retail, IoT in Healthcare and IoT in Sports.

Text Books:

1. Learning Internet of Things By: Peter Waher Publisher: Packt Publishing
2. IoT Fundamentals :Networking Technologies, Protocols, and Use Cases for the Internet of Things, By David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry ·CISCO Press.

Reference Books:

1. The Internet of Things: Key Applications and Protocol By: Olivier Hersent; David Boswarthick; Omar Elloumi, Publisher: John Wiley & Sons
2. M2M Communications: A Systems Approach By: David Boswarthick; Omar Elloumi; Olivier Hersent, John Wiley & Sons.

Syllabus VII Semester, B.E. (Information Technology)

OPEN ELECTIVE-IV

Course Code: ITT498-01 **Course: Internet Technologies**

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

Course Outcomes:

At the end of the course students will be able to

1. Understand the basic Internetworking concept and technologies.
2. Understand the issues related to ethics and privacy related to Internet.
3. Create web pages using HTML.
4. Plan, design and publish websites.
5. Develop familiarity with the JavaScript language.

Syllabus

Unit I

Introduction, Network hardware, LAN, MAN, WAN, Wireless networks, Internetworks, Network software, Protocol hierarchies, Design issues for layers, Interfaces and services, Relationships of Services to Protocols, The OSI reference model, Example networks, Network topologies: Bust, star and ring,

Unit II

Types of Server- DNS, FTP, Web Server, Addressing in Internet: DNS, Domain Name and their organization, understanding the Internet Protocol Address. Evolution and growth of the Internet, working of the internet, Getting Online, Internet Protocol- HTTP,FTP,SNMP, Email protocols – SMTP, POP3, IMAP, MIME,WWW, Building Websites and making Dynamic webpages. Hosting and promoting Websites.

Unit III

Hypertext Markup Language, Designing Webpages using Webpages, Physical styles of text, Logical styles of Texts, creation of List. Tables in HTML: Creation of tables, Including Images in Webpages: Image Tag, Image mapping.

Unit IV

Frames in HTML, creation of Forms, Introduction to Cascading style sheet (CSS).

Unit V

JavaScript: Basics, Statements, comments, variable, comparison, condition, switch, loop, break. Object - string, array, Boolean.

Unit VI

Managing Information security: The need for control, Control strategies, Types of control. Ethical, Legal and Moral constraints on Information system: Professionalism, ethics and morality Codes of conduct, Social issues, Legal issues.

Text Books:

1. Internet, The: A User's Guide: K.L. James, 2nd edition, PHI learning.
2. Business Information System: Paul Bocij, Andrew Greasley, Simon Hickie,4th Edition, Pearson Education
3. HTML, XML, CSS, and XHTML: Teodom Gugoin, 1st Edition, Firewall Media.
4. JavaScript : The Complete Reference 2nd Edition,Fritz Schneider,Thomas Powell,Tata McGraw – Hill Education

Reference Books:

1. Web Design: A Beginners Guide: Wendy Willard, 2nd Edition, MGH.
2. Computer Networks and Internet: Douglas Comer, 5th Edition, PHI.

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Course Code: ITT498-02 **Course: E-Commerce**

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

Course Outcomes:

At the end of the course students will be able to

1. Understand the basic concepts and technologies used in the field of E-Commerce systems.
2. Exhibit knowledge of networking infrastructure required for implementing E-Commerce Systems.
3. Understand different modules in E-Commerce.
4. Handle different security issues in E-Commerce.
5. Exhibit knowledge of ethical, tax and social issues in E-Commerce systems.
6. Know the working of payment gateways and EDI Applications in E-Commerce

Syllabus

Unit I

Introduction: Definition of Electronic Commerce, E-Commerce: Technology and prospects, Needs of E-Commerce, advantages and disadvantages, framework, Impact of E-commerce on business, E-Commerce Models.

