STAREX UNIVERSITY, GURUGRAM

SCHEME OF STUDIES and EXAMINATION

B.TECH (Computer Science and Engineering)

SEMESTER I - VIII

(NEW SCHEME)

B.Tech. (Computer Science and Engineering)
Scheme of Studies/Examination
SEMESTER I

S. No.	Course code	Course Title	Hours per week			Total Contact hrs/week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
			L	T	P			Mark of Class work	Theory	Practical	Total	
1	0801103	Semiconductor Physics	3	1	0	4	4	25	75		100	3
2	0801102	Mathematics-I	3	1	0	4	4	25	75		100	3
3	0801104	Basic Electrical Engineering	3	1	0	4	4	25	75		100	3
4	0801105	English	2	0	0	2	2	10	40		50	2
5	0801106	Engineering Graphics & Design	0	0	4	4	2	25		25	50	3
6	0801103	Physics Lab-1	0	0	4	4	2	25		25	50	3
7	0801104	Basic Electrical Engineering Lab	0	0	4	4	2	25		25	50	3
8	0801105	Language lab	0	0	2	4	2	25		25	50	3
9	0801191	EVS	2				0	10	40	-	-	2
						Total	**22**	**185**	**265**	**75**	**550**	

B.Tech. (Computer Science and Engineering)
Scheme of Studies/Examination
SEMESTER II

Sr. No.	Course Code	Course Title	Hours per week			Total Contact hrs/week	C	Examination Schedule (Marks)				Duration of Exam (Hours)
			L	T	P			Mark of Class work	Theory	Practical	Total	
1	0801204	Chemistry-1	3	1	0	4	4	25	75		100	3
2	0801202	Mathematics-II	3	1	0	4	4	25	75		100	3
3	0801206	Programming for Problem Solving	3	1	0	4	4	25	75		100	3
4	0801207	Workshop Technology	2	0	0		2	10	40		50	3
5	0801204	Chemistry Lab-1	0	0	2	4	2	25		25	50	3
6	0801206	Programming for Problem Solving lab	0	0	2	4	2	25		25	50	3
7	0801208	Manufacturing Practices Lab			4	4	2	25		25	50	
						Total	**20**	**160**	**265**	**75**	**500**	

B.Tech. (Computer Science and Engineering)
Scheme of Studies/Examination
SEMESTER III

Sr. No.	Course Code	Course Title	Hours per week			Total Contact Hrs. per week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
			L	T	P			Mark of Class work	Theory	Practical	Total	
1	0801301	Database Management Systems	3	1	0	4	4	25	75		100	3
2	0801302	Data Structures & Algorithms	3	1	0	4	4	25	75		100	3
3	0801303	Digital Electronics	3	1	0	4	4	25	75		100	3
4	0801304	Python Programming	2	0	0	2	2	10	40		50	2
5	0801305	Mathematics - III (Multivariable Calculus and Differential Equations)	2	0	0	2	2	10	40		50	2
6	0801306	Economics for Engineers	2	0	0	2	2	10	40		50	2
7	0801301	Database Management Systems LAB	0	0	4	4	2	25		25	50	3
8	0801303	Digital Electronics LAB	0	0	4	4	2	25		25	50	3
9	0801302	Data Structures & Algorithms LAB Using C	0	0	4	4	2	25		25	50	3
10	0801304	Python Programming LAB	0	0	4	4	2	25		25	50	3
						Total	26	205	345	100	650	

B.Tech. (Computer Science and Engineering)
Scheme of Studies/Examination
SEMESTER IV

Sr. No.	Course Code	Course Title	Hours per week			Total Contact Hrs. per week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
			L	T	P			Mark of Class work	Theory	Practical	Total	
1	0801401	Discrete Mathematics	3	1	0	4	4	25	75		100	3
2	0801402	Computer Organization & Architecture	3	1	0	4	4	25	75		100	3
3	0801403	Operating System	3	1	0	4	4	25	75		100	3
4	0801404	Object Oriented Programming	3	1	0	4	4	25	75		100	3
5	0801405	Organizational Behaviour	2	0	0	2	2	10	40		50	2
6	0801406	Web Technologies	2	0	0	2	2	10	40		50	2
7	0801403	Operating System LAB	0	0	4	4	2	25		25	50	3
8	0801404	Object Oriented Programming LAB Using C++	0	0	4	4	2	25		25	50	3
9	0801406	Web Technologies Lab	0	0	4	4	2	25		25	50	3
						Total	26	195	380	75	650	

NOTE: At the end of 4th semester each student has to undergo Practical Training of 4/6 weeks in an Industry/ Institute/ Professional Organization/ Research Laboratory/ training centre etc. and submit typed report along with a certificate from the organization & its evaluation shall be carried out in the 5th Semester.

B.Tech. (Computer Science and Engineering)
Scheme of Studies/Examination
SEMESTER V

Sr. No.	Course Code	Course Title	Hours per week			Total Contact Hrs. per week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
			L	T	P			Mark of Class work	Theory	Practical	Total	
1	0801501	Microprocessor	3	1	0	4	4	25	75		100	3
2	0801504	Computer Network	3	1	0	4	4	25	75		100	3
3	0801502	Formal Languages & Automata	3	1	0	4	4	25	75		100	3
4	0801503	Software Engineering	2	0	0	2	2	10	40		50	2
5	0801505	Design &Analysis of Algorithm	3	1	0	4	4	25	75		100	3
6	0801506	Programming in Java	3	1	0	4	4	25	75		100	3
7	0801503	Software Engineering Lab	0	0	4	4	2	25		25	50	3
8	0801504	Computer Networks LAB	0	0	4	4	2	25		25	50	3
9	0801505	Design & Analysis of Algorithms Using C++ Lab	0	0	4	4	2	25		25	50	3
10	0801506	Programming in Java Lab	0	0	4	4	2	25		25	50	3
11	0801507	Practical Training-1							Refer to Note-1			
			Total				30	235	415	100	750	

Note: 1. The evaluation of Practical Training-I will be based on seminar, viva-voce, report submitted by the students. According to performance, the students are awarded grades A, B, C, F. A student who is awarded 'F' grade is required to repeat Practical Training.

Excellent: A; Good : B; Satisfactory: C; Not Satisfactory: F.

B.Tech. (Computer Science and Engineering)
Scheme of Studies/Examination
SEMESTER VI

Sr. No.	Category	Course Code	Course Title	Hours per week			Total Contact Hrs. per week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
				L	T	P			Mark of Class work	Theory	Practical	Total	
1	Professional Core Course	0801601	Compiler Design	3	1	0	4	4	25	75		100	3
2	Professional Core Course	0801603	Artificial Intelligence	3	1	0	4	4	25	75		100	3
3	Professional Core Course	0801604	Advanced Java	3	1	0	4	4	25	75		100	3
4	Engineering Science Course	0801602	Mobile and Wireless Communication	3	1	0	4	4	25	75		100	3
5	Professional Elective Course	0801605	**Data Science**	2	0	0	2	2	10	40		50	2
6	Professional Elective Course	0801606	Advanced Database Management System	3	1	0	4	4	25	75		100	3
7	Professional Core Course	0801601	Compiler Design Lab	0	0	4	4	2	25		25	50	3
8	Professional Core Course	0801603	Artificial Intelligence Lab using python	0	0	4	4	2	25		25	50	3
9	Professional Core Course	0801604	Advanced Java Lab	0	0	4	4	2	25		25	50	3
		TOTAL						**28**	210	415	75	**700**	

*__MC-317G__ is a mandatory non –credit course in which the students will be required passing marks in theory.

NOTE: At the end of 6th semester each student has to undergo Practical Training of 4/6 weeks in an Industry/ Institute/ Professional Organization/ Research Laboratory/ training centre etc. and submit typed report along with a certificate from the organization & its evaluation shall be carried out in the 7th Semester.

B.Tech. (Computer Science and Engineering)
Scheme of Studies/Examination
SEMESTER VII

Sr. No.	Category	Course Code	Course Title	Hours per week			Total Contact Hrs. per week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
				L	T	P			Mark of Class work	Theory	Practical	Total	
1	Professional Elective Course	0801704/05/06	Elective-I	3	1	0	4	4	25	75		100	3
2	Professional Elective Course	0801707/08	Elective-II	3	1	0	4	4	25	75		100	3
3	Professional Core Course	0801701	Neural Network	3	1	0	4	4	25	75		100	3
4	Engineering Science Course	0801702	Data mining	3	1	0	4	4	25	75		100	3
5	Professional Core Course	0801703	Cryptography and Network security	2	0	0	2	4	25	75		50	2
7	Project		Minor Project-I	0	0	0	2	4	50		50	100	3
		TOTAL						**24**	175	475	50	**550**	

NOTE: At the end of 7th semester each student has to undergo Practical Training of 4/6 weeks in an Industry/ Institute/ Professional Organization/ Research Laboratory/ training centre etc. and submit typed report along with a certificate from the organization.

B.Tech. (Computer Science and Engineering)
Scheme of Studies/Examination
SEMESTER VIII

Sr. No.	Category	Course Code	Course Title	Hours per week			Total Contact Hrs. per week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
				L	T	P			Mark of Class work	Theory	Practical	Total	
1	Professional Elective Course	0801802 / 0801803	Elective-III	3	1	0	4	4	25	75		100	3
2	Professional Elective Course	081804/ 05/06	Elective-IV	3	1	0	4	4	25	75		100	3
3	Project	0801801	Project	0	0	0	20	20			500	500	3
		TOTAL						**28**	50	150	500	**700**	

List of Electives:

Electives-I

1. Machine Learning
2. Software Project Management
3. Machine Learning Lab

Electives-II

1. Big data
2. Cloud Computing

Electives-III

1. R programming
2. Graph Theory

Electives-IV

1. Pattern Recognition
2. Soft Computing
3. Mobile Computing
4.

PHYSICS-I

Course code					
Category	Basic Science Course				
Course title	**Physics I**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	Semester-I/II
	3	**1**		**4**	
Branches (B. Tech.)	Computer Science Engineering				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.**Prerequisite:** "Introduction to Quantum Mechanics" Desirable

UNIT - I

Electronic Materials

Free electron theory, Density of states and energy band diagrams, Kronig-Penny model (to introduce origin of band gap), Energy bands in solids, E-k diagram, Direct and indirect band gaps, Types of electronic materials: metals, semiconductors, and insulators, Density of states, Occupation probability, Fermi level, Effective mass, Phonons.

UNIT - II

Semiconductors

Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction, Metal-semiconductor junction (Ohmic and Schottky), Semiconductor materials of interest for optoelectronic devices.

UNIT - III

Light-Semiconductor Interaction

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

UNIT - IV

Measurements & Engineered Semiconductor Materials

Four-point probe and van der Pauw measurements for carrier density, resistivity, and hall mobility; Hot-point probe measurement, capacitance-voltage measurements, parameter extraction from diode I-V characteristics, DLTS, band gap by UV-Vis spectroscopy, absorption/transmission.

Densityofstatesin2D, 1D and 0D (qualitatively). Practical examples of low-dimensional systems such as quantum wells, wires, and dots: design, fabrication, and characterization techniques. Heterojunctions and

associated band- diagram.

References:

1. Pierret, Semiconductor Device Fundamental,
2. P. Bhattacharya, Semiconductor Optoelectronic Devices, Pearson Education
3. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-HillInc.
4. B.E.A. Saleh and M.C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc.
5. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley
6. A. Yariv and P. Yeh, Photonics: Optical Electronics in Modern Communications, Oxford University Press, New York.
7. Online course: “Semiconductor Optoelectronics” by M R Shenoy on NPTEL
8. Online course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak Gupta on NPTEL

PHYSICS LAB

Course code					
Category	Basic Science Course				
Course title	Physics Lab				
Scheme and Credits	L	T	P	Credits	Semester-I
			4	2	
Branches (B. Tech.)	Computer Science Engineering				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Note: Students will be required to learn to take readings of vernier calliper, screw gaspherometer , spectrometer etc. during their orientation labs at the starting and **will have to perform at least ten subject related experiments in a semester.**

Basic experiments on least count and error estimation (during orientation)

- To aware about the least count of vernier calliper and screw gauge and to find the thickness of a slide using vernier calliper and diameter of wire using screw gauge.
- Calculation of radius of curvature of a convex surface using spherometer.
- Angel measurement using spectrometer.

List of Subject related Experiments:

1. To study the forward and reverse characteristics of P-N junction diode.
2. To study the characteristics of transistor in common base configuration.
3. To study the characteristics of transistor in common emitter configuration.
4. To study the characteristics of Junction field effect (JFET) transistor.
5. To study the characteristics of Metal oxide semiconductor field effect (MOSFET) transistor.
6. To study the characteristics of Solar cell and find out the fill factor.
7. To design and study Active and Passive filters.
8. To study the reverse characteristics of Zener diode and voltage regulation using Zener Diode.
9. To determine Planks constant using photocell.
10. To measure e/m of electron using helical method.
11. To find capacitance of condenser using fleshing and quenching experiment.
12. To find temperature co-efficient of platinum using Callender Griffith bridge.
13. To find out low resistance by Carry Foster bridge.
14. To find resistance of galvanometer by post office box.
15. To compare the capacitance of two capacitors

MATH-I (CALCULUS AND LINEAR ALGEBRA)

Course code					
Category	Basic Science Course				
Course title	Math-I (Calculus and Linear Algebra)				
Scheme and Credits	L	T	P	Credits	Semester-I
	3	1		4	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory
and selecting one from each Unit.

Unit-I

Calculus: Indeterminate forms and L'Hospital's rule, Maxima and Minima, Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders, Evolutes and Involutes, Evaluation of definite and improper integrals, Applications of definite integrals to evaluate surface areas and volumes of revolutions, Beta and Gamma functions and their properties.

Unit-II

Matrices: Matrices, Vectors: addition and scalar multiplication, Matrix multiplication, Linear systems of equations, Linear Independence, Rank of a matrix, Determinants, Cramer's Rule, Inverse of a matrix, Gauss elimination and Gauss-Jordan elimination.

Unit-III

Vector spaces I: Vector Space, Linear dependence of vectors, Basis, Dimension, Linear transformations (maps), Range and kernel of a linear map, Rank and nullity, Inverse of a linear transformation, Rank nullity theorem, Matrix associated with a linear map, Composition of linear maps.

Unit-IV

Vector spaces II: Eigenvalues, Eigenvectors, Symmetric, Skew-symmetric and Orthogonal Matrices, Eigenbases, Diagonalization, Inner product spaces, Gram-Schmidt orthogonalization.

Reference Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, Pearson Education.
2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
3. D. Poole, Linear Algebra: A Modern Introduction, Brooks Cole.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Limited.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
7. V. Krishnamurthy, V.P. Mainra and J. L. Arora, An introduction to Linear Algebra, Affiliated East–West Press Private limited.

8. Seymour Lipschutz and Marc Lipson, Linear algebra, Schaum's Outline, Tata McGraw-Hill Publishing Company Limited.
9. Kenneth Hoffman and Ray Kunze, Linear algebra, Pearson Education.

Course Outcomes

The students will learn:

- To apply differential and integral calculus to notions of curvature and to improper integrals. Apart from various applications, they will have a basic understanding of Beta and Gamma functions.
- The essential tools of matrices and linear algebra including linear transformations, eigenvalues, diagonalization and orthogonalization.

BASIC ELECTRICAL ENGINEERING

Course code					
Category	**Engineering Science Course**				
Course title	Basic Electrical Engineering (Theory)				
Scheme and Credits	L	T	P	Credits	Semester-I
	3	1		4	
Branches (B. Tech.)	Computer Science Engineering				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

Section A

DC Circuits

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws with their applications (Nodal and Mesh Analysis), analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

AC Circuits

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.

Section B

Transformers

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, transformer tests regulation and efficiency. Auto-transformer and three-phase transformer connections.

Polyphase Circuits

Three phase balanced circuits, voltage and current relations in star and delta connections. Power Measurement by two wattmeter method.

Section C

Electrical Machines

Generation of rotating magnetic fields, construction, working, starting and speed control of single-phase induction motor. Construction and working of a three-phase induction motor. Construction, working, torque-speed characteristic and speed control of dc motor. Construction and working of synchronous generators.

Section D

Measuring Instruments

Construction, operating and uses of moving iron type and moving coil type, induction type voltmeter, Ammeter, watt meter, energy meter.

Electrical Installations

Components of LT Switchgear: Introduction to Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

Suggested Text / Reference Books

(i) E. Hughes, "Electrical and Electronics Technology", Pearson Education.
(ii) D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
(iii) S. K Sahdev, Basic of Electrical Engineering, Pearson Education, 2015.
(iv) D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
(v) L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
(vi) V. D. Toro, "Electrical Engineering Fundamentals", Pearson Education.