Unit II

Technology Infrastructure: Relationship Between E – Commerce & Networking, Different Types of Networking For E – Commerce, Internet, Intranet & Extranet, EDI Systems Wireless Application Protocol: Definition, Hand Held Devices, Mobility & Commerce, Mobile Computing, Wireless Web, Web Security, Infrastructure Requirement for E – Commerce

Unit III

Business Models of e – commerce: Model Based On Transaction Type, Model Based On Transaction Party - business-to-business(B2B), business-to-consume (B2C), consume-to-business (C2B), consume-to- consume (C2C), E – Governance

Unit IV

Security issues: Approaches to safe e-commerce, security in e-commerce – smart cards and applications WEB SECURITY Security Issues on web, Importance of Firewall, components of Firewall, Transaction security, Emerging client server, Security Threats, Network Security, Factors to consider in Firewall design, Limitation of Firewalls.

Unit V

Ethical and tax issues and business plans: Legal, Ethical, and Tax Issues: International nature of E-Commerce, the legal environment of electronic commerce, taxation and E-Commerce, business

plans for implementing E-commerce project, managing electronic commerce implementation Law, Forms of Agreement, Government policies for E-Commerce implementation.

Unit VI

Electronic Payments: Overview Payment Gateway, certificate, digital Tokens, Smart card, credit card, magnetic strip card, E-Checks, Credit/Debit card based EPS, online Banking.EDI Application in business, E- Commerce ,Electronic Data Interchange, EDI Applications in Business, EDI and E-Commerce, Standardization , EDI Software Implementation.

Text Books

1. E-Commerce : David Whiteley, TMH.

2. Electronic Commerce : Gary P. Schneider & James T. Perry,

3. Electronic Commerce (9/e). G. Schneider, Cengage Learning,

Reference Books

1. E-commerce : Bhushan Dewan, S. Chand Pub.

2. E-Business, A beginners Guide : Elsenpeter, TMH.

3. E-commerce : The cutting Edge of Business By Bajaj & Nag

Course Code: ITP456 **Course: Project-II**

L: 0 Hrs. T: 0 Hrs. P: 12 Hrs. Per week **Total Credits: 06**

Course Outcomes:

At the end of the course students will be able to

1. Demonstrate a sound technical knowledge of their selected project topic.
2. Undertake problem identification, formulation and solution.
3. Design engineering solutions to complex problems utilizing a systems approach.
4. Communicate with engineers and the community at large in written and oral forms.
5. Demonstrate the knowledge, skills and attitudes of a professional engineer.
6. Learn to work as a team for timely completion of project work.

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HONORS COURSE

Course Code: ITTH72 **Course: NPTEL Course**

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

Note : For Seventh and Eight semesters, students will have to opt for NPTEL course (12 Weeks duration) as suggested by the department, as per the availability of courses at the time of registration.

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MINOR COURSE

Course Code: ITTM71-01 **Course: Introduction to Machine Learning**

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

Course Outcomes

Upon completion of course, students will be able to

1. Understand the basic concept and need of machine learning.
2. Understand and analyze different models of learning.
3. Understand applicability of various learning models.
4. Design systems with different Learning paradigms.

Syllabus

Unit-I

Basics of Machine Learning, Supervised Learning, Unsupervised Learning, Cost Function, Regression. Linear Regression, Loss function. Least-squares fit. Parameter estimation. Statistical view on the regression. Gradient descent. Gradient Descent for Linear Regression. Logistic Regression.

Unit-II

Instance-Based Learning: k-Nearest neighbor algorithm, Decision Tree Learning, Case-based learning. Rule Learning: Propositional and First-Order, Over-fitting.

Unit III

Artificial Neural Networks: Types of Learning, Introduction of Multilayer networks and back-propagation, Recurrent networks.

Unit IV

Probabilistic Machine Learning Maximum Likelihood Estimation, MAP, Bayes Classifiers Naive Bayes, Bayes optimal classifiers, Minimum description length principle.

Unit V

Bayesian Networks, Inference in Bayesian Networks, Bayes Net Structure Learning Unlabelled data: EM, preventing over fitting, Gaussian Mixture Models.

Unit VI

Clustering, Hierarchical Clustering, K-means Clustering, Hidden Markov Models, Reinforcement Learning, Support Vector Machines.

Text Books:

1. Mitchell Tom. Machine Learning. McGraw Hill, 1997.

2. Richard O. Duda, Peter E. Hart, David G. Stork. Pattern classification, Wiley, New York, 2001.
3. Chris Bishop, Pattern Recognition and Machine Learning

Reference Books:

1. Earl Gose, Richard Johansabaugh, Steve Jost, Pattern Recognition and Image Analysis. Prentice-Hall of India Pvt. Ltd.

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MINOR COURSE

Course Code: ITTM71-02 **Course: Computer Networking**

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

Course Outcomes:

After the completion of course the students would:

1. Understand the functionality and the use of different hardware devices used in Networking
2. Exhibit understanding of layered approach of networking and the functionality of each layer.
3. Distinguish the protocols based on layers and know their purpose
4. Implement a network through protocol configuration and specification of address.
5. Develop ability to locate faults and troubleshoot the network.

Syllabus

Unit 1

Introduction to Networking: Why Networking, Hardware software requirements of Networking, Network devices, Concept of layering, TCP/IP Model, Functionality and use of Physical and Data Link layers.

Unit 2

The Network Layer: Services provided by Network layer, IPv4 Addressing, Subnetting, Routing protocols, Working of Internet, Introduction to IPv6.

Unit 3

The Transport and Application Layers: Services provided by Transport and Application Layers, TCP ports, Sockets, UDP and TCP protocols, Communication using TCP protocol.

Unit 4

Networking Services: Need and working of DNS, Role and working of DHCP, Effective use of addresses through NAT, Role of VPN and Proxies to stay connected and secured.

Unit 5

Connecting to the Internet: History, evolution and working of internet. Communication mediums, Configuring protocols to setup internet connection, Concept of WAN.

Unit 6

Troubleshooting and the Future of Networking: Future of computer networking, Network troubleshooting through Network management tools on Windows and Linux Operating Systems.

Text books:

1. Data Communication and Networking: Behrouz Forouzan, 4th Edition, TMH.
2. Computer Networks and Internet: Douglas Comer, 5th Edition, PHI.

Reference book:

1. Computer Networks: Andrew Tanenbaum, 4th Edition, PHI.

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ELECTIVE- V

Course Code: ITT457 **Course: Data Warehousing and Business Intelligence**

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

Course Outcomes:

At the end of the course students will be able to

1. Understand the need for Data Warehouse and Business Intelligence
2. Understand Architecture of a data warehouse and methods for data gathering and data pre-processing using OLAP tools.
3. Apply knowledge of different data mining models and techniques.
4. Differentiate between Transaction Processing and Analytical applications and describe the need for Business Intelligence.
5. Demonstrate understanding of technology and processes associated with Business Intelligence framework.

Syllabus

Unit I

Foundation: Introduction to DATA Warehousing. Client/Server Computing model & Data Warehousing. Parallel processors & Cluster Systems. Distributed DBMS implementations. Client/Server RDBMS Solutions. Data Warehousing: Data Warehousing Components. Building a Data Warehouse. Mapping the Data Warehousing to a Multiprocessor Architecture.

Unit II

DBMS Schemas for Decision Support. Data Extraction, Cleanup and Transformation Tools. Metadata. Business Analysis: Reporting & Query Tools & Applications. On line Analytical Processing (OLAP).

Unit III

BI Definitions & Concepts, Business Applications of BI, BI Framework, Role of Data Warehousing in BI, BI Infrastructure Components – BI Process, BI Technology, BI Roles & Responsibilities

Unit IV

Concepts of Data Integration Need and Advantages of Using Data Integration, Introduction to Common Data Integration Approaches, Introduction to ETL, Introduction to Data Quality, Data Profiling Concepts and Applications.

Unit V

Introduction to Data and Dimension Modeling, Multidimensional Data Model, ER Modeling Vs. Multi Dimensional Modeling, Concepts of Dimensions, Facts, Cubes, Attribute, Hierarchies, Star and Snowflake Schema, Introduction to Business Metrics and KPIS, Creating Cubes Using SSAS, Introduction to Enterprise Reporting, Concepts of Dashboards, Balanced Scorecards, and Overall Architecture.

Unit VI

Association rules mining, Mining Association Rules from Single Level, Multilevel Transaction Databases, Classification and Prediction, Decision Tree Induction, Bayesian Classification, K-Nearest Neighbor Classification, Cluster Analysis, Types of Data in Clustering, Categorization of Clustering Methods.