Course Outcomes:

- To understand and analyze basic electric and magnetic circuits
- To study the working principles of electrical machines and Transformers.
- To study various type of measuring instruments.
- To introduce the components of low voltage electrical installations

BASIC ELECTRICAL ENGINEERING (LABORATORY)

Course code					
Category	Engineering Science Course				
Course title	Basic Electrical Engineering (Laboratory)				
Scheme and Credits	L	T	P	Credits	Semester-I
			4	2	
Branches (B. Tech.)	Computer Science Engineering				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Notes:
(i) At least 10 experiments are to be performed by students in the semester.
(ii)At least 7 experiments should be performed from the list, remaining three experiments may either be performed from the above list or designed and set by the concerned institution as per the scope of the syllabus

List of Experiments:

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Practical resistors, capacitors and inductors.
2. To verify KCL and KVL.
3. To verify Thevenin's and Norton theorems.
4. To verify Maximum power transfer and Superposition theorems.
5. To perform direct load test of a transformer and plot efficiency Vs load characteristic.
6. To perform O.C. and S.C. tests of a transformer.
7. Measurement of power in a 3-phase system by two wattmeter method.
8. Measurement of power by 3 voltmeter/3 Ammeter method.
9. Measuring the response of R-L, R-C, and R-L-C circuits to a step change in voltage. Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.
10. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase induction machine.
11. Torque Speed Characteristic of shunt dc motor.
12. Speed control of dc motor.

Laboratory Outcomes

- Get an exposure to common electrical components and their ratings.
- Make electrical connections by wires of appropriate ratings.
- Understand the usage of common electrical measuring instruments.
- Understand the basic characteristics of transformers and

electrical machines.

Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
(i) Kalpakjian S. And Steven S. Schmid, "Manufacturing Processes for Engineering Materials, Pearson Education.
(ii) Gowri P. Hariharan and A. Suresh Babu, "Manufacturing Technology – I" Pearson Education, 2008.
(iii) Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Pearson Education.
(iv) Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House,

Course Outcomes

Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials

ENGINEERING GRAPHICS & DESIGN

Course code					
Category	**Engineering Science Course**				
Course title	Engineering Graphics & Design				
Scheme and Credits	L	T	P	Credits	Semester-I
		0	4	2	
Branches (B. Tech.)	Computer Science Engineering				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

UNIT-I

Module 1: Introduction to Engineering Drawing

General: Importance, Significance and scope of engineering drawing Lettering, Dimensioning, Scales, Sense of Proportioning, Different types of Projections, B.I.S. Specification, line symbols, rules of printing.

Module 2: Isometric and Orthographic Views

First and Third angle of system of projection, sketching of Orthographic views from pictorial views and vice –versa, Sectional views.

UNIT-II

Module 3: Projections of Points and Lines

Introduction of planes of projection, Reference and auxiliary planes, projections of points and lines in different quadrants, traces, inclinations, and true lengths of the lines, projections on auxiliary planes, shortest distance, intersecting and nonintersecting lines.

Module 4: Projections of Plane Figures

Different cases of plane figure (of different shapes) making different angles with one or both reference planes and lines lying in the plane figures making different given angles (with one or both reference planes). Obtaining true shape of the plane figure by projection.

UNIT-III

Module 5: Planes Other than the Reference Planes

Introduction of other planes (perpendicular and oblique), their traces, inclinations etc., projections of points lines in the planes, conversion of oblique plane into auxiliary plane and solution of related problems.

Module 6: Projection of Solids

Simple cases when solid is placed in different positions, Axis, faces and lines lying in the faces of the solid making given angles. Drawing of Engineering objects like coupling, crankshaft, pulley.

Module 7: Principles of dimensioning, Development of lateral surfaces of simple solids,

UNIT-IV

Overview of Computer Graphics Annotations, layering & other functions

Module 8: Listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids]

Module 9: Applying dimensions to objects, applying annotations to drawings; layers to create drawings, orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface.

Suggested Text/Reference Books:

(i) Engineering Graphics, Narayana, K.L. and Kannaiah, P, Tata McGraw Hill 2005.
(ii) Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
(iii) Engineering Graphics, Naveen Kumar and S C Sharma

Course Outcomes

All phases of manufacturing or construction require the conversion of new ideas and design concepts into the basic line language of graphics. Therefore, there are many areas (civil, mechanical, electrical, architectural and industrial) in which the skills of the CAD technicians play major roles in the design and development of new products or construction. Students prepare for actual work situations through practical training in a new state-of-the-art computer designed CAD laboratory using engineering software. This course is designed to address:

- to prepare you to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- to prepare you to communicate effectively
- to prepare you to use the techniques, skills, and modern engineering tools necessary for Engineering practice The student will learn :
- Introduction to engineering design and its place in society
- Exposure to the visual aspects of engineering design
- Exposure to engineering graphics standards
- Exposure to solid modeling

ENGLISH LANGUAGE SKILLS

Course code					
Category	Humanities				
Course title	English Language Skills				
Scheme and Credits	L	T	P	Credits	Semester-I
	2	0	0	2	
Branches (B. Tech.)	Computer Science Engineering				
Class work	10 Marks				
Exam	40 Marks				
Total	50 Marks				
Duration of Exam	02 Hours				

Course Objective:

To equip the students with English language skills needed in academic and professional world and to inculcate human/ethical values in them

Course Outcome:

The students will acquire basic proficiency in English with special emphasis on reading and writing skills, and writing practices along with an inclination to become better human beings. **Course Contents:**

Section: A

Basic Writing skills

Subject Verb Agreement, Noun Pronoun Agreement, Governance of Nouns through Prepositions, Basic Verb Patterns (V, SV, SVO, SVOO, SVC, SVOC, SVOA)

Section: B

Vocabulary Building& Creating Grammatical Cohesion

One word substitution, Phrasal Verbs,Commonly used Idioms, Foreign words, Referring Time in Language (Tenses), Use of Active and Passive Voice

Section: C

Phonetics

Basic concept –Vowels, Consonants, Phonemes, Syllable, Transcription of words

Section: D

Reading and Writing Practices

(a) Literary Texts:

i. "Patriotism beyond politics and Religion' by Abdul Kalam Azad
ii. "The Secret of Work" by Swami Vivekananda
iii. "An Outline of Intellectual Rubbish" by Bertrand Russell
iv. "Mother Teresa" by Khushwant Singh

(b) Writing official Letters- Issues Concerning Students' academic and social life
(c) Essay Writing
(d) Paragraph Writing

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

Recommended Readings:

1. Nitin Bhatnagar and Mamta Bhatnagar, *Communicative English for Engineers and Professionals*. Pearson Education.
2. Bhatnagar, k. Manmohan.Ed. *The Spectrum of Life: An Anthology of Modern Prose*. Delhi: Macmillan India Ltd., 2006.
1 C. Murlikrishna& Sunita Mishra, Communication Skills for Engineers, Pearson Ed.
2 Sinha, R.P.*Current English Grammar and Usage*. OUP.
5.Rizvi, M. Ashraf.*Effective Technical Communication*. McGraw Hill Education (India) Pvt. Ltd., 2014.
6.Eastwood, John.*Oxford Guide to English Grammar*.OUP, 2010.
7.Kumar, Sanjay and PushpLata. *Communication Skills*. OUP, 2011.
8.Raman, Meenakshi and Sangeeta Sharma.*CommunicationSkills*.NewDelhi:OUP,2011.
9.Hill, L.A.*A Guide to Correct English*.London:OUP,1965.
10.*Oxford Dictionary of English Idioms*. New Delhi: OUP, 2009

ENGLISH LANGUAGE LAB

Course code						
Category	Humanities					: 03
Course title	English Language Lab					
Scheme and Credits	L	T	P	Credits	Semester-I	
	0	0	2	1		
Branches (B. Tech.)	Computer Science Engineering					
Class work	25Marks					
Exam	25 Marks					
Total	50 Marks					
Duration of Exam	03 Hours					

The course aims at developing the desired English language skills of students of Engineering and Technology so that they become proficient in communication to excel in their professional lives. The course has been sodesigned as to enhance their linguistic and communicative competence.

The students will acquire basic proficiency in English with special emphasis on listening, comprehension and speaking skills both at social and professional platforms.

(i) Listening comprehension
(ii) Recognition of phonemes in International Phonetic Alphabet
(iii) Self introduction and introduction of another person (iv)Conversation and dialogues in common everyday situations
(v)Communication at work place (Standard phrases and sentences in various situations)
(vi) Telephonic communication
(vii) Speeches for special occasions (Welcome speeches, Introduction speeches, Felicitation speeches and Farewell speeches) Tag Questions
(viii) Formal Presentations on literary texts prescribed in theory paper

Note: Three hour time to each segment is recommended for instruction and practice. Scheme of End Semester Practical Exam:

1. A small passage may be read out to the examinees and they will have to write the answers to the questions asked at the end of the passage.Questions will be short answertype.
2. Examinees may be asked to identify the sounds of phonemes in given words.
3. Examinees may be asked to introduce themselves or others, participate in role play activities in mock situations, give short responses, engage in hypothetical telephonic conversation or supply the tag questions to statements etc.
4. Examinees may also be asked to deliver speeches on given situations or make presentation on the literary texts prescribed in Unit IV of theory paper.

Recommended Readings:

1. Bhatnagar, Nitin andMamta Bhatnagar.*Communicative English for Engineers and Professionals*.Pearson Education, 2013.
2. Swan, Michael.*Practical English Usage*. OUP, 1995.

3.Gangal, J.K. *Practical Course in Spoken English*. New Delhi: PHI Learning, 2015.

4. Konar,Nira. *Communication Skills for Professionals*. New Delhi: PHI Learning Pvt. Ltd., 2009.
5. Bansal, R.K. and J.B. Harrison. *Spoken English*. Orient Longman, 1983.
6. Sharma, Sangeeta and Binod Mishra. *Communication Skills for Engineers and Scientists*. Delhi: PHI Learning Pvt. Ltd., 2015.

CHEMISTRY I (THEORY)

Course code					
Category	Basic Science Course				
Course title	Chemistry I (Theory)				
Scheme and Credits	L	T	P	Credits	Semester-II
	3	1	0	4	
Branches (B. Tech.)	Computer Science Engineering				
Class work	25Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

UNIT-I

Atomic and molecular structure: Schrodinger equation(Introduction and concept only).. Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations(derivation excluded). Molecular orbital energy level diagrams of diatomic molecules. Pi-molecular orbitals of butadiene and benzene. Crystal field theory and the energy level diagrams for transition metal ions . Band structure of solids and the role of doping on band structures.

Periodic properties: Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states. (12)

UNIT-II

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

Organic reactions and synthesis of a drug molecule :Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization (mechanism excluded). Synthesis of commonly used drug molecules (Asprin &Paracetamol). (10)

UNIT-III

Intermolecular forces: Ionic, dipolar and Van der Waals interactions. Equations of state of real gases and critical phenomena.

Water Chemistry and Corrosion: Hardness of water- Introduction, Types, Measurement of hardness by EDTA method, Methods of water softening (Lime soda process, Zeolite Process, Demineralisation process). Corrosion: Introduction, Types, Factor affecting corrosion and methods of prevention. (10)

UNIT-IV

Spectroscopic techniques and applications: Basic concept of spectroscopy, Principle and Applications of different spectroscopic techniques (UV-Visible and IR spectroscopy). Nuclear magnetic resonance and magnetic resonance imaging, Elementary discussion on Flame photometry. (10)

Suggested Text Books:

(i) University Chemistry, Bruce M. Mahan, Pearson Education.

(ii) Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane

(iii) Essentials of Analytical Chemistry, Shobha Ramakrishnan and Banani Mukhopadhyay, Education.

(iv)Fundamentals of Molecular Spectroscopy, by C. N. Banwell

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

Krishnan

(vi) Physical Chemistry, by P. W. Atkins

(vii) Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition.

Course Outcomes

The course will enable the student to:

- Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
- Understand the concept of hardness of water and phenomenon of corrosion.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.
- Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electron affinity.

CHEMISTRY I (PRACTICAL)

Course code					
Category	Basic Science Course				
Course title	Chemistry I (**Practical**)				
Scheme and Credits	L	T	P	Credits	Semester-II
	0	0	4	2	
Branches (B. Tech.)	Computer Science Engineering				
lass work	25Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

LIST OF EXPERIMENTS:-

1. Determination of surface tension of given liquid by drop number method.
2. Determine the viscosity of given liquid by using Ostwald's viscometer / Redwood viscometer.
3. Calculate the Rf value of given sample using Thin layer chromatography / Paper chromatography.
4. Removal of Ca^{2+} and Mg^{2+} hardness from given water sample using ion exchange column.
5. Determination of chloride content in given water sample.
6. Calculate the strength of strong acid by titrating it with strong base using conductometer.
7. Calculate the emf value of given cell.
8. To prepare the of urea formaldehyde and phenol formaldehyde resin.
9. To determine the rate constant of a reaction.
10. To Prepare iodoform.
11. Calculate the saponification value / acid value of given oil sample.
12. Chemical analysis of two anions and two cations in given sample of salt.
13. Determination of the partition coefficient of a substance between two immiscible liquids.
14. To determine the total hardness of given water sample by EDTA method. 15.Study the adsorption phenomena using acetic acid and charcoal.
16. Lattice structures and packing of spheres.

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 be able to:

- Estimate rate constants of reactions from concentration of reactants/products as a function of time.
- Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc.
- Synthesize a small drug molecule and analyse a salt sample.

Note: At least 10 experiments are to be performed by the students.

1. Each laboratory class/section shall not be more than about 20 students.
2. To allow fair opportunity of practical hands on experience to each student,each experiment may either done by each student individually or in groupofnotmore than 3-4 students. Larger groups be strictly discouraged/disallowed.
3. Pre-experimental &post experimental quiz/questions may be offered for each lab experiment to reinforce &aid comprehension of the experiment.

Suggested Books:

1. A Text book on Experiments and Calculation –Engineering Chemistry by S.S.Dara, chand & Company Ltd.
2. Essentials of Analytical Chemisty, Shobha Ramakrishnan, Pearson Education.
3. Essential of Experimental Engineering chemistry, Shashi Chawla, Dhanpat Rai Publishing Co.
4. Theory & Practice Applied Chemistry – O.P.Virmani, A.K. Narula (New Age). Engineering Chemistry

MATH-II (PROBABILITY AND STATISTICS) BSC-MATH-104G

Course code					
Category	Basic Science Course				
Course title	Math-II (Probability and Statistics)				
Scheme and Credits	L	T	P	Credits	Semester-II
	3	1		4	
Branches (B. Tech.)	Computer Science Engineering				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

Unit-I

Random variables and discrete probability distributions: Conditional probability, Probability spaces, Discrete random variables, Independent random variables, Expectation of discrete random variables, Sums of independent random variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality, The multinomial distribution, Poisson approximation to the binomial distribution, Infinite sequences of Bernoulli trials.

Unit-II

Continuous and Bivariate probability distribution: Continuous random variables and their properties, Distribution functions and densities, Normal, Exponential and Gamma densities, Bivariate distributions and their properties, Distribution of sums and quotients, Conditional densities, Bayes' rule.

Unit-III

Basic Statistics: Measures of Central tendency: Moments, Skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions; Correlation and regression – Rank correlation; Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves.

Unit-IV

Applied Statistics: Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations; Small samples: Test for single mean, difference of means and correlation coefficients; Test for ratio of variances - Chi- square test for goodness of fit and independence of attributes.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
2. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall.
3. S. Ross, A First Course in Probability, Pearson Education.
4. W. Feller, An Introduction to Probability Theory and its Applications, Wiley.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
7. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill Publishing Company Limited.

Course Outcomes

The students will learn:

- The ideas of probability and random variables and various discrete and continuous probability distributions and their properties.
- The basic ideas of statistics including measures of central tendency, correlation and regression.
- The statistical methods of studying data samples.

PROGRAMMING FOR PROBLEM SOLVING

Course code					
Category	Engineering Science Course				
Course title	Programming for Problem Solving				
Scheme and Credits	L	T	P	Credits	Semester-II
	3	1		4	
Branches (B. Tech.)	Computer Science Engineering				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes:

The course will enable the students:

- To formulate simple algorithms for arithmetic and logical problems.
- To translate the algorithms to programs (in C language).
- To test and execute the programs and correct syntax and logical errors.
- To implement conditional ranching, iteration and recursion.
- To decompose a problem into functions
- To use arrays, pointers and structures to formulate algorithms and programs.
- To apply programming to solve matrix addition and multiplication problems
- To apply programming to solve simple numerical method problems, namely differentiation of function and simple integration.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

Unit 1

Basics of computers and its operation with block diagram, Memory and its types, Types of Programming languages, Translators: compiler and interpreter, Operating system and its functions.

Idea of Algorithm: Representation of Algorithm: Flowchart/ Pseudo code with examples. C Programming: Keywords, Variables and Data Types: basic, derived and user defined, Operators and Arithmetic Expressions and Precedence**.**

Unit 2

Header Files, Basic Input and Output Functions and Statements. Compilation, Syntax and Logical Errors in compilation, Object and Executable Code, Storage Classes, Preprocessors,

Conditional and Branching Statements: if statement and switch statement, Loops/ Iterative Statements: for loop, while loop, do-while loop**,** Writing and evaluation of conditionals and consequent branching.