Text Books:

1. Data Warehousing, Data Mining & OLAP: Berson, 2nd Edition, TMH.
2. Data Mining: Concepts and Techniques : Jiawei Han and Micheline Kamber, 2nd edition Morgan Kaufmann Publishers, 2006.
3. Fundamentals of Business Analytics: R N Prasad, Seema Acharya, 1st Edition Wiley India.

Reference Books:

1. Data Warehousing System: Mallach, TMH.
2. Data Mining and Knowledge Discovery Technologies (Advances in Data Warehousing and Mining : David Taniar , IGI Publication
3. Business Intelligence: David Loshin, 2nd Edition, Morgan Kaufman publishers, Harcourt India pvt. Ltd.
4. Business intelligence for the enterprise: Mike Biere.

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ELECTIVE- V

Course Code: IDT457 **Course: Computational Biology**

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

Course Outcomes:

At the end of the course students will be able to

1. Know about the properties of DNA, RNA, proteins and the relationships among this molecule.
2. Convert a biological question into a computational problem that can be solved using computers.
3. Read and understand solutions to computational problems, which will be formalized as a series of tasks (an algorithm).
4. Learn about general approaches for solving computational problems, and you will be able to apply these approaches to new problems you encounter.

Syllabus

Unit I

Introduction: The cell as basic unit of life- Prokaryotic cell and Eukaryotic cell, Cell Structure and Function, structure of chromosome, Cell Division.

Unit II

Biomolecules: Chemistry and biological functions of carbohydrates, lipids, protein and nucleic acid (DNA/RNA).

Unit III

Central Dogma of cell: Replication, Transcription, Translation, Post transcriptional & post translational modifications, RNA processing, RNA splicing and RNA editing.

Unit IV

Biological Database :Type of databases, Nucleotide sequence databases, Primary nucleotide sequence databases-EMBL, Gene Bank, DDBJ; Secondary nucleotide sequence databases, biological databases and their growth, concept of homology, pairwise sequence alignment, Protein sequence databases- SwissProt/ TrEMBL, PIR, Sequence motif databases -Pfam, PROSITE,KEGG.

Unit V

Evolutionary Tree and Phylogeny: Multiple sequence alignment and phylogetic analysis, CLUSTAL, statistical data for phylogenetic analysis, Definition and descriptions of phylogenetic trees, Neighbour joining, and types of trees dendrogram and its interpretation.

Unit VI

Computational Proteomic and Genomic :Prediction of secondary structure from sequence, Protein homology modeling, Protein threading, Protein ab initio structure prediction.DNA sequence assembly and gene identification, Homology based gene prediction, SNP's and its applications, Methods of studying gene expression, EST, QTL, Basics of Microarray

Reference Books:

1. Lehninger Principles of Biochemistry, David L. Nelson; Michael M.Cox,W.H.Feeeman publication
2. Biochemistry, Berg, J. M., Tymoczko, J. L., & Stryer, L., NCBI.
3. Computational Cell Biology, Christopher Fall, Springer .
4. Textbook of Biotechnology H K Das, Wiley-India(P) Ltd.
5. Introduction to Computational Biology: Maps, Sequences and Genomes, Michael S. Waterman, Chapman and hall publication.
6. Computational Cell Biology, Fall, C.P., Marland, E.S., Wagner, J.M., Tyson, J.J.(2002), Springer

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ELECTIVE - VI

Course Code: ITT458-01 **Course: Information Retrieval**

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

Course Outcomes:

At the end of the course students will be able to

1. Understand the basics of Information retrieval systems and compare it with DBMS.
2. Analyze the data structures like Inverted Indices used in Information retrieval systems and Boolean model query processing.
3. Apply the concept of ranking model onto the problems.
4. Know the fundamentals of Bayes theorem and its applicability to IR systems.
5. Understand the basics of web Crawler and Link analysis.
6. Appreciate the concept of clustering and matrix decomposition for designing effective IR system.

Syllabus

Unit I

Introduction to Information Retrieval: Introduction to Information Retrieval, Comparison of Database Management System and IR system, Components of IR system.

Unit II

Boolean Model: Inverted Index and the terms vocabulary and postings lists, Data structures used in Information retrieval, Dictionaries and tolerant retrieval, Introduction to index-construction and index-compression.

Unit III

Ranking Model: Scoring, term weighting and the vector space model, Cosine similarity measures, tf-idf model, Computing scores in a complete search system, Evaluation in information retrieval.

Unit IV

Probabilistic Model: Review of basic probability theory, the probability ranking principle, the binary independence model, BM25 ranking function.

Unit V

Web Search: Introduction to Web search basics, Web crawling and indexes, Link analysis, Page rank computation, Concept of Hub and Authority.

Unit VI

Clustering: Clustering in Information Retrieval, Flat clustering, and Hierarchical clustering. Matrix decomposition and Latent semantic Indexing. Introduction to Language Modelling.

Text Books:

1. An Introduction to Information Retrieval: Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze, 1st Edition, Cambridge University Press.

Reference Book:

1. Information Retrieval: Implementing and evaluating search engines: Stefan Buttcher, Charles L. A. Clarke, Gordon V. Cormack, 1st Edition, MIT Press.
2. Modern Information Retrieval : Ricardo Yates, Berthier Ribeiro-Neto, Addison Wesley

Syllabus for Semester VIII, B.E. (Information Technology)

ELECTIVE - VI

Course Code: ITT458-02 **Course: Distributed Systems**

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

Course Outcomes:

At the end of the course students will be able to

1. Demonstrate knowledge of the basic elements and concepts related to distributed system Technologies.
2. Analyze the various techniques used for clock synchronization and mutual exclusion.
3. Demonstrate and analyze the deadlocks in distributed systems.
4. Analyze and apply the various distributed file system and distributed scheduling algorithms.
5. Analyze and apply the concepts of recovery and security protocols for reliable communication.

Syllabus

Unit I

Introduction to Distributed System: Motivation and goals, broad overview and advantages of distributed systems, Main characteristics: Absence of global clock and state, possibility of large network delays.

Issues in Distributed Systems, Theoretical foundation Lamport's clock, Causal ordering of messages, Chandy Lamport Global State recording algorithm, Termination detection.

Unit II

Mutual Exclusion in Distributed System: Concept of mutual exclusion in DS, need of mutual exclusion, types of algorithms for mutual exclusion in DS, Centralized Algorithm, Non- token based algorithm, token based algorithm and their performance analysis.

Unit III

Distributed Deadlock Detection : Concept of deadlock in distributed system**,** Types of deadlock detection algorithms, Centralized Deadlock detection algorithm, Edge chasing algorithms, path pushing algorithms.

Model of processor failures, Byzantine agreement problem and other problem solutions, and applications.

Unit IV

Distributed File Systems and Name Services: Introduction and features of DFS, File models, File Accessing models, File-Caching Schemes, File Replication, Case Study: Distributed File Systems

(DSF), Network File System (NFS), Andrew File System (AFS), Introduction to Name services and Domain Name System, Directory Services, Case Study: The Global Name Service, The X.500 Directory Service, Designing Distributed Systems: Google Case Study.

Unit V

Scheduling in Distributed System: Introduction, issues in load distributing, components of load distributing algorithms, Load Distributing Algorithms, Performance Comparison, selecting a suitable Load Sharing Algorithm, requirements for Load Distributing, Case Studies, Task migration, Issues in Task Migration

Unit VI

Failure Recovery and Fault Tolerance: Recovery: classification of failures, issues in failure recovery, Checkpoint-based recovery, Log-based rollback recovery, Koo–Toueg coordinated checkpointing algorithm, Juang–Venkatesan algorithm for asynchronous checkpointing and recovery, Manivannan–Singhal quasi-synchronous checkpointing algorithm backward and forward error recovery, Checkpoint, Cryptography: private and public implementation issues, RSA algorithm, authentication in distributed systems, Kerberos case study.

Text Books

1. Advanced concepts in Operating Systems by Mukesh Singhal and Nirajan Shivaratri.
2. Distributed Systems: Principles and Paradigms by Andrew Tanenbaum and Maarten van Steen

Reference Books

1. Distributed Algorithms: Principles, Algorithms, and Systems by A. D. Kshemkalyani and M. Singhal.
2. G. F. Coulouris, J. Dollimore and T. Kindberg. Distributed Systems: Concepts and Design, 4th Ed, Addison-Wesley, 2005.