Unit 3

Arrays (1-D, 2-D), Character Arrays and Strings,

Functions (including using built in libraries), Parameter passing in functions, Call by Value, Call by Reference, Passing arrays to functions, Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series etc.

Unit 4

Idea of pointers, Defining pointers, Use of Pointers , Introduction to Dynamic Memory Allocation and its Methods,

Structures, Union, Defining Structures and Array of Structures.

Suggested Text Books:

Ajay Mittal, Programming in C, 'A Practical Approach', Pearson Education. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
Yashavant Kanetkar, Let Us C, BPB Publication.

Suggested Reference Books

Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

PROGRAMMING FOR PROBLEM SOLVING LAB

Course code					
Category	Engineering Science Course				
Course title	Programming for Problem Solving lab				
Scheme and Credits	L	T	P	Credits	Semester-II
	0	0	4	2	
Branches (B. Tech.)	Computer Science Engineering				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Laboratory Outcomes

- To formulate the algorithms for simple problems
- To translate given algorithms to a working and correct program
- To be able to correct syntax errors as reported by the compilers
- To be able to identify and correct logical errors encountered at run time
- To be able to write iterative as well as recursive programs
- To be able to represent data in arrays, strings and structures and manipulate them through a program
- To be able to declare pointers of different types and use them in defining self-referential structures.
- To be able to create, read and write to and from simple text files.

Tutorial 1: Problem solving using computers:

Lab1: Familiarization with programming environment

Tutorial 2: Variable types and type conversions:

Lab 2: Simple computational problems using arithmetic expressions

Tutorial 3: Branching and logical expressions:

Lab 3: Problems involving if-then-else structures

Tutorial 4: Loops, while and for loops:

Lab 4: Iterative problems e.g., sum of series

Tutorial 5: 1D Arrays

Lab 5: 1D Array manipulation

Tutorial 6: 2D arrays and Strings

Lab 6: Matrix problems, String operations

Tutorial 7: Functions, call by value:

Lab 7: Simple functions

Tutorial 8 &9: Numerical methods (Root finding, numerical differentiation, numerical integration):

Lab 8 and 9: Programming for solving Numerical methods problems

Tutorial 10: Recursion, structure of recursive calls

Lab 10: Recursive functions

Tutorial 11: Pointers, structures and dynamic memory allocation

Lab 11: Pointers and structures

Tutorial 12: File handling:

Lab 12: File operations: To be able to create, read and write to and from simple text files.

WORKSHOP TECHNOLOGY

Course code					
Category	ENGINEERING SCIENCE COURSE				
Course title	WORKSHOP TECHNOLOGY				
Scheme and Credits	L	T	P	Credits	Semester-II
	2	0	0	2	
Branches (B. Tech.)	Computer Science Engineering				
Class work	10 Marks				
Exam	40 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

UNIT-1

Manufacturing Processes:

Introduction to Manufacturing Processes and their Classification, , additive manufacturing Industrial Safety; Introduction, Types of Accidents, Causes and Common Sources of Accident, Methods of Safety, First Aid, Objectives of Layout, Types of Plant Layout and their Advantages.

UNIT-II

Carpentry, Fitting & Forming Processes

Basic Principle of Hot & Cold Working, Hot & Cold Working Processes, Rolling, Extrusion, Forging, Drawing, Wire Drawing and Spinning, Sheet Metal Operations: Measuring Layout marking, Shearing, Punching, Blanking, Piercing, Forming, Bending and Joining. Advantages of timber, types of timber, defects in timber, carpentry tools, classification of metals, fitting tools, fitting operations, glass cutting

UNIT-III

Casting and Machine Tools

Introduction to Casting Processes, Basic Steps in Casting Processes, Pattern: Types of Pattern and Allowances, Sand Casting: Sand Properties, Constituents and Preparation. Gating System. Melting of Metal, Cupola Furnace, Casting Defects & Remedies, plastic moulding, lathe machine, lathe operations, CNC machining, Shaper and planner machine.

UNIT-1V

Welding :

Introduction to welding, Classification of Welding Processes, GAS Welding : Oxy-Acetylene Welding, Resistance Welding : Spot and Seam Welding, Arc Welding : Metal Arc, TIG & MIG, Welding Defects and Remedies, Soldering & Brazing.

Suggested Text/Reference Books:

(i) Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 7th Edition, Pearson Education, 2018.

(ii) Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop

Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
(iii) Kalpakjian S. And Steven S. Schmid, "Manufacturing Processes for Engineering Materials, Pearson Education.
(iv) Gowri P. Hariharan and A. Suresh Babu, "Manufacturing Technology – I" Pearson Education, 2008.
(v) Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Pearson Education.
(vi) Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House,

Course Outcomes

Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials

Course code					
Category	ENGINEERING SCIENCE COURSE				
Course title	Manufacturing practices				
Scheme and Credits	L	T	P	Credits	Semester-II
	0	0	4	2	
Branches (B. Tech.)	Computer Science Engineering				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

List of Experiments/ Jobs

1. To study different types of measuring tools used in metrology and determine least counts of vernier calipers, micrometers and vernier height gauges.
2. To study different types of machine tools (lathe, shaper, planer, milling, drilling machines)
3. To prepare a job on a lathe involving facing, outside turning, taper turning, step turning, radius making and parting-off.
4. To study different types of fitting tools and marking tools used in fitting practice.
5. To prepare lay out on a metal sheet by making and prepare rectangular tray pipe shaped components
   e.g. funnel.
6. To prepare joints for welding suitable for butt welding and lap welding.
7. To study plastic moulding and glass cutting process
8. To study various types of carpentry tools and prepare simple types of at least two wooden joints.
9. To prepare simple engineering components/shapes by forging.
10. To prepare mold and core assembly.
11. To prepare horizontal surface/vertical surface/curved surface/slats or V-grooves on a shaper/planner.
12. To prepare a job involving side and face milling on a milling
13. To study electric machines, electronic components and power tools.

Note :

At least ten experiments/jobs are to be performed/prepared by the students in the semester.

Laboratory Outcomes

Upon completion of this laboratory course, students will be able to fabricate components with their own hands. They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.

By assembling different components, they will be able to produce small devices of their interest.

NOTE: At the end of 4th semester each student has to undergo Practical Training of 4/6 weeks in an Industry/ Institute/ Professional Organization/ Research Laboratory/ training centre etc. and submit typed report along with a certificate from the organization & its evaluation shall be carried out in the 5th Semester.

Database Management System

Course code					
Category	Professional Core Course				
Course title	Database Management System				
Scheme and Credits	L	T	P	Credits	
	3	1		4	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Objectives of the course

a. To understand the different issues involved in the design and implementation of a database system.
b. To study the physical and logical database designs, database modeling, relational, hierarchical, and network models
c. To understand and use data manipulation language to query, update, and manage a database
d. To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency, distributed database, and intelligent database, Client/Server (Database Server), Data Warehousing.
e. To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit: 1

Database system architecture: Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML). **Data models:** Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations.

Unit: 2

Relational query languages: Relational algebra, Tuple and domain relational calculus, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server.

Relational database design: Domain and functional dependency, Normal forms, Dependency preservation, Lossless design.

Query processing and optimization: Query processing **,** Evaluation of relational algebra expressions, Query optimization.

Unit: 3

Storage strategies: Indexing, B-trees, hashing.

Transaction processing: Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp ordering, Multi-version and optimistic Concurrency Control schemes, Database recovery.

Unit: 4

Database Security: Authentication, Authorization and access control, Intrusion detection, SQL injection.

Advanced topics: Object oriented and Multimedia databases, Web databases, Distributed databases, Data warehousing and data mining.

Suggested books:

"Database System Concepts", 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.

Suggested reference books

"Principles of Database and Knowledge – Base Systems", Vol 1 by J. D. Ullman Computer Science Press.

"Fundamentals of Database Systems", 5th Edition by R. Elmasri and S. Navathe, Pearson Education

"Foundations of Databases", Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley

Course Outcomes

1. For a given query write relational algebra expressions for that query and optimize the developed expressions
2. For a given specification of the requirement, design the databases using E R method and normalization.
3. For a given specification, construct the SQL queries for Open source and Commercial DBMS -MYSQL, ORACLE, and DB2.
4. For a given query optimize its execution using Query optimization algorithms
5. For a given transaction-processing system, determine the transaction atomicity, consistency, isolation, and durability.
6. Implement the isolation property, including locking, time stamping based on concurrency control and Serializability of scheduling.

Data Structure & Algorithms

Course code					
Category	Professional Core Course				
Course title	Data Structure & Algorithms				
Scheme and Credits	L	T	P	Credits	
	3	1		4	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Objectives of the course:

- To impart the basic concepts of data structures and algorithms.
- To understand concepts about searching and sorting techniques
- To understand basic concepts about stacks, queues, lists, trees and graphs.
- To enable them to write algorithms for solving problems with the help of fundamental data structures

Unit 1:

Introduction: Basic Terminologies: Concept of Data Structure, Choice of right Data Structure, Algorithms , how to design and develop algorithm , Complexity of algorithm. Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations.
Searching: Linear Search and Binary Search Techniques and their complexity analysis.

Unit 2:

Stacks and Queues: Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation -corresponding algorithms. **Queue**, Types of Queue: Simple Queue: Operations and algorithms, Circular Queue, Priority Queue, Dequeue.

Unit 3:

Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list, Circular Linked Lists.

Trees: Basic Tree Terminologies, Representing binary tree in memory, Different types of Trees: Binary Tree and its traversal, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions.

Unit 4:

Graph: Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

Sorting and Hashing: Objective and properties of different sorting algorithms: Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods.

Suggested books:

"Fundamentals of Data Structures", Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press.

Suggested reference books:

Algorithms, Data Structures, and Problem Solving with C++", Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company

"How to Solve it by Computer", 2nd Impression by R.G. Dromey, Pearson Education.

Course outcomes

1. For a given algorithm student will able to analyze the algorithms to determine the time and computation complexity and justify the correctness.
2. For a given Search problem (Linear Search and Binary Search) student will able to implement it.
3. For a given problem of Stacks, Queues and linked list student will able to implement it and analyze the same to determine the time and computation complexity.
4. Student will able to write an algorithm Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity.
5. Student will able to implement Graph search and traversal algorithms and determine the time and computation complexity.

Digital Electronics

Course code					
Category	Professional Core Course				
Course title	Digital Electronics				
Scheme and Credits	L	T	P	Credits	Semester 3
	3	1	0	4	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT 1:

FUNDAMENTALS OF DIGITAL SYSTEMS AND LOGIC FAMILIES

Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes.

UNIT 2:

COMBINATIONAL DIGITALCIRCUITS

Standard representation for logic functions, K-map representation, and simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices, Q-M method of function realization.

UNIT 3:

SEQUENTIAL CIRCUITS AND SYSTEMS

A 1-bit memory, the circuit properties of Bistable latch, the clocked SR flip flop, J- K-T and D types flip flops, applications of flip flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple (Asynchronous)

counters, synchronous counters, counters design using flip flops, special counter IC's, asynchronous sequential counters, applications of counters.

UNIT 4:

A/D AND D/A CONVERTERS

Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter lCs, sample and hold circuit, Analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter,

SEMICONDUCTOR MEMORIES AND PROGRAMMABLE LOGIC DEVICES

Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read only memory (ROM), read and write memory(RAM), content addressable memory (CAM), ROM as a PLD, Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA).

Course Outcomes:

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

1. Understand working of logic families and logic gates.
2. Design and implement Combinational and Sequential logic circuits.
3. Understand the process of Analog to Digital conversion and Digital to Analog conversion.
4. Use PLDs to implement the given logical problem.

REFERENCES:

1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
2. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.
3. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.
4. Nasib Singh Gill and J B Dixit, "Digital Design and Computer Organization", University Science Press, New Delhi

Python Programming

Course code					
Category	Professional Core Course				
Course title	Python Programming				
Scheme and Credits	L	T	P	Credits	Semester 3
	2	0	0	2	
Class work	10 Marks				
Exam	40 Marks				
Total	50 Marks				
Duration of Exam	02 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Objectives of the course:

- To impart the basic concepts of Python programming.
- To understand syntax of Python language
- To create dynamic applications in Python language.
- To implement object oriented concepts using Python language

Detailed contents: Unit

Unit 1:

Introduction: Features of Python, basic syntax, interactive shell, editing, saving, and running a script; The concept of identifiers, data types, variables, assignments; numerical types, indentation in python, comments in program, Input, output and import functions.
Operators and expressions, understanding error messages; Control statements: if-else, loops (for, while), range function.

Unit 2:

Strings, text files: String manipulations: subscript operator, indexing, slicing a string; strings and number system: converting strings to numbers and vice versa. Binary, octal, hexadecimal numbers;

Files: reading/writing text and numbers from/to a file; creating and reading, file methods, Directories.

Unit 3:

Lists, dictionary and Design with functions: Basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary, adding, and removing keys, accessing and replacing values; traversing dictionaries. Hiding redundancy, complexity.
Functions: arguments and return values; Program structure and design, Lambda functions, Recursive functions.

Unit 4:

Object Oriented concepts: Classes and OOP: classes, objects, attributes and methods; defining classes; design with classes, data hiding, Inheritance, polymorphism, operator overloading; abstract classes. **Exception** handling, try block, except, finally.

Course outcomes

- For a given conceptual problem student will able to analyze the problem and write a program in python with basic concepts.
- For a given problem of Strings and texts, student will able to analyze the problem and write a program in python with basic concepts involving strings and texts.
- The knowledge of list and dictionary will enable student to implement in python language and analyze the same.
- Student will able to write a program using functions to implement the basic concepts of object oriented programming language

Suggested books:

"Fundamentals of Python: First Programs" Kenneth Lambert, Course Technology, Cengage Learning, 2012

Suggested reference books:

"Introduction to Computer Science Using Python: A Computational Problem-Solving Focus", By Charles Dierbach, John Wiley & Sons, December 2012,

Mathematics-III (Multivariable Calculus and Differential Equations)

Course code					
Category	Basic Science Course				
Course title	Mathematics-III (Multivariable Calculus and Differential Equations)				
Scheme and Credits	L	T	P	Credits	Semester 3
	2	0		2	
Class work	10 Marks				
Exam	40 Marks				
Total	50 Marks				
Duration of Exam	02 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Multivariable Differential Calculus: Limit, Continuity and Partial derivatives, Homogeneous functions, Euler's Theorem, Total derivative, Maxima, Minima and Saddle points, Lagrange's method of undetermined multipliers

Unit-II

Multivariable Integral Calculus: Double integral, Change of order of integration, Change of variables, Applications of double integral to find area enclosed by plane curves, Triple integral

Unit-III

Ordinary Differential Equations of first order: Linear and Bernoulli's equations, Exact differential equations, Equations reducible to exact differential equations, Applications of differential equations of first order and first degree to simple electric circuits, Newton's law of cooling, Heat flow and Orthogonal trajectories

Unit-IV

Ordinary Differential equations of second and higher order: Linear differential equations of second and higher order, Complete solution, Complementary function and Particular integral, Method of variation of parameters to find particular integral, Cauchy's and Legendre's linear equations, Simultaneous linear differential equations with constant coefficients, Applications of linear differential equations to oscillatory electric circuits

Reference Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, Pearson Education.
2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
3. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Limited.
4. N. P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications.
5. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
6. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems,Wiley India.
7. S. L. Ross, Differential Equations, Wiley India.
8. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India.
9. E. L. Ince, Ordinary Differential Equations, Dover Publications

Course Outcomes

The students will learn:

1. To deal with functions of several variables and evaluate partial derivative.
2. The mathematical tools needed in evaluating multiple integrals and their usage.
3. The effective mathematical tools for the solutions of ordinary differential equations that model physical processes.

Economics for Engineers

Course code					
Category	Humanities/ Social Sciences/ Management				
Course title	Economics For Engineers				
Scheme and Credits	L	T	P	Credits	
	2	0	0	2	
Branches (B. Tech.)	Common For All Branches				
Class work	10 Marks				
Exam	40 Marks				
Total	50 Marks				
Duration of Exam	02 Hours				

Course Objectives:

1. Acquaint the students to basic concepts of economics and their operational significance.

2. To stimulate the students to think systematically and objectively about contemporary economic problems.

UNIT-1

Definition of Economics- Various definitions, types of economics- Micro and Macro Economics, nature of economic problem, Production Possibility Curve, Economic laws and their nature, Relationship between Science, Engineering, Technology and Economic Development.

Demand- Meaning of Demand, Law of Demand, Elasticity of Demand- meaning, factors effecting it, its practical application and importance,

UNIT 2

Production- Meaning of Production and factors of production, Law of variable proportions, and Returns to scale, Internal external economies and diseconomies of scale.Various concepts of cost of production- Fixed cost, Variable cost, Money cost, Real cost, Accounting cost, Marginal cost, Opportunity cost. Shape of Average cost, Marginal cost, Total cost etc. in short run and long run.