Syllabus for Semester VIII, B.E. (Information Technology)

Course Code: ITP459 **Course: Project-III**

L: 0 Hrs. T: 0 Hrs. P: 12 Hrs. Per week **Total Credits: 06**

Course Outcomes:

At the end of the course students will be able to

1. Demonstrate a sound technical knowledge of their selected project topic.
2. Undertake problem identification, formulation and solution.
3. Design engineering solutions to complex problems utilizing a systems approach.
4. Communicate with engineers and the community at large in written and oral forms.
5. Demonstrate the knowledge, skills and attitudes of a professional engineer.
6. Learn to work as a team for timely completion of project work.

Syllabus VIII Semester, B.E. (Information Technology)

Course Code: ITP460 **Course: Full Semester Internship**

L: 0 Hrs. T: 0 Hrs. P: 0 Hrs. Per week **Total Credits: 12**

Course Outcomes:

At the end of the course students will be able to

1. Demonstrate knowledge of domain as identified by industry.
2. Identify suitable tool to work in the domain identified.
3. Demonstrate the ability to work on the tool identified to solve real world problems.
4. Defend the knowledge acquired through seminars and viva voce.

Syllabus VII Semester, B.E. (Information Technology)

HONORS COURSE

Course Code: ITTH82 **Course: NPTEL Course**

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

Note : For Seventh and Eight semesters, students will have to opt for NPTEL course (12 Weeks duration) as suggested by the department, as per the availability of courses at the time of registration.

Syllabus for Semester VIII, B.E. (Information Technology)

MINOR COURSE

Course Code: ITTM81 **Course: Introduction to Emerging Technologies**

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

Course Outcomes

Upon completion of course, students will be able to

1. Understand the concepts and benefits of Internet of Things.
2. Understand the components of IoT (Hardware and Software) and use them in IoT application.
3. Design IoT applications in different domain and be able to analyze their performance.
4. Understand and analyze architecture, services in cloud computing.
5. Understand the services offered by cloud vendors for IoT platform.
6. Design and deploy IoT application on Cloud platform.

Syllabus

Unit I

Introduction to Internet of Things: IoT basics, Connected devices evolution, Introduction to communication mechanisms in IoT, Challenges with IoT, Applications of IoT.

Unit II

Hardware in IoT: Introduction to RFID, Types of RFID, Simple and programmable Beacons, Various sensors prominently used in mobile devices, overview of different IoT boards.

Unit III

Wireless Communication Protocols in IOT: Infrastructure (6LowPAN, IPv4/IPv6, RPL) ,Identification (EPC, uCode, IPv6, URIs),Comms / Transport (Wifi, Bluetooth, LPWAN), Discovery (Physical Web, mDNS, DNS-SD), Data Protocols (MQTT, SMQT, CoAP, AMQP, Websocket, Node) ,Device Management (TR-069, OMA-DM), Semantic (JSON-LD, Web Thing Model),Multi-layer Frameworks (Alljoyn, IoTivity, Weave, Homekit)

Unit IV

Cloud Computing Fundamental: Cloud Computing definition, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public vs private clouds

Unit V

Cloud Platform: Introduction to Amazon Web Services (AWS), Services offered by AWS for IoT application deployment.

Unit VI

IBM Bluemix: IBM Watson IoT Platform service, Case studies of IoT application.

Text Books:

1. Learning Internet of Things By: Peter Waher Publisher: Packt Publishing
2. Cloud Computing: A Practical approach for learning and implementation, A. Srinivasan, J. Suresh, 1stEdition, Pearson Publication

Reference Books:

1. The Internet of Things: Key Applications and Protocol By: Olivier Hersent; David Boswarthick
2. Omar Elloumi, Publisher: John Wiley & Sons. M2M Communications: A Systems Approach By: David Boswarthick; Omar Elloumi; Olivier Hersent, John Wiley & Sons
3. Cloud Computing Explained: Implementation Handbook for Enterprise, 2013 Edition, Recursive Press Publication.
4. Enterprise Cloud Computing: Technology, Architecture, Applications, Gautam Shroff, 1st Edition, Cambridge University Press
5. Cloud Computing: Dr. Kumar Saurabh, 2nd Edition, Wiley- India Edition