UNIT-3

Market- Meaning of Market, Types of Market- Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly (main features) Supply- Supply and law of supply, Role of demand & supply in price determination and effect of changes in demand and supply on prices.

UNIT-4

Indian Economy- Nature and characteristics of Indian economy as under developed, developing and mixed economy (brief and elementary introduction), Privatization - meaning, merits and demerits. Globalization of Indian economy - merits and demerits. Banking- Concept of a Bank, Commercial Bank-functions, Central Bank- functions, Difference between Commercial & Central Bank.

COURSE OUTCOMES:

1. The students will able to understand the basic concept of economics.
2. The student will able to understand the concept of production and cost.
3. The student will able to understand the concept of market.
4. The student will able to understand the concept of privatization, globalization and banks.

REFERENCES:

1. Jain T.R., Economics for Engineers, VK Publication.
2. Chopra P. N., Principle of Economics, Kalyani Publishers.
3. Dewett K. K., Modern economic theory, S. Chand.
4. H. L. Ahuja., Modern economic theory, S. Chand.
5. Dutt Rudar & Sundhram K. P. M., Indian Economy.
6. Mishra S. K., Modern Micro Economics, Pragati Publications.
7. Singh Jaswinder, Managerial Economics, dreamtech press.
8. A Text Book of Economic Theory Stonier and Hague (Longman's Landon).
9. Micro Economic Theory – M.L. Jhingan (S.Chand).
10. Micro Economic Theory - H.L. Ahuja (S.Chand).
11. Modern Micro Economics : S.K. Mishra (Pragati Publications).
12. Economic Theory - A.B.N. Kulkarni & A.B. Kalkundrikar (R.Chand & Co).

Database Management System Lab

Course code					
Category	Professional Core Course				
Course title	Database Management System Lab				
Scheme and Credits	L	T	P	Credits	
	0	0	4	2	
Branches (B. Tech.)	Computer Science and Engineering				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Course Objectives:

- Keep abreast of current developments to continue their own professional development
- To engage themselves in lifelong learning of Database management systems theories and technologies this enables them to purse higher studies.
- To interact professionally with colleagues or clients located abroad and the ability to overcome challenges that arises from geographic distance, cultural differences, and multiple languages in the context of computing.
- Develop team spirit, effective work habits, and professional attitude in written and oral forms, towards the development of database applications.

Contents:

i. Creation of a database and writing SQL queries to retrieve information from the database.
ii. Performing Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on conditions.
iii. Creation of Views, Synonyms, Sequence, Indexes, Save point.
iv. Creating an Employee database to set various constraints.
v. Creating relationship between the databases.
vi. Study of PL/SQL block.
vii. Write a PL/SQL block to satisfy some conditions by accepting input from the user.
viii. Write a PL/SQL block that handles all types of exceptions.
ix. Creation of Procedures.
x. Creation of database triggers and functions

xi. Mini project (Application Development using Oracle/ MySQL)

a) Inventory Control System
b) Material Requirement Processing.
c) Hospital Management System.
d) Railway Reservation System.
e) Personal Information System.
f) Web Based User Identification System.
g) Time Table Management System.
h) Hotel Management

Digital Electronics Lab

Course code					
Category	Professional Core Course				
Course title	Digital Electronics Lab				
Scheme and Credits	L	T	P	Credits	Semester-3
	0	0	4	2	
Branches (B. Tech.)	Computer Science and Engineering				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Implementation all experiments with help of Bread- Board.

1. Study of Logic Gates: Truth-table verification of OR, AND, NOT, XOR, NAND and NOR gates; Realization of OR, AND, NOT and XOR functions using universal gates.
2. Half Adder / Full Adder: Realization using basic and XOR gates.
3. Half Subtractor / Full Subtractor: Realization using NAND gates.
4. 4-Bit Binary-to-Gray & Gray-to-Binary Code Converter: Realization using XOR gates.
5. 4-Bit and 8-Bit Comparator: Implementation using IC7485 magnitude comparator chips.
6. Multiplexer: Truth-table verification and realization of Half adder and Full adder.
7. Demultiplexer: Truth-table verification and realization of Half subtractor and Full subtractor.
8. Flip Flops: Truth-table verification of JK Master Slave FF, T-type and D-type FF.
9. Asynchronous Counter: Realization of 4-bit up counter and Mod-N counter.
10. Synchronous Counter: Realization of 4-bit up/down counter and Mod-N counter.
11. Shift Register: Study of shift right, SIPO, SISO, PIPO, PISO & Shift left operations.
12. DAC Operation: Study of 8-bit DAC , obtain staircase waveform.
13. ADC Operations: Study of 8-bit ADC

Data Structures and Algorithms Lab Using C

Course code					
Category	Professional Core Course				
Course title	Data Structures and Algorithms Lab Using C				
Scheme and Credits	L	T	P	Credits	Semester-3
	0	0	4	2	
Branches (B. Tech.)	Computer Science and Engineering				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Data Structures Lab List of practical exercises, to be implemented using object-oriented approach in C++ Language.

1. Write a menu driven program that implements following operations (using separate functions) on a linear array:
   - Insert a new element at end as well as at a given position
   - Delete an element from a given whose value is given or whose position is given
   - To find the location of a given element
   - To display the elements of the linear array
2. Write a menu driven program that maintains a linear linked list whose elements are stored in on ascending order and implements the following operations (using separate functions):
   - Insert a new element
   - Delete an existing element
   - Search an element
   - Display all the elements
3. Write a program to demonstrate the use of stack (implemented using linear array) in converting arithmetic expression from infix notation to postfix notation.
4. Program to demonstrate the use of stack (implemented using linear linked lists) in evaluating arithmetic expression in postfix notation.
5. Program to demonstration the implementation of various operations on a linear queue represented using a linear array.
6. Program to demonstration the implementation of various operations on a circular queue represented using a linear array.
7. Program to demonstration the implementation of various operations on a queue represented using a linear linked list (linked queue).

8. Program to illustrate the implementation of different operations on a binary search tree.
9. Program to illustrate the traversal of graph using breadth-first search
10. Program to illustrate the traversal of graph using depth-first search.
11. Program to sort an array of integers in ascending order using bubble sort.
12. Program to sort an array of integers in ascending order using selection sort.
13. Program to sort an array of integers in ascending order using insertion sort.
14. Program to sort an array of integers in ascending order using radix sort.
15. Program to sort an array of integers in ascending order using merge sort.
16. Program to sort an array of integers in ascending order using quick sort.
17. Program to sort an array of integers in ascending order using heap sort.
18. Program to sort an array of integers in ascending order using shell sort.
19. Program to demonstrate the use of linear search to search a given element in an array.
20. Program to demonstrate the use of binary search to search a given element in a sorted array in ascending order.

Python Programming Lab

Course code					
Category	Professional Core Course				
Course title	Python Programming Lab				
Scheme and Credits	L	T	P	Credits	Semester-3
	0	0	4	2	
Branches (B. Tech.)	Computer Science and Engineering				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Objectives

- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, and dictionaries.
- Read and write data from/to files in Python.

List of Programs

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton‘s method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. Merge sort
8. First n prime numbers
9. Multiply matrices
10. Programs that take command line arguments (word count)
11. Find the most frequent words in a text read from a file
12. Simulate elliptical orbits in Pygame
13. Simulate bouncing ball using Pygame

Outcome:

- Write, test, and debug simple Python programs.
- Implement Python programs with conditionals and loops

- Develop Python programs step-wise by defining functions and calling them.
- Use Python lists, tuples, dictionaries for representing compound data.
- Read and write data from/to files in Python.

Discrete Mathematics

Course code					
Category	Professional Core Course				
Course title	Discrete Mathematics				
Scheme and Credits	L	T	P	Credits	Semester - 4
	3	1		4	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Sets, Relation, Function and Propositional Logic: Operations and Laws of Sets, Cartesian Products, Representation of relations, Binary Relation, Equivalence Relation, Partial Ordering Relation, POSET, Hasse Diagram, Lattices and its types, Function, Bijective functions, Inverse and Composite Function, Finite and infinite Sets, Countable and Uncountable Sets, Cantor's diagonal argument and The Power Set theorem, **S**chroeder-Bernstein theorem, Propositions, Logical operations, Conditional Statements, Tautologies, Contradictions, Logical Equivalence, The use of Quantifiers

Unit-II

Basic Counting Techniques and Recurrence Relation: Pigeon-hole principle, Permutation and Combination**,** the Division algorithm: Prime Numbers, The GCD: Euclidean Algorithm, The Fundamental Theorem of Arithmetic., Linear recurrence relation with constant coefficients, Homogenous Solutions, Particular Solutions, Total Solutions, Solving recurrence relation using generating functions

Unit-III

Algebraic Structures: Definitions and examples of Algebraic Structures with one Binary Operation: Semi Groups, Monoids, Groups; Congruence Relation and Quotient Structures, Permutation Groups, Cyclic groups, Normal Subgroups, Definitions and examples of Algebraic Structures with two Binary Operation: Rings, Integral Domain, Fields; Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form

Unit-IV

Graphs and Trees: Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Multigraph and Weighted graph, Shortest path in Weighted graphs, Eulerian paths and circuits, Hamiltonian path and circuits, Planar Graphs, Euler's formulae, Graph Colouring, Trees, Binary trees and its traversals, Trees Sorting, Spanning tree, Minimal Spanning tree

Reference Books:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw – Hill
2. Satinder Bal Gupta: A Text Book of Discrete Mathematics and Structures, University Science Press, Delhi.
3. C. L. Liu and D. P. Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, Tata McGraw – Hill.
4. J.P. Tremblay and R. Manohar, Discrete mathematical structures with applications to computer science, TMG Edition, TataMcgraw-Hill
5. Discrete Mathematics, Babu Ram, Pearson Publication
6. Discrete Mathematics, Semyour Lipschutz and Marc Lipson, Schaum's outline

Course Outcomes

The students will learn

1. To solve mathematical problems based on concepts of set theory, relations, functions and lattices.
2. To express logic sentence in terms of quantifiers and logical connectives.
3. To apply basic counting techniques to solve permutation and combination problems.
4. To solve recurrence relations.
5. To classify algebraic structure of any given mathematical problem.
6. To evaluate Boolean functions and simplify expressions using the properties of Boolean algebra
7. To develop the given problem as graph networks and solve with techniques of graph theory.

Computer Organization & Architecture

Course code					
Category	Professional Core Course				
Course title	Computer Organization & Architecture				
Scheme and Credits	L	T	P	Credits	Semester-IV
	3	1	0	4	
Branches (B. Tech.)	Computer Science and Engineering				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Objectives of the course:

To expose the students to the following:

- How Computer Systems work & the basic principles
- Instruction Level Architecture and Instruction Execution
- The current state of art in memory system design
- How I/O devices are accessed and its principles.
- To provide the knowledge on Instruction Level Parallelism
- To impart the knowledge on micro programming
- Concepts of advanced pipelining techniques.

Unit 1

Data representation: Data Types, Complements, Fixed-Point Representation, Conversion of Fractions, Floating-Point Representation, Gray codes, BCD codes, Excess-3 code, Error Detection Codes.

Register Transfer and Microoperations : Register Transfer Language, Register, Bus and Memory Transfers, Shift Microoperations,.

Unit 2

Basic Computer Organization and Design : Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instruction, Input-Output Instruction.

Central Processing Unit : General Register Organization, Stack organization, Instruction Format, Addressing Modes, Data Transfer and Manipulation, Program Control, RISC, CISC.

Unit 3

Pipelining: Basic Concepts of Pipelining, Throughput and Speedup, Pipeline Hazards.
Parallel Processors: Introduction to Parallel Processors, Locality of reference principle.

Unit 4

Input-output Organization : I/O device interface, I/O transfers–program controlled, interrupt driven and DMA, Software Interrupts.

Memory organization: Memory Hierarchy, Main Memory, **Auxiliary** Memory, Associative Memory, Cache Memory, Associative Mapping, Direct Mapping, Set-Associative Mapping, Virtual Memory.

Suggested books:

1) "Computer System Architecture", 3rd Edition by M.Morris Mano, Pearson.
2) "Computer Organization and Design: The Hardware/Software Interface", 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.
3) "Computer Organization and Embedded Systems", 6th Edition by CarlHamacher, McGraw Hill Higher Education.

Suggested reference books:

1) "Computer Architecture and Organization", 3rd Edition by John P. Hayes, WCB/McGraw-Hill
2) "Computer Organization and Architecture: Designing for Performance", 10th Edition by William Stallings, Pearson Education.
3) "Computer System Design and Architecture", 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education.

Course outcomes :

1) Draw the functional block diagram of a single bus architecture of a computer and describe the function of the instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set.

2) Write assembly language program for specified microprocessor for computing

   16 bit multiplication, division and I/O device interface (ADC, Control circuit, serial port communication).
3) Write a flowchart for Concurrent access to memory and cache coherency in Parallel Processors and describe the process.
4) Given a CPU organization and instruction, design a memory module and analyze its operation by interfacing with the CPU.
5) Given a CPU organization, assess its performance, and apply design techniques to enhance performance using pipelining, parallelism and RISC methodology

Operating System

Course code					
Category	Professional Core Course				
Course title	Principles of Operating System				
Scheme and Credits	L	T	P	Credits	Semester-4
	3	1	0	4	
Branches (B. Tech.)	Computer Science and Engineering				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT 1:

Introduction: Concept of Operating Systems, Types of Operating Systems, OS Services.

Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching. Thread: Definition, Various states, Benefits of threads, Types of threads, Multithreading.

Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non-pre-emptive, FCFS, SJF, SRTF, RR Scheduling.

UNIT 2:

Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, The Producer\ Consumer Problem, Semaphores, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc.

Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, and Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

UNIT 3:

Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition–Internal and External fragmentation and Compaction; Paging, Disadvantages of paging.
Virtual Memory: Basics of Virtual Memory – Locality of reference, Page fault, Working Set, Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Optimal Page Replacement and Least Recently used (LRU).

UNIT 4:

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), efficiency and performance. **Disk Management:** Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, LOOK , C – LOOK, . Disk formatting-boot block, bad block

Suggested books:

- Operating System Concepts Essentials, 9th Edition by Avi Silberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.
- Operating Systems: Internals and Design Principles, 5th Edition, William Stallings , Prentice Hall of India.

Suggested reference books:

- Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing
- Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley
- Design of the Unix Operating Systems, 8th Edition by Maurice Bach, Prentice-Hall of India
- Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly and Associates

Course Outcomes:

CO1: Understand the structure and architectural components of OS to analyze and design the applications to run in parallel. Moreover, students would be able to develop scheduling algorithms to optimize various parameters like CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time for research purpose.

CO2: Understand the design issues associated with Operating system (e.g. Mutual exclusion, Deadlock detection etc.) to gain insight towards developing algorithms/techniques for efficient deadlock handling.

CO3: For a given specification of memory organization, develop the techniques for optimally allocating memory to processes by increasing memory utilization and for improving the access time.

CO4: Design and implement file management system for a given specification. Identify, use and evaluate the disk management policies with respect to various performance evaluation parameters.

Object Oriented Programming

Course code					
Category	Professional Core Course				
Course title	Object Oriented Programming				
Scheme and Credits	L	T	P	Credits	Semester-4
	3	1	0	4	
Branches (B. Tech.)	Computer Science and Engineering				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit - I

Object-Oriented Programming Concepts: Introduction, comparison between procedural programming paradigm and object-oriented programming paradigm, basic concepts of object-oriented programming — concepts of an object and a class, interface and implementation of a class, operations on objects, relationship among objects, abstraction, encapsulation, data hiding, inheritance, overloading, polymorphism.

Classes and Objects: Specifying a class, creating class objects, accessing class members, access specifiers, static members, use of const keyword, friends of a class, empty classes, nested classes, local classes, abstract classes, container classes.

Unit - II

Inheritance: Introduction, defining derived classes, forms of inheritance, ambiguity in multiple and multipath inheritance, virtual base class, object slicing, overriding member functions, order of execution of constructors and destructors.

Pointers and Dynamic Memory Management: Declaring and initializing pointers, accessing data through pointers, pointer arithmetic, memory allocation (static and dynamic), dynamic memory management using new and delete operators, pointer to an object, this pointer, pointer related problems - dangling/wild pointers, null pointer assignment, memory leak and allocation failures.

Unit - III

Constructors and Destructors: Need for constructors and destructors, copy constructor, dynamic constructors, destructors, constructors and destructors with static members, initializer lists.

Operator Overloading and Type Conversion: Overloading operators, rules for overloading operators, overloading of various operators, type conversion - class to another class type.

Virtual functions & Polymorphism: Concept of binding - early binding and late binding, virtual functions, pure virtual functions, abstract classes.

Unit - IV

Exception Handling: Review of traditional error handling, basics of exception handling, exception handling mechanism, throwing mechanism, catching mechanism, specifying exceptions. **Templates and Generic Programming**: Template concepts, Function templates, illustrative examples.

TEXT BOOKS, AND/OR REFERENCE MATERIAL:

1. Bjrane Stroustrup, "C++ Programming language",3rd edition, Pearson education Asia(1997)
2. Lafore R."Object oriented Programming in C++",4th Ed. Techmedia,New Delhi(2002).
3. Yashwant Kenetkar,"Let us C++",1stEd.,Oxford University Press(2006)
4. B.A. Forouzan and R.F. Gilberg,CompilerScience,"A structured approach using C++" Cengage Learning, New Delhi.

Organizational Behavior

Course code	**Organizational Behavior**				
Category	Professional Core Course				
Course title	Object Oriented Programming				
Scheme and Credits	L	T	P	Credits	Semester-4
	3	1	0	4	
Branches (B. Tech.)	Computer Science and Engineering				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

The objective of this course is to expose the students to basic concepts of management and provide insights necessary to understand behavioral processes at individual, team and organizational level.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

SYLLABUS

UNIT - 1

Introduction of Management- Meaning, definitions, nature of management; Managerial levels, skills and roles in an organization; Functions of Management: Planning, Organizing, staffing, Directing & Controlling, Interrelationship of managerial functions, scope of management & Importance of management. Difference between management and administration.

UNIT - 2

Introduction of organization:- Meaning and process of Organization, Management v/s Organization; **Fundamentals of Organizational Behavior:** Concepts, evolution, importance and relationship with other Fields; Contemporary challenges and opportunities of OB. **Individual Processes and Behavior-Personality**- Concept, determinants and applications; **Perception-**Concept, process and applications, **Learning**- Concept (Brief Introduction) ; **Motivation-** Concept, techniques and importance

UNIT - 3

Interpersonal Processes- Teams and Groups- Definition of Group, Stages of group development, Types of groups, meaning of team, merits and demerits of team; difference between team and group, **Conflict-** Concept, sources, types, management of conflict; **Leadership:** Concept, function, styles & qualities of leadership. **Communication –** Meaning, process, channels of communication, importance and barriers of communication.

UNIT 4

Organizational Processes: Organizational structure - Meaning and types of organizational structure and their effect on human behavior; **Organizational culture -** Elements, types and factors affecting organizational culture. **Organizational change:** Concept, types & factors affecting organizational change, Resistance to Change.

Course Outcomes: By the end of this course the student will be able to:

1. Students will be able to apply the managerial concepts in practical life.
2. The students will be able to understand the concept of organizational behavior at individual level and interpersonal level.
3. Students will be able to understand the behavioral dynamics in organizations.
4. Students will be able to understand the organizational culture and change

Suggested Books:

1. Robbins, S.P. and Decenzo, D.A. Fundamentals of Management, Pearson Education Asia, New Delhi.
2. Stoner, J et. al, Management, New Delhi, PHI, New Delhi.
3. Satya Raju, Management – Text & Cases, PHI, New Delhi.
4. Kavita Singh, Organisational Behaviour: Text and cases. New Delhi: Pearson Education.
5. Pareek, Udai, Understanding Organisational Behaviour, Oxford University Press,
6. Robbins, S.P. & Judge, T.A., Organisational Behaviour, Prentice Hall of India, New Delhi.
7. Ghuman Karminder, Aswathappa K., Management concept practice and cases, Mc
8. Chhabra T. N., Fundamental of Management, Sun India Publications-New Delhi.

Web Technologies

Course code					
Category	Professional Core Course				
Course title	Web Technologies				
Scheme and Credits	L	T	P	Credits	
	2	0	0	2	
Branches (B. Tech.)	Computer Science and Engineering				
Class work	10 Marks				
Exam	40 Marks				
Total	50 Marks				
Duration of Exam	02 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Objectives of the course:

- To impart the basic concepts of Web Technologies
- To understand various client side technologies
- To create web pages
- To create dynamic applications on web through server side technologies

Detailed contents: Unit 1:

Introduction: Concept of Internet- History of Internet, Protocols of Internet, World Wide Web, URL, Web Server, Web Browser, HTML, HTTP, SMTP, POP3, MIME, IMAP. Web site design principles, planning the site and navigation,

Unit 2:

HTML and CSS: History of HTML, Structure of HTML Document: Text Basics, Document: Images and Multimedia, Links and webs, Document Layout, Cascading Style Sheet: 4 Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS,

Unit 3:

XML: Introduction of XML- Some current applications of XML, Features of XML, Anatomy of XML document, The XML Declaration, Element Tags- Nesting and structure, XML text and text formatting element, Table element, Mark-up Element and Attributes, Document Type Definition (DTD), types. XML Objects, Checking Validity, Understanding XLinks, XPointer, Event-driven Programming, XML Scripting.

Unit 4:

PHP: PHP Introduction, Structure of PHP, PHP Functions, AJAX with PHP, PHP Code and the Complete AJAX Example. AJAX Database, Working of AJAX with PHP, Ajax PHP Database Form, AJAX PHP MySQL Select Query.

Suggested books:

1. Steven Holzner,"HTML Black Book", Dremtech press.
2. Web Technologies, Black Book, Dreamtech Press
3. Web Applications : Concepts and Real World Design, Knuckles, Wiley-India
4. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel Pearson.

Suggested reference books:

1. Paul Deitel , Harvey Deitel, Abbey Deitel ,"Internet and world wide web – How to Program", Prentice Hall

Course outcomes

- For a given conceptual problem student will able to understand the basic process of Web Technologies and their application domains
- For a given problem the student will able to analyze the problem and select which technique is most suitable for developing a website.
- The knowledge of various techniques will enable student to implement in these dynamic techniques using various tools to make interactive web pages.
- Student will able to write a program using these technologies to implement the basic concepts of web.

Operating System Lab

Course code					
Category	Professional Core Course				
Course title	Operating System Lab				
Scheme and Credits	L	T	P	Credits	
	0	0	4	2	
Branches (B. Tech.)	Computer Science and Engineering				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Contents:

1 Introduction to UNIX File System.

2. File and Directory Related Commands in UNIX.

3. Essential UNIX Commands for working in UNIX environment.

4. I/O Redirection and Piping

5. Introduction to VI Editors.

6. Introduction of Processes in UNIX

7. Communication in UNIX and AWK.

8. Introduction of the concept of Shell Scripting.

9. Decision and Iterative Statements in Shell Scripting.

10. Writing the Shall Scripts for unknown problems.

1. UNIX Shell Programming by Yashavant Kanetkar.
2. UNIX Concepts and Applications by Sumitabha

Das Course Outcomes.

Co1: Understand the structure and architectural components of UNIX Operating System to analyze and design the problem. Moreover, students would be able to know the Basic Introduction of UNIX Operating System.

Co2: Basic Introduction of UNIX Commands that are used for operating the UNIX.

Co3: Introduction of Shell Scripting and VI Editor.so that the students get familiar with writing the UNIX scripts in UNIX editor.

Co4: Students will establish themselves as effective professionals by solving real problems with UNIX Shell Scripting knowledge and with attention to teamwork, critical thinking and problem solving skills by Writing Shell Scrips of unknown problems

Object Oriented Programming Lab Using C++

Course code					
Category	Professional Core Course				
Course title	Object Oriented Programming Lab Using C++				
Scheme and Credits	L	T	P	Credits	
	0	0	4	2	
Branches (B. Tech.)	Computer Science and Engineering				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Contents:

1. [Classes and Objects] Write a program that uses a class where the member functions are defined inside a class.
2. [Classes and Objects] Write a program that uses a class where the member functions are defined outside a class.
3. [Classes and Objects] Write a program to demonstrate the use of static data members.
4. [Classes and Objects] Write a program to demonstrate the use of const data members.
5. [Constructors and Destructors] Write a program to demonstrate the use of zero argument and parameterized constructors.
6. [Constructors and Destructors] Write a program to demonstrate the use of dynamic constructor.
7. [Constructors and Destructors] Write a program to demonstrate the use of explicit constructor.
8. [Initializer Lists] Write a program to demonstrate the use of initializer list.
9. [Operator Overloading] Write a program to demonstrate the overloading of increment and decrement operators.
10. [Operator Overloading] Write a program to demonstrate the overloading of binary arithmetic operators.
11. [Operator Overloading] Write a program to demonstrate the overloading of memory management operators.
12. [Inheritance] Write a program to demonstrate the multilevel inheritance.
13. [Inheritance] Write a program to demonstrate the multiple inheritance.
14. [Inheritance] Write a program to demonstrate the virtual derivation of a class.
15. [Polymorphism] Write a program to demonstrate the runtime polymorphism.
16. [Exception Handling] Write a program to demonstrate the exception handling.

17. [Templates and Generic Programming] Write a program to demonstrate the use of function template.

18. [Templates and Generic Programming] Write a program to demonstrate the use of class template.

Web Technologies Lab

Course code					
Category	Professional Core Course				
Course title	Web Technologies Lab				
Scheme and Credits	L	T	P	Credits	
	0	0	4	2	
Branches (B. Tech.)	Computer Science and Engineering				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Contents:

HTML :

1. Simple HTML using
   a. Heading elements
   b. Text Elements
   c. Logical Styles
   d. Physical Styles
   e. Ordered , Unordered and Definition list
2. Hyper Links
   a. Image Link → Link to page containing Images and Videos
   b. File Link
   c. Single Page Link
3. Using Frames
   a. Navigation Frame
   b. Floating Frame
   c. Inline Frame
4. Registration Form with Table

CSS:

Inline Style , Internal Style ,and External Style Sheets

XML :

1. Create a any catalog
2. Display the catalog created using CSS or XSL

PHP:

1. File operation
2. Regular Expression, Array, Math, String, Date functions.

MICROPROCESSOR

Course code					
Category	Engineering Science Course				
Course title	Microprocessor				
Scheme and Credits	L	T	P	Credits	Semester 5
	3	1		4	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Objectives:

- To make understand architecture and working of Intel 8085 microprocessor in depth.
- To make understand architecture and working of Intel 8086 microprocessor in depth.
- Familiarization with the assembly language programming.
- Familiarization with various peripheral operations

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit: 1

THE 8085 PROCESSOR: Introduction to microprocessor, 8085 microprocessor: Architecture, instruction set, interrupt structure, and Assembly language programming.

Unit: 2

THE 8086 MICROPROCESSOR ARCHITECTURE: Architecture, block diagram of 8086, details of sub-blocks such as EU, BIU; memory segmentation and physical address computations, program relocation, addressing modes, instruction formats, pin diagram and description of various signals.

Unit: 3

INSTRUCTION SET OF 8086: Instruction execution timing, assembler instruction format, data transfer instructions, arithmetic instructions, branch instructions, looping instructions, NOP and HLT instructions, flag manipulation instructions, logical instructions, shift and rotate instructions, directives and operators, programming examples.

Unit: 4

INTERFACING DEVICE: 8255 Programmable peripheral interface, interfacing keyboard and seven segment display, 8254 (8253) programmable interval timer, 8259A programmable interrupt controller, Direct Memory Access and 8237 DMA controller.

TEXT BOOKS:

1. Microprocessor Architecture, Programming & Applications with 8085: Ramesh S Gaonkar; Wiley Eastern Ltd.
2. Intel Microprocessors 8086- Pentium processor: Brey; PHI

REFERENCE BOOKS:

1. Microprocessors and interfacing: D V Hall; TMH
2. The 8088 & 8086 Microprocessors-Programming, interfacing, Hardware & Applications: Triebel & Singh; PHI
3. Microcomputer systems: the 8086/8088 Family: architecture, Programming &Design: Yu-Chang Liu & Glenn A Gibson; PHI.
4. Advanced Microprocessors and Interfacing: Badri Ram; TMH

Course Outcomes:

- Understand the operation and architecture of Intel 8085 microprocessor including Instruction Set Architecture, assembly language programming, timing and speed of operation.
- Learn the operation of circuits for user interaction through switches, keyboard and display devices.
- Understand the operation and architecture of Intel 8086 microprocessor including Instruction Set Architecture, assembly language programming, timing and speed of operation.
- Understand the motivation and need for peripheral operations circuits for digital data exchange, timer, serial communication, merits of direct memory access, interrupt controller and other circuits.

COMPUTER NETWORKS

Course code					
Category	Professional Core Course				
Course title	Computer Networks				
Scheme and Credits	L	T	P	Credits	Semester 5
	3	1	0	4	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Objectives:

- To develop an understanding of modern network architectures from a design and
- Performance perspective.
- To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).
- To provide an opportunity to do Network programming
- To provide a WLAN measurement idea.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit: 1

Introduction: Data communication, Components, Computer networks and its historical development, distributed processing, Internet

Network Models: OSI model and TCP/IP Model

Physical Layer – physical layer functions, Data Representation, Simplex, Half Duplex and Full Duplex Transmission, Modulation and Multiplexing, Packet and circuit switching, Transmission media, Topologies, connectionless and connection-oriented services.

Data Link Layer : Data link layer functions and services, MAC Addressing, Framing, Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window Protocol.

Unit: 2

Medium Access Control: MAC layer functions, Random access, Controlled Access and channelization protocols.

Network Layer: Network layer functions and services, Logical addressing, IPv4 classful and classless addressing, subnetting, NAT, IPv4, ICMPv4, ARP, RARP and BOOTP, IPv6, IPv6 addressing, DHCP.

Network Devices: Repeater, hub, switch, router and gateway.

Unit: 3

Routing Algorithms: introduction to routing, Shortest Path Algorithm, Flooding, Hierarchical Routing, Link State and Distance Vector Routing

Transport Layer: Transport layer functions and services, Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), TCP connection management

Application Layer: Application layer functions and services, Domain Name Space (DNS), EMAIL, File Transfer Protocol (FTP), HTTP, SNMP

Unit: 4

Congestion Control, Quality of Service, QoS Improving techniques.
LAN: Ethernet, Token Bus, Token Ring, MAN Architecture- DQDB, WAN Architectures- Frame Relay, ATM, SONET/SDH

Network Security: Firewalls, security goals, types of attack, Introduction to cryptography, Types of ciphers: symmetric and asymmetric key ciphers.

Suggested books:

1. Data Communication and Networking, 4th Edition, Behrouz A. Forouzan, McGraw-Hill.
2. Data and Computer Communication, 8th Edition, William Stallings, Pearson Prentice Hall India.

Suggested reference books:

1. Computer Networks, 8th Edition, Andrew S. Tanenbaum, Pearson New International Edition.
2. Internetworking with TCP/IP, Volume 1, 6th Edition Douglas Comer, Prentice Hall of India.
3. TCP/IP Illustrated, Volume 1, W. Richard Stevens, Addison-Wesley, United States of America.

Course Outcomes:

- Explain the functions of the different layer of the OSI Protocol.
- Draw the functional block diagram of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) and describe the function of each.
- Identify and connect various connecting components of a computer network.
- Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available software and tools.

FORMAL LANGUAGES AND AUTOMATA

Course code					
Category	Professional Core Course				
Course title	Formal Languages & Automata				
Scheme and Credits	L	T	P	Credits	Semester 5
	3	1		4	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Objectives:

- To understand basic concepts of formal languages and automata theory.
- To study the types of Automata i.e. NFA, DFA, NFA with ϵ-transition and their interconversion methods and importance.
- To Study formal languages of different kinds, such as regular and context-free languages. Understand the concept of grammar and its types. Removal of ambiguity and reduced form and Normal forms of grammar.
- To develop the concepts and design of higher-level automata to accept the language not accepted by finite automata such as PDA &Turing machine.
- To study the various properties of turing machine and their designing.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit 1:

Finite Automata: Introduction: Set, Power Set, Super Set, Alphabet, languages and grammars, productions and derivation, Deterministic finite automata (DFA), Non- Deterministic finite automata (NDFA), Equivalence of DFA and NDFA, Conversion of NFA to DFA , minimization of finite automata, Finite automata with ϵ- moves, Acceptability of a string by a finite Automata.

Introduction to Machines: Properties and limitations of Finite Automata, Mealy and Moore Machines, Equivalence of Mealy and Moore machines.

Unit 2:

Regular Expression: State and prove Arden's Method, Regular Expressions, Recursive definition of regular expression, Regular expression conversion to Finite Automata and vice versa.

Properties of regular languages: Regular language, pumping lemma for regular sets/languages, Application of regular languages.

Unit 3:

Grammars: Chomsky hierarchy of languages, Relation between different types of grammars, Context-free grammar, Derivation tree / Parse tree, Ambiguity in regular grammar and their removal, Reduced Forms: Removal of useless symbols, null and unit productions, Normal Form: Chomsky Normal form(CNF) and Greibach Normal Form(GNF),

Push Down Automata: Introduction to PDA, Deterministic and Non-Deterministic PDA, Design of PDA: Transition table, Transition diagram and acceptability of strings by designed PDA, Pushdown automata (PDA) and equivalence with CFG.

Unit 4:

Turing machines: The basic model for Turing machines (TM), Deterministic and Non- Deterministic Turing machines and their equivalence, Design of Turing Machines: Transition table, Transition diagram and acceptability of strings by designed turing machine. Variants of Turing machines, Halting problem of Turing machine, PCP Problem of Turing Machine, Linear Bounded Automata, TMs as enumerators.

Undecidability: Church-Turing thesis, universal Turing machine, the universal and diagonalization languages, reduction between languages and Rice s theorem, undecidable problems about languages.

Suggested books:

1. Introduction to Automata Theory, Languages, and Computation, 3nd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Introduction to the Theory of Computation, Michael Sipser, 3rd edition, Cengage Learning.

Suggested reference books

1. K. L. P Mishra, N. Chandrashekaran (2003), Theory of Computer Science-Automata Languages and Computation, 2nd edition, Prentice Hall of India, India.
2. Raymond Greenlaw, H. James Hoover, Fundamentals of the Theory of Computation, Principles and Practice, Morgan Kaufmann, 1998.
3. John C. Martin: Introduction to Languages and Automata Theory, 3rd edition, Tata Mcgraw-Hill, 2007

Course Outcomes:

- To use basic concepts of formal languages of finite automata techniques.
- To Design Finite Automata's for different Regular Expressions and Languages.
- To Construct context free grammar for various languages.
- To solve various problems of applying normal form techniques, push down automata and Turing Machines.

DESIGN AND ANALYSIS OF ALGORITHMS

Course code					
Category	Professional Core Course				
Course title	Design and Analysis of Algorithms				
Scheme and Credits	L	T	P	Credits	Semester 5
	3	1		4	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Objectives:

- Analyze the asymptotic performance of algorithms.
- Write rigorous correctness proofs for algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit 1:

Introduction to Algorithms: Algorithm, Performance Analysis (Time and Space complexity), Asymptotic Notation (Big OH, Omega and Theta)-best, average and worst-case behaviour. Elementary Data Structures (Basic terminology of Stacks and Queues, Tree, Graph), Sets and Disjoint Set Union.

Divide and Conquer: General method, Binary Search, Merge Sort, Quick Sort, and other sorting algorithms with divide and conquer strategy, Strassen's Matrix Multiplication algorithms and analysis of these problems.

Unit 2:

Greedy Method: General method, Fractional Knapsack problem, Job Sequencing with Deadlines, Minimum Cost Spanning Trees, Single source shortest paths.

Dynamic Programming: General method, Optimal Binary Search Trees, 0/1 knapsack, The Traveling Salesperson problem.

Unit 3:

Back Tracking: General method, The 8-Queen's problem, Sum of subsets, Graph Colouring, Hamiltonian Cycles.

Branch and Bound: The method, 0/1 knapsack problem, Traveling Salesperson problem, Efficiency considerations.

Unit 4:

NP Hard and NP Complete Problems: Basic concepts, Cook's theorem, NP hard graph problems, NP

hard scheduling problems, NP hard code generation problems, and Some simplified NP hard problems.

Suggested Text Books:

1. Fundamental of Computer algorithms, Ellis Horowitz and Sartaj Sahni, 1978, Galgotia Publication
2. Introduction to Algorithms, Thomas H Cormen, Charles E Leiserson and Ronald L Rivest: 1990, TMH

Suggested Reference Books:

1. The Design and Analysis of Computer Algorithm, Aho A.V. Hopcroft J.E., 1974, Addison Wesley.
2. Algorithms-The Construction, Proof and Analysis of Programs, Berlion, P.Bizard, P., 1986. Johan Wiley & Sons,
3. Writing Efficient Programs, Bentley, J.L., PHI
4. Introduction to Design and Analysis of Algorithm, Goodman, S.E. &Hedetnieni, 1997, MGH.
5. Introduction to Computers Science- An algorithms approach, Jean Paul Trembley, Richard B.Bunt, 2002, T.M.H.
6. Fundamentals of Algorithms: The Art of Computer Programming Vol Knuth, D.E.: 1985, Naresh Publication.

Course Outcomes:

- To identify and justify correctness of algorithms and to analyse running time of algorithms based on asymptotic analysis.
- To understand when an algorithmic design situation calls for the divide-and-conquer paradigm. Synthesize divide-and-conquer algorithms.
- Describe the greedy paradigm and dynamic-programming paradigm. Explain when an algorithmic design situation calls for it.
- Developing greedy algorithms/dynamic programming algorithms, and analyze it to determine its computational complexity.
- To write the algorithm using Backtracking and Branch and Bound strategy to solve the problems for any given model engineering problem.

PROGRAMMING IN JAVA

Course code					
Category	Professional Core Course				
Course title	Programming in JAVA				
Scheme and Credits	L	T	P	Credits	Semester 5
	3	1	0	4	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Objectives:

- Programming in the Java programming language.
- Knowledge of object-oriented paradigm in the Java programming language.
- The use of Java in a variety of technologies and on different platforms.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit 1:

Introduction to Java: Evolution of Java, Object Oriented Programming Structure, Overview and characteristics of Java, Java program Compilation and Execution Process, Organization of the Java Virtual Machine, Platform Independency & Portability, Security, Relation b/w JVM, JRE and JDK, Naming Conventions, Data types, operators, sandbox model

Unit 2:

OOPS Implementation: Classes, Objects, attributes, methods, data encapsulation, Constructors, Anonymous block, Method Overloading, Static Data members, Block & methods, Argument Passing Mechanism, Wrapper Classes, **this** keyword: Referencing instance members, Method chaining;

Inheritance & Runtime Polymorphism: Inheritance & code reusability: Extending classes for code reusability, Usage of super keyword, Method Overriding, Runtime Polymorphism, Abstract classes & methods, Final Keyword;

Interfaces: classes & interfaces, interface applications, Has-A relation: Aggregation & Composition, applets, Life cycle of applet.

Unit 3:

Threads: Creating Threads, Thread Priority, Blocked States, Extending Thread Class, Runnable Interface, Starting Threads, Thread Communication, wait, notify and notify all.

Package & Scopes: Need of Packages, associating classes to Packages, Import Keyword and Feature of static import, Public, protected, private & default scope, Private Inheritance;

Exception Handling: exception and error, Exception Handling & Robustness, Common Exceptions and Errors, Try and catch block, Exception handlers, throw keyword, Checked and Unchecked Exceptions, Role of finally, User defined Exceptions;

Unit 4:

Collection Framework: Role and Importance of Collection Framework, List & Set based collection, Iterator & List Iterator, Maps, searching elements in List, Hash and Tree based collections, Comparable and Comparator Interfaces.

Database Connectivity Using JDBC: Overview of native and ODBC Drives, Introduction to JDBC, Type of JDBC drivers, Usage of drivers,Basic database operations: Insert, Delete, Update, and Select;

Text Books:

1. Patrick Naughton and HerbertzSchidt, "Java-2 the complete Reference", TMH
2. Sierra & bates, "Head First Java", O'Reilly.

Reference Books:

1. E. Balaguruswamy, "Programming with Java", TMH
2. Horstmann, "Computing Concepts with Java 2 Essentials", John Wiley.
3. Decker &Hirshfield, "Programming.Java", Vikas Publication.

Course Outcomes:

- Knowledge of the structure and model of the Java programming language, (knowledge)
- Use the Java programming language for various programming technologies (understanding)
- Develop software in the Java programming language

Software Engineering Lab

Course code					
Category	Engineering Science Course				
Course title	Microprocessor Lab				
Scheme and Credits	L	T	P	Credits	Semester 5
	0	0	4	2	
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Programs related to the course contents of Software Engineering.

COMPUTER NETWORKS LAB

Coursec ode	LC-CSE-323G				
Category	Professional Core Course				
Course title	Computer Networks Lab				
Scheme and Credits	L	T	P	Credits	Semester 5
	0	0	4	2	
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Hands-on experiments related to the course contents of Computer Networks using hardware resources and using simulation tool.

DESIGN & ANALYSIS OFALGORITHMS USING C++

Course code	LC-CSE-325G				
Category	Professional Core Course				
Course title	Design & Analysis of Algorithms Using C++				
Scheme and Credits	L	T	P	Credits	Semester 5
	0	0	4	2	
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Course Objectives:

- Implementation of various algorithms and to analyze the performance of algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations.

List of programs:

1. Write a Program for iterative and recursive Binary Search.
2. Write a Program to sort a given set of elements using the Quick Sort/Merge Sort/Selection Sort method and determine the time required to sort the elements.
3. Write a Program for implementation of Fractional Knapsack problem using Greedy Method and 0/1 Knapsack problem using Dynamic Programming.
4. Write a Program to find the shortest path from a given vertex to other vertices in a weighted connected graph using Dijkstra's algorithm.
5. Write a Program to find the minimum cost spanning tree (MST) of a given undirected graph using Kruskal's algorithm/Prim's Algorithms.
6. Write a Program to implement N-Queens problem using back tracking.
7. Write a Program to check whether a given graph is connected or not using DFS method.
8. Write a program to implement the Travelling Salesman Problem (TSP).

Note: At least 5 to 10 more exercises to be given by the teacher concerned.

Course Outcomes:

- The course will help in improving the programming skills of the students.
- The design of algorithms for any problem will inculcate structured thinking process in the students and improve the analytical power.

PROGRAMMING IN JAVA LAB

Course code	LC-CSE-327G				
Category	Professional Core Course				
Course title	Java Programming Lab				
Scheme and Credits	L	T	P	Credits	Semester 5
	0	0	4	2	
Classwork	25Marks				
Exam	25Marks				
Total	50Marks				
Duration of Exam	03Hours				

List of Experiments:

Programs related to the course contents of Java Programming.

PRACTICAL TRAINING 1

Course code					
Category	Professional Core Course				
Course title	PRACTICAL TRAINING 1				
Scheme and Credits	L	T	P	Credits	Semester 5
	0	0	0		
Classwork	-				
Exam	-				
Total	-				
Duration of Exam	-				

The evaluation of Practical Training-I will be based on seminar, viva-voce, report submitted by the students. According to performance, the students are awarded grades A, B, C, F. A student who is awarded 'F' grade is required to repeat Practical Training.

Excellent: A; Good : B; Satisfactory: C; Not Satisfactory: F.

SOFTWARE ENGINEERING

Course code					
Category	Professional Elective Course				
Course title	Software Engineering				
Scheme and Credits	L	T	P	Credits	Semester 5
	2		0	2	
Class work	10 Marks				
Exam	40 Marks				
Total	50 Marks				
Duration of Exam	02 Hours				

Objectives of the course

- Be successful professionals in the field with solid fundamental knowledge of software engineering
- Utilize and exhibit strong communication and interpersonal skills, as well as professional and ethical principles when functioning as members and leaders of multi- disciplinary teams
- Apply their foundations in software engineering to adapt to readily changing environments using the appropriate theory, principles and processes

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit: 1

Introduction: The process, software products, emergence of software engineering, evolving role of software, software life cycle models, Software Characteristics, Applications, Software crisis.
Software project management: Project management concepts, software process and project metrics Project planning, project size estimation metrics, project estimation Techniques, empirical estimation techniques, COCOMO- A Heuristic estimation techniques, staffing level estimation, team structures, staffing, risk analysis and management, project scheduling and tracking

Unit: 2

Requirements Analysis and specification requirements engineering, system modeling and simulation Analysis principles modeling, partitioning Software, prototyping: , Prototyping methods and tools; Specification principles, Representation, the software requirements specification and reviews Analysis Modeling: Data Modeling, Functional modeling and information flow: Data flow diagrams, Behavioral Modeling; The mechanics of structured analysis: Creating entity/ relationship diagram, data flow model, control flow model, the control and process specification; The data dictionary; Other classical analysis methods.
System Design: Design concepts and principles: the design process: Design and software quality, design principles; Design concepts: Abstraction, refinement, modularity, software architecture, control hierarchy, structural partitioning, data structure, software procedure, information hiding; Effective modular design: Functional independence, Cohesion, Coupling;

Unit: 3

Architectural Design: Software architecture, Data Design: Data modeling, data structures,

databases and the data warehouse, Analyzing alternative Architectural Designs, architectural complexity; Mapping requirements into a software architecture; Transform flow, Transaction flow; Transform mapping: Refining the architectural design.

Testing and maintenance: Software Testing Techniques, software testing fundamentals: objectives, principles, testability; Test case design, white box testing, basis path testing: Control structure testing: Black box testing, testing for specialized environments, architectures and applications. Software Testing Strategies: Verification and validation, Unit testing, Integration testing, Validation testing, alpha and beta testing; System testing: Recovery testing, security testing, stress testing, performance testing; The art of debugging, the debugging process debugging approaches. Software re-engineering, reverse engineering, restructuring, forward engineering.

Unit: 4

Software Reliability and Quality Assurance :Quality concepts, Software quality assurance , SQA activities; Software reviews: cost impact of software defects, defect amplification and removal; formal technical reviews: The review meeting, review reporting and record keeping, review guidelines; Formal approaches to SQA; Statistical software quality assurance; software reliability: Measures of reliability and availability ,The ISO 9000 Quality standards: The ISO approach to quality assurance systems, The ISO 9001 standard, Software Configuration Management. Computer Aided software Engineering: CASE, building blocks, integrated case environments and architecture, repository.

Suggested books:

- Software Engineering – A Practitioner's Approach, Roger S. Pressman, 1996, MGH.

Suggested reference books

- Fundamentals of software Engineering, Rajib Mall, PHI Software Engineering by Nasib Singh Gill, Khanna Book Publishing Co (p) Ltd
- Software Engineering by Ian Somerville, Pearson Edu, 5 edition, 1999, AW,
- Software Engineering – David Gustafson, 2002, T.M.H
- Software Engineering Fundamentals Oxford University, Ali Behforooz and Frederick
  J. Hudson 1995 JW&S,
- An Integrated Approach to software engineering by Pankaj jalote , 1991 Narosa,

Course Outcomes

1. How to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment
2. An ability to work in one or more significant application domains
3. Work as an individual and as part of a multidisciplinary team to develop and deliver quality software
4. Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle
5. Demonstrate an ability to use the techniques and tools necessary for engineering practice.

Compiler Design

Course code					
Category	Professional Core Course				
Course title	Compiler Design				
Scheme and Credits	L	T	P	Credits	Semester 6
	3	1	0	4	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Objectives of the course:

1. To understand and list the different stages in the process of compilation.
2. Identify different methods of lexical analysis.
3. Design top-down and bottom-up parsers.
4. Identify synthesized and inherited attributes.
5. Develop syntax directed translation schemes.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT 1

Introduction to Compilers: Language Processors, The Structure of compiler: its different phases, Compiler Construction Tools, Applications of Compiler Technology.
Lexical Analysis: Role of lexical analyzer, Input Buffering, Specification and recognition of tokens, design of lexical analyzer, regular expressions, A language specifying lexical analyzer, Finite automata, conversion from regular expression to finite automata, and vice versa, minimizing number of states of DFA, Implementation of lexical analyzer.

UNIT 2

Syntax Analysis: Role of parsers, context free grammars.
Parsing Technique: Shift-reduce parsing, Operator precedence parsing, Top down parsing, Predictive parsing.

UNIT 3

LR parsers, SLR, LALR and Canonical LR parser.
Syntax Directed Translations: Syntax directed definitions, construction of syntax trees, syntax directed translation scheme, implementation of syntax directed translation, Intermediate- Code Generation: three address code, quadruples and triples.

Symbol Table & Error Detection and Recovery: Symbol tables: its contents and data structure for symbol tables; trees, arrays, linked lists, hash tables. Errors, lexical phase error, syntactic phase error, Semantic error.

Code Optimization & Code Generation: Code generation, forms of objects code, machine dependent code, optimization, register allocation for temporary and user defined variables.

Suggested Text Books:

1. Compilers Principle, Techniques & Tools - Alfread V. AHO, Ravi Sethi & J.D. Ullman; 1998 Addison Wesley.

Suggested Reference Books:

1. Theory and practice of compiler writing, Tremblay & Sorenson, 1985, Mc. Graw Hill.
2. System software by Dhamdere, 1986, MGH.
3. Principles of compiler Design, Narosa Publication
4. Elements compiler Design, Dr. M. Joseph, University Science Press

Course Outcomes:

1. To develop the lexical analyser for a given grammar specification.
2. For a given parser specification design top-down and bottom-up parsers.
3. To Develop syntax directed translation schemes.

ARTIFICIAL INTELLIGENCE

Course code					
Category	Professional Core Course				
Course title	**ARTIFICIAL INTELLIGENCE**				
Scheme and Credits	L	T	P	Credits	Semester 6
	3	1	0	4	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Objectives of the course:

- To provide historical perspective of AI and its foundation.
- To provide the most fundamental knowledge to the students so that they become familiar with basic principles of AI towards problem solving, inference, knowledge representation and learning.
- Explore application of AI techniques in Expert systems, Neural Networks.
- Explore the current trends, potential, limitations, and implications of AI.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT 1

Introduction: Definition of AI, History of AI, nature of AI problems, examples of AI problems. **Problem solving by search**: *Uninformed Search*: Depth First Search (DFS), Breadth First Search (BFS). *Informed Search*: Best First Search, A*. *Local Search*: Hill Climbing. *Problem Reduction Search*: AO*. *Population Based Search*: Ant Colony Optimization, Genetic Algorithm. *Game Playing:* Min Max Algorithm, Alpha-Beta Pruning.

UNIT 2

Knowledge Representation: Types of Knowledge, Knowledge Representation Techniques/schemes: Propositional Logic, Predicate Logic, Semantic nets, Frames. Knowledge representation issues. Rule based systems.

UNIT 3

Reasoning under Uncertainty: Basics of Probability Theory, Probabilistic Reasoning, Bayesian Reasoning, Dempster-Shafer Theory.

Planning: Introduction to Planning, Representation of Planning, Partial-order Planning.

Learning: Introduction to Learning, Types of Learning: Learning by Induction, Rote Learning, Symbol Based Learning, Identification Trees, Explanation Based Learning, Transformational Analogy, Introduction to Neural Networks, Expert Systems, Current trends in Artificial Intelligence

Suggested Test books:

1. Artificial Intelligence: A Modern Approach Third Edition Stuart Russell and Peter Norvig, 2010, Pearson Education.

Suggested reference books:

1. Elaine Rich, Kevin Knight, & Shivashankar B Nair, Artificial Intelligence, McGraw Hill, 3rd ed.,2009.
2. Introduction to Artificial Intelligence & Expert Systems, Dan W Patterson, PHI.,2010.
3. Artificial intelligence, Patrick Henry Winston, 1992, Addition Wesley 3 Ed.

Course Outcomes:

1. Display the understanding of the historical perspective of AI and its foundation.
2. Apply basic principles of AI in solutions that require problem solving, inference, knowledge representation and learning.
3. Demonstrate fundamental understanding of various application of AI techniques in Expert systems, Neural Networks.
4. Demonstrate an ability to share in discussion of AI, it's the current trends, limitations, and implications of AI.

Advanced Java

Course code					
Category	Professional Course Code				
Course title	Advanced Java				
Scheme and Credits	L	T	P	Credits	Semester 6
	3	0	1	4	
Classwork	25Marks				
Exam	75Marks				
Total	100Marks				
Duration of Exam	03Hours				

Objectives of the course:

1. Programming in the Java programming language
2. Knowledge of object-oriented paradigm in the Java programming language.
3. The use of Java in a variety of technologies and on different platforms.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Servlets: Servlet, Web Terminology, Servlet API, Servlet Interface, Generic Servlet, Http Servlet, The life cycle of Servlet, Handling HTTP requests and responses, Using cookies, Session tracking.

UNIT-II

Java Server Pages (JSP): JSP Architecture, Life cycle of JSP, JSP syntax basics– Directives, Declarations, Scripting elements, Implicit objects.

UNIT-III

Hibernate : Introduction to hibernate framework, understanding basic architecture of Model, view, controller. Basic concepts of creating pojo files, mapping, object creation in hibernate ,database connectivity .

UNIT-IV

Remote Method Invocation: Defining the remote interface, Implementing the remote interface, Compiling and executing the server and the client.

Design Pattern: java design pattern, creational, structural, behavioral.

Course Outcome:

1. Knowledge of the structure and model of the Java programming language, (knowledge)
2. Use the Java programming language for various programming technologies (understanding)
3. Develop software in the Java programming language,

Suggested Text Books:

1. Patrick Naughton and Herbertz Schidt, "Java-2 the complete Reference", TMH 2. Sierra & bates, "Head First Java", O'Reilly.

Suggested Reference Books:

1. E. Balaguruswamy, “Programming with Java”,TMH
2. Horstmann, “Computing Conceptswith Java2 Essentials”, John Wiley.
3. Decker & Hirsh field, “Programming.Java”, Vikas Publication.

MOBILE AND WIRELESS COMMUNICATION

Course code					
Category	Engineering Science Course				
Course title	Mobile and wireless communication				
Scheme and Credits	L	T	P	Credits	Semester 6
	3	1	0	4	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Objectives of the course:

- Understand the wireless/cellular radio concepts such as frequency reuse, handoff and interference between mobiles and base stations.
- Identify the techno-political aspects of wireless and mobile communications such as the allocation of the limited wireless spectrum by regulatory agencies.
- Understand the information theoretical aspects such as channel capacity, propagation effects, modeling the impact of signal bandwidth and motion in mobile systems.
- Describe the current and future Mobile Communication Systems, GSM, Satellite, Broadcasting, Bluetooth, Wireless LANs, Mobile Adhoc Networks.
- Describe the mobility support mechanism, WWW and WAPs.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT 1

Introduction: Application, History, Market Scenario, Reference Model and Overview, Wireless Local Loop and Cellular system.

Wireless Transmission: Frequencies, Signals, Antennae, Signal Propagation, Multiplexing, Modulation, Spread Spectrum.

MAC Layer: Specialized MAC, SDMA, FDMA, TDMA – Fixed TDM, Classical ALOHA, Slotted, ALOHA, CSMA, DAMA, PKMA, Reservation TDMA. Collision Avoidance, Polling, Inhibit Sense Multiple Access, CDMA.

Broadcasting: Unidirectional Distribution Systems, Digital Audio Broadcasting, Digital Video Broadcasting, Convergence of Mobile and Broadcasting Techniques.

UNIT 2

GSM: **Mobile Services, Architecture Radio, Interface, Protocol, Localization, Calling Handover, Security, New data services.**

Wireless LAN: IEEE 802 11- System and Protocol Architecture, Physical Layer, MAC Layered Management.

Bluetooth: User scenarios, Physical layer, MAC Layer, Networking, Security and Link Management. Wimax

UNIT 3

Mobile Network Layer: Mobile IP-Goals, Assumptions, Requirement, Entities, Terminology, IP Packet delivery, Agent Advertisement and Discovery, Registration, Tunneling, Encapsulation, Optimization, Reserve Tunneling, Security, IPv6 , DHCP.

Mobile Adhoc Networks: Routing, Destination Sequence Distance Vector, Dynamic Source Routing, Hierarchical algorithms, Performance Metrics.

Mobile Transport Layer: Traditional TCP, Indirect TCP, Snooping, TCP, Mobile TCP, Fast- retransmission TCP, Transaction oriented TCP.

UNIT 4

Satellite Systems: History, Applications, GEO, LEO, MEO, Routing, Localization, Handover in Satellite System.

Support for Mobility: File System, WWW, HTML, System Architecture.

WAP: Architecture, Wireless Datagram, Protocol, Wireless Transport Layer Security, Wireless Transaction Protocol, Application Environment, Telephony Applications.

Suggested Reference Books:

1. Jochen Schiller, "MobileCommunication", Pearson Education, 2002
2. LEE, "Mobile Cellular Telecommunications", McGRAW-Hill, 2nd Edition.
3. Theodore S Rappaport, "Wireless Communications", Pearson Education.

Course Outcomes:

- Explain the principles and theories of mobile computing technologies.
- Describe infrastructures and technologies of mobile computing technologies.
- List applications in different domains that mobile computing

offers to the public, employees, and businesses.

- Describe the possible future of mobile computing technologies and applications.
- Effectively communicate course work through written and oral presentations

PROJECT - I

Course code					
Category	Professional Core Course				
Course title	PROJECT- I				
Scheme and Credits	L	T	P	Credits	Semester 6
	0	0	4	2	
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Students will be assigned projects individually or in a group of not more than 3 students depending on the efforts required for completion of project.

The project will have 4 stages :
(*Marks for internal evaluation are given in brackets)

- Synopsis submission (5 marks),
- 1st mid term progress evaluation (5 marks)
- 2nd mid term progress evaluation (5 marks)
- Final submission evaluation (10 marks).

The external examiner will evaluate the project on the basis of idea/quality of project, implementation of the project, project report and viva.

Compiler Design Lab

Course code					
Category	Professional Core Course				
Course title	Compiler Design Lab				
Scheme and Credits	L	T	P	Credits	Semester 6
	0	0	2	2	
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Objectives of the course:

- Implementation of different concepts of lexical analysis.
- Implementation of parsers.
- Study and use of compiler design tools.

List of programs:

1. Write a Program for Token separation with a given expression.
2. Write a Program for Token separation with a given file.
3. Write a Program for Lexical analysis using LEX tools.
4. Write a Program to identify whether a given line is a comment or not.
5. Write a Program to check whether a given identifier is valid or not.
6. Write a Program to recognize strings under 'a', 'a*b+', 'abb'.
7. Write a Program to simulate lexical analyser for validating operators.
8. Write a Program for implementation of Operator Precedence Parser.
9. Study of LEX and YACC tools:
   i) Write a Program for implementation of calculator using YACC tool.
   ii) Write a Program for implementation of Recursive Descent Parser using LEX tool.
10. Write a Program for implementation of LL (1) Parser.
11. Write a Program for implementation of LALR Parser

Note: At least 5 to 10 more exercises to be given by the teacher concerned.

Course Outcomes:

- The course will help in improving the programming skills of the students.
- The implementation of different parsers will help in understanding of compiler designing.

Artificial Intelligence Lab Using Python

Course code					
Category	Professional Core Course				
Course title	Artificial Intelligence Lab Using Python				
Scheme and Credits	L	T	P	Credits	Semester 6
	0	0	2	2	
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

List of Program:

1. Write a Program to Implement Breadth First Search using Python.
2. Write a Program to Implement Depth First Search using Python.
3. Write a Program to Implement Tic-Tac-Toe game using Python.
4. Write a Program to Implement 8-Puzzle problem using Python.
5. Write a Program to Implement Water-Jug problem using Python.
6. Write a Program to Implement Travelling Salesman Problem using Python.
7. Write a Program to Implement Tower of Hanoi using Python.
8. Write a Program to Implement Monkey Banana Problem using Python.
9. Write a Program to Implement Missionaries-Cannibals Problems using Python.
10. Write a Program to Implement 8-Queens Problem using Python.

Note: At least 5 to 10 more exercises to be given by the teacher concerned.

Advanced Java Lab

Course code					
Category	Professional Core Course				
Course title	Advanced Java Lab				
Scheme and Credits	L	T	P	Credits	Semester 6
	0	0	2	2	
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Students have to write at list 15 programs based on the course.

ADVANCED DATABASE MANAGEMENT

Course code					
Category	Professional Elective Course				
Course title	Advanced Database Management System				
Scheme and Credits	L	T	P	Credits	Semester 6
	3	1	0	4	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Objective of the course:

- To understand DBMS Components, Advantages and Disadvantages.
- Understanding Data modeling: ER, EER, Network, Hierarchical and Relational data models.
- Understanding normalization, general strategies for query processing, query processor, syntax analyzer, Query decomposition, Heuristic Query optimization.
- To understand transaction concept, schedules, serializability, locking and concurrency control protocols.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT 1

Introduction: Architecture, Advantages, Disadvantages, Data models, relational algebra, SQL, Normal forms.

Query Processing: General strategies for query processing, transformations, expected size, statistics in estimation, query improvement. Query evaluation, view processing, query processor.

UNIT 2

Recovery: Reliability, Transactions, recovery in centralized DBMS, reflecting updates, Buffer management logging schemes, disaster recovery.

Concurrency: Introduction, Serializability, Concurrency control, Locking schemes, Timestamp based ordering, Optimistic, Scheduling, Multiversion techniques, Deadlocks.

UNIT 3

Parallel and Distributed Databases: Distributed Data Storage – Fragmentation & Replication, Location and Fragment.

Transparency Distributed Query Processing and Optimization, Distributed Transaction Modeling and concurrency Control, Distributed Deadlock, Commit Protocols, Design of Parallel Databases, Parallel Query Evaluation.

UNIT 4

Objected Oriented and Object Relational Databases: Modeling Complex Data Semantics, Specialization, Generalization, Aggregation and Association, Objects, Object Identity, Equality and Object Reference, Architecture of Object Oriented and Object Relational Databases

Suggested Text Book:

i. Elmarsi, Navathe, Somayajulu, Gupta, "Fundamentals of Database Systems", 4th Edition, Pearson Education,2007

ii. Garcia, Ullman, Widom, "Database Systems, The complete book", Pearson Education, 2007

iii. R. Ramakrishnan, "Database Management Systems", McGraw Hill International Editions, 1998

Suggested References Books:

1. Date, Kannan, Swaminathan, "An Introduction to Database Systems", 8th Edition Pearson Education, 2007
2. Singh S.K., "Database System Concepts, design and application", Pearson Education, 2006.
3. Silberscatz, Korth, Sudarshan, "Database System Concepts", Mcgraw Hill, 6th Edition, 2006
4. W. Kim, "Modern Database Systems", 1995, ACM Press, Addision Wesley,

Course Outcomes:

- Students will get understanding of DBMS Components, Its advantages and disadvantages.
- Understanding about various types of Data modeling: ER, EER, Network, Hierarchical and Relational data models.
- Understanding normalization, general strategies for query processing, query processor, syntax analyzer, Query decomposition, Heuristic Query optimization.
- Understanding transaction concept, schedules, serializability, locking and concurrency control protocols.

Data Science

Course code					
Category	Professional Core Course				
Course title	Data Science				
Scheme and Credits	L	T	P	Credits	Semester 6
	2	0	0	2	
Class work	10 Marks				
Exam	40 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Objectives of the course:

- The objective of this course is to impart necessary knowledge of the basic foundations needed for understanding data science domain and develop programming skills required to build data science applications.
- To introduce the conceptual knowledge of the area of data science domain, feature and scope of applications.
- To impart programming knowledge needed for data sciences.
- To understand the different issues involved in the design and implementation of a data science applications.
- To understand case studies of essential Data sciences applications.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT 1

Introduction to Data Science: Concept of Data Science, Traits of Big data, Web Scraping, Analysis vs Reporting, Collection, storing, processing, describing and modelling, statistical modelling and algorithm modelling, AI and data science, Myths of Data science

UNIT 2

Introduction to Programming Tools for Data Science: Toolkits using Python: Matplotlib, NumPy, Scikit-learn, NLTK, Visualizing Data: Bar Charts, Line Charts, Scatterplots, Working with data: Reading Files, Scraping the Web,

UNIT 3

Data Science Methodology: Business Understanding, Analytic Approach, Data Requirements,

Data Collection, Data Understanding, data Preparation, Modeling, Evaluation, Deployment, feedback

UNIT 4

Data Science Application: Prediction and elections, Recommendations and business analytics, clustering and text analytics

Suggested Text books:

1. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media
2. AurélienGéron, "Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems", 1st Edition, O'Reilly Media
3. Jain V.K., "Data Sciences", Khanna Publishing House, Delhi.
4. Jain V.K., "Big Data and Hadoop", Khanna Publishing House, Delhi.

Suggested Reference books:

1. Data Science Workflow: Overview and Challenges by Philip Guo
2. Python for Data Analysis, O'Reilly Media Rajiv, "Machine Learning", Khanna Publishing House, Delhi.
3. Ian Goodfellow, YoshuaBengio and Aaron Courville, "Deep Learning", MIT Press
4. http://www.deeplearningbook.org
5. Jiawei Han and Jian Pei, "Data Mining Concepts and Techniques", Third Edition, Morgan
6. Kaufmann Publishers

Course Outcomes:

- Understand the value of data science and the process behind using it.
- Use Python to gather, store, clean, analyse, and visualise data-sets.
- Apply toolkits to formulate and test data hypotheses and uncover relationships within data-sets
- Understand the data science methodology in the data science pipeline
- Understand real-world challenges with several case studies

NEURAL NETWORKS

Course code					
Category	Professional Core Course				
Course title	Neural Networks				
Scheme and Credits	L	T	P	Credits	Semester 7
	3	1	0	4	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

UNIT 1

Overview of biological neurons: Structure of biological neurons relevant to ANNs. Fundamental concepts of Artificial Neural Networks: Models of ANNs; Feedforward & feedback networks; learning rules; Hebbian learning rule, perception learning rule, delta learning rule, Widrow-Hoff learning rule, correction learning rule, Winner –lake all elarning rule, etc.

UNIT 2

Single layer Perception Classifier: Classification model, Features & Decision regions; training & classification using discrete perceptron, algorithm, single layer continuous perceptron networks for linearlyseperable classifications. Multi-layer Feed forward Networks: linearly non-seperable pattern classification, Delta learning rule for multi-perceptron layer, Generalized delta learning rule, Error back-propagation training, learning factors, Examples.

UNIT 3

Single layer feed back Networks: Basic Concepts, Hopfield networks, Training & Examples. Associative memories: Linear Association, Basic Concepts of recurrent Auto associative memory: rentrieval algorithm, storage algorithm; By directional associative memory, Architecture, Association encoding & decoding, Stability.

UNIT 4

Self organizing networks: UN supervised learning of clusters, winner-take-all learning, recall mode, Initialisation of weights, seperability limitations

Suggested Books/Resources:

- Introduction to artificial Neural systems by Jacek M. Zurada, 1994, Jaico Publ. House.

Reference Books:

- "Neural Networks :A Comprehensive formulation", Simon Haykin, 1998, AW
- "Neural Networks", Kosko, 1992, PHI. 3. "Neural Network Fundamentals" – N.K. Bose , P. Liang, 2002, T.M.H
- Neural Network , T.N.Shankar, University Science Press
- Neuro Fuzzy Systems, Lamba, V.K., University Science Press

DATA MINING

Course code					
Category	Professional Core Course				
Course title	Data mining				
Scheme and Credits	L	T	P	Credits	Semester 7
	3	1	0	4	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Objectives of the course:

- To describe the concept of Data warehouse & its attributes
- To study different data warehouse models, architectures and implementation
- To understand the basic concept of data mining and its functionality
- To understand the concept of classification techniques and its implementation
- To understand the concept of association rules, different techniques and implementation details
- To understand the concept of cluster analysis, anomaly detection and its usage and implementation details.

UNIT 1

Data Warehouse: Need for data warehouse, Definition, Goals of data Warehouse, Advantages,

Data warehouse and OLAP technology: Difference between OLTP and OLAP, Strengths of OLAP, Applications of OLAP.

OLAP operations: Advantages, Types: Roll up, Drill down, Pivot, Slice & Dice operations, Applications. OLAP Server: Need, Types: ROLAP, MOLAP and HOLAP.

UNIT 2

Introduction: Data Mining, Motivation, Challenges, Origins of Data Mining, Data Mining Tasks, Data: Types of Data, Data Quality, Data Pre-processing, Measures of Similarity and Dissimilarity, Exploring Data: Iris Data Set, Summary Statistics, Visualization, OLAP and Multi-dimensional Data Analysis.

UNIT 3

Classification: Basic Concepts and Preliminaries, Approach to Solving a Classification Problem, Decision Tree Induction, Model Over fitting, Evaluating Performance of Classifier. Alternative Techniques: Rule-Based Classifier, Nearest-Neighbor Classifiers

UNIT 4

Association Analysis: Basic Concepts and Problem Definition, Frequent Itemset Generation, Rule Generation, Representation of Frequent Itemset, FP-Growth Algorithm, Evaluation of Association Patterns, Handling Categorical Attributes , Handling Continuous Attributes, Handling a Concept Hierarchy, Sequential Patterns, Subgraph Patterns.

Suggested Books/Resources:

- Data Mining Concepts and Techniques J. Han and M. Kamber Morgan Kaufmann, 2006, ISBN 1-55860- 901-6
- Introduction to Data Mining Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Pearson Education (Addison Wesley), 0-321-32136-7

- Mining Massive data sets Anand Rajaram, Jure Leskovec and Jeff Ullman Cambridge University Press 2. https://onlinecourses.nptel.ac.in/noc18_cs14/preview
- https://www.coursera.org/specializations/data-mining.
- https://www.futurelearn.com/courses/data-mining-with-weka

CRYPTOGRAPHY AND NETWORK SECURITY

Course code					
Category	Professional Core Course				
Course title	Cryptography and network security				
Scheme and Credits	L	T	P	Credits	Semester 7
	3	1	0	4	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

UNIT 1

Block Symmetric Ciphers : Block Cipher and the Data Encryption Standard : Simplified DES, Block Cipher Principles, Cryptography: OSI security architecture, Classical encryption techniques(Substitution Techniques, Transposition Techniques and Staganography).

Introduction to the Concepts of Security: The need for security, Security Approaches, Principles of Security, Types of Attacks. Cryptographic Techniques: Plain Text and Cipher Text, Encryption and Decryption, Symmetric and Asymmetric Key Cryptography, Steganograph, Key Range and Key Size.

UNIT 2

Asymmetric Ciphers, Public Key Cryptography: RSA, Key management, Hashes& Message Digest: Authentication functions, Message authentication codes, Hash functions and their security, Authentication:X.509 Authentication service,

UNIT 3

Security Applications and Protocols

Electronic Mail Security: S/MIME, IP and Web Security Protocols: IPsec, Secure socket layer and transport layer security, secure e-transaction, Digital Signature, Certificates & standards.

UNIT 4

System Security

System Security: Computer Virus, Firewall & Intrusion Detection, Trusted systems, Security Investigation/Audit, Cyber Laws: IT ACT 2000, IT amendment ACT 2008.

Suggested Books/Resources:

1. “Cryptography & Network Security” by Stallings, William (Seventh Edition or later).

Other useful resources:

1. Virtual Labs: http://cse29-iiith.virtual-labs.ac.in/index.php?section=Experiments Students are advised to practice virtual lab experiments at above link as and when the topics are covered in the class.

MACHINE LEARNING

Course code					
Category	Professional Core Course				
Course title	Machine Learning				
Scheme and Credits	L	T	P	Credits	Semester 7
	3	1	0	4	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Objectives of the course:

1. Have a good understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.
2. Have an understanding of the strengths and weaknesses of many popular machine learning approaches.
3. Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.
4. Be able to design and implement various machine learning algorithms in a range of real-world applications.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT 1

INTRODUCTION – Learning , Machine Learning, Machine Learning Applications, History of ML, Life cycle of Machine Learning, Machine Learning and Data Science ,AI, Types of Learning, Supervised Machine Learning, Unsupervised Machine Learning, Supervised vs Unsupervised Learning, Advantages of Machine Learning, Disadvantages of Machine Learning, Install Anaconda & Python, AI vs Machine Learning, How to Get Datasets, Data Pre-processing.

UNIT 2

REGRESSION: Supervised Learning; Regression Analysis, Linear Regression, Simple Linear Regression, Multiple Linear Regression, Polynomial Regression, Underfitting and Overfitting, Advantages of Using Linear Regression, Limitations of Linear Regression, Logistic Regression,

UNIT 3

DECISION TREE LEARNING -Classification; Logistic Regression, Decision tree learning, Types of Decision Tree; Classification, Regression, Decision tree learning algorithm, Advantages of Decision tree learning, Entropy, Information gain, Issues in Decision tree learning**.**

SUPPORT VECTOR MACHINE: Introduction, Types of support vector kernel – (Linear kernel, polynomial kernel, and radial basis kernel), Hyperplane – (Decision surface), Properties of SVM, and Issues in SVM, Random forest.

UNIT 4

BAYESIAN LEARNING - Probability Fundamentals; joint probability, conditional Probability, Bayes theorem, Concept learning, Naïve Bayes classifier and its applications.

CLUSTERING ; k-means clustering, k-Nearest Neighbor Learning, Association rule learning, Apriori algorithm, Neural networks

Suggested Text Books:

1. Tom Mitchell, "Machine Learning", McGraw Hill, 1997, ISBN 0070428077
2. Introduction to Machine Learning Edition 2, by Ethem Alpaydin.

Suggested Reference Books:

1. Richard o. Duda, Peter E. Hart, and David G. Stork, "Pattern Classification", John Wiley Asia, 2006
2. T. Hastie, R. Tibshirani, & J. H. Friedman, "The Elements of Statistical Learning: Data Mining, Inference, and Prediction", Springer Verlag, 2001.
3. Ian H. Witten & Eibe Frank, "Data Mining: Practical Machine Learning Tools and Techniques with Java Implementations", Morgan Kaufmann, 1999.
4. S. M. Weiss & C. A. Kulikowski, "Computer Systems that Learn", Morgan Kaufman Publishers, San Fancisco, CA, 1991

Other useful resource(s):

1. Link to NPTEL course contents: https://onlinecourses.nptel.ac.in/noc18_cs40/preview 2. Link to topics related to course:
   i.https://in.udacity.com/course/intro-to-machine-learning--ud120-india
   ii.https://www.edx.org/learn/machine-learning
   iii.https://www.datacamp.com/courses/introduction-to-machine-learning-with-r
   https://www.simplilearn.com/big-data-and-analytics/machine-learning-certification-training-course

Course Outcomes:

- To learn the basic concepts and terminology in machine learning Familiarity.
- To learn about the definition of learning systems, their goals and applications in machine learning Familiarity
- To understand concepts associated with classification and experimental evaluation of classification algorithms Assessment
- To learn concepts associated with decision trees and experimental evaluation of classification algorithms Assessment
- To learn about instance-based learning, clustering and unsupervised learning

MACHINE LEARNING LAB

Course code					
Category	Professional Core Course				
Course title	Machine Learning Lab				
Scheme and Credits	L	T	P	Credits	Semester 7
	0	0	2	2	
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	02 Hours				

Objectives of the course:

- To understand the working of Machine learning tools and languages.
- To learn the implementation of classification techniques for any dataset.
- To conduct experiments for clustering techniques for any dataset.
- To discuss different classification and clustering algorithms based on the analysis of results obtained from experimental evaluation.

List of experiments:

Students have to write at least 10 programs based on the course.

Suggested Books/Resources:

1. Tom Mitchell, “Machine Learning”, McGraw Hill, 1997, ISBN 0070428077
2. Sebastian Raschka, “Python Machine Learning”, Packt Publishing Ltd.
3. Andreas C. Müller, Sarah Guido, “Introduction to Machine Learning with Python”, O'Reilly Media, Inc.
4. Sunila Gollapudi, “Practical Machine Learning”, Packt Publishing Ltd
5. Wes McKinney, “Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython”, O'Reilly Media, Inc.
6. Willi Richert, “Building Machine Learning Systems with Python”, Packt Publishing Ltd.

Course Outcomes:

- To implement classification algorithms in python.
- To implement Clustering algorithms in python.
- To implement Genetic Algorithms in Python.
- Top compare different algorithms based on some common factors.

SOFTWARE PROJECT MANAGEMENT

Course code					
Category	Professional Core Course				
Course title	**Software project management**				
Scheme and Credits	L	T	P	Credits	Semester 7
	3	1	0	4	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

UNIT 1
Project Evaluation and Planning - Activities in Software Project Management, Overview Of Project Planning, Stepwise planning, contract management, Software processes and process models. Cost Benefit Analysis, Cash Flow Forecasting, Cost-Benefit Evaluation Techniques, Risk Evaluation.

UNIT 2
Project costing, COCOMO 2, Staffing pattern, Effect of schedule compression, Putnam‟s equation, Capers Jones estimating rules of thumb, Project Sequencing and Scheduling Activities, Scheduling resources, Critical path analysis, Network Planning, Risk Management, Nature and Types of Risks, Managing Risks, Hazard Identification, Hazard Analysis, Risk Planning and Control, PERT and Monte Carlo Simulation techniques.

UNIT 3
Monitoring And Control- Collecting Data, Visualizing Progress, Cost Monitoring, review techniques, project termination review, Earned Value analysis, Change Control, Software Configuration Management (SCM), Managing Contracts, Types Of Contracts, Stages In Contract Placement, Typical Terms of A Contract, Contract Management and Acceptance.

UNIT 4
Quality Management and People Management- Introduction, Understanding Behavior, Organizational Behaviour, Selecting The Right Person For The Job, Motivation, The Oldman – Hackman Job Characteristics Model , Working in Groups, Organization and team structures, Decision Making, Leadership, Organizational Structures, Stress, Health And Safety. ISO and CMMI models, Testing, and Software reliability, test automation, Overview of project management tools.

Suggested Books/Resources:

1.Bob Hughes, Mike Cotterell, “Software Project Management”, Tata McGraw Hill. (2009)

Reference Books:
1. Royce, “Software Project Management”, Pearson Education. (2005). 2. Robert K. Wysocki, “Effective Software Project Management”, Wiley.(2006)

BIG DATA

Course code					
Category	Professional Core Course				
Course title	**Big Data**				
Scheme and Credits	L	T	P	Credits	Semester 7
	3	1	0	4	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Objectives of the course:

- To learn the basic concepts and terminology in big data analytics
- To learn about the map reduce and the new software stack
- To learn about the mining of data streams, estimating moments and windowing, link analysis: page rank and efficient computation of page rank
- To learn concepts associated with frequent item sets from big data and counting frequent items from stream
- To learn about clustering for big data and mining of social network graph
- To learn about recommendation systems, collaborative filtering and dimensionality reduction

UNIT 1

Introduction to Big Data: Big data definition, Difference between Traditional data and Big data, Evolution of Big Data, The Sources of Big Data, Types of Big Data, Advantages of Big Data (Features), Applications of Big Data, Big Data Case studies, Challenges with Big Data

UNIT 2

What is Hadoop? History of Hadoop, Modules of Hadoop, Hadoop Architecture, Hadoop Distributed File System, Advantages of Hadoop, HDFS, Where to use HDFS? Where not to use HDFS? HDFS Concepts, HDFS Features and Goals,

UNIT 3

YARN, Components Of YARN, Benefits of YARN, Map Reduce and the New Software Stack: Distributed File Systems, Map Reduce, Algorithms Using Map Reduce, Complexity Theory for Map Reduce.

UNIT 4

Frequent Item sets from Big Data: The Market-Basket Model, Market Baskets and the A-Priori Algorithm, Handling Larger Datasets in Main Memory, Limited-Pass Algorithms, Clustering for Big Data: Introduction to Clustering Techniques, Hierarchical Clustering, Clustering in Non-Euclidean Spaces, Clustering for Streams and Parallelism.

Course outcomes

- To learn the basic concepts and terminology in big data analytics Familiarity
- To learn about the map reduce and the new software stack Familiarity
- To learn about the mining of data streams, estimating moments and windowing, link analysis: page rank and efficient computation of page rank Assessment
- To learn concepts associated with frequent item sets from big data and counting frequent items from stream Assessment
- To learn about clustering for big data and mining of social network graph Assessment
- To learn about recommendation systems, collaborative filtering and dimensionality reduction

CLOUD COMPUTING

Course code					
Category	Professional Core Course				
Course title	Cloud Computing				
Scheme and Credits	L	T	P	Credits	Semester 7
	3	1	0	4	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

UNIT 1

Introduction- Shift from distributed computing to cloud computing; principles and characteristics of cloud computing- IaaS, PaaS, SaaS; service oriented computing and cloud environment

UNIT 2

Cloud Computing Technology-Client systems, Networks, server systems and security from services perspectives; Accessing the cloud with platforms and applications; cloud storage

UNIT 3

Working with Cloud -Infrastructure as a Service – conceptual model and working Platform as a Service – conceptual model and functionalities. Software as a Service – conceptual model and working. Trends in Service provisioning with clouds

UNIT 4

Using Cloud Services-Cloud collaborative applications and services – case studies with calendars, schedulers and event management; cloud applications in project management.
Case studies- Microsoft Azure, Google App Engine and Open source cloudsOpen-Nebula and Eucalyptus

Suggested Books/Resources:

1. Anthony T.Velte, Toby J.Velte and Robert E, Cloud Computing – A Practical Approach, TMH 2010
2. Michael Miller, Cloud Computing – Web based Applications, Pearson Publishing, 2011

Reference Books:

1. Resources from Internet /WWW.

PROJECT WORK-I

Course code					
Category	Professional Core Course				
Course title	**PROJECT WORK-I**				
Scheme and Credits	L	T	P	Credits	Semester 7
			4	4	
Class work					
Exam	100 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

The object of Project Work I is to enable the student to take up investigative study in the broad field of Computer Science & Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a Supervisor. This is expected to provide a good initiattion for the student(s) in R&D work. The assignment to normally include:

- Survey and study of published literature on the assigned topic;
- Working out a preeliminary Approach to the Problem relating to the assigned topic;
- Conducting preliminary Analysis/Modelling/Simulation/Experiment/Design/Feasibility;
- Preparing a Written Report on the Study conducted for presentation to the Department;
- Final Seminar, as oral Presentation before a Departtmental Committtee.

R PROGRAMMING

Course code					
Category	Professional Core Course				
Course title	**R Programming**				
Scheme and Credits	L	T	P	Credits	Semester 7
	3	1	0	4	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Objectives:

R is open source free software that can handle mathematical and statistical manipulations. R Programming has its own programming language constructs like other languages as well as built in functions to perform any specialized task. This course will cover the concept how to program in R and how to use R for effective data analysis. The students will be able to understand how to install and configure R and how it could be used for an analytics programming environment and gain basic analytic skills via this high-level analytical language. Upon completion of this course students should be able to:

1. Introduction and Usages of R Programming
2. How to install R Software and How to use the packages in R Software
3. How to do data management for different applications using R Software
4. Able to draw the Graphs and Plots for better visualization of real life problems.
5. Able to know how the different real applications could be converted according to R Programming Environment for better data analysis.

UNIT 1

Introduction and History of R Programming, Basic fundamentals, installation and use of software, data editing, use of R as a calculator, functions and assignments. Use of R as a calculator application, functions and matrix operations in R, missing data and logical operators. Conditional executions and loops in R, data management with sequences.

UNIT 2

Data management with repeats, sorting, ordering, and lists, Vector indexing, factors, Data management with strings, display and formatting.

UNIT 3

Data management with display paste, split, find and replacement, manipulations with alphabets, evaluation of strings, data frames.

Data frames, import of external data in various file formats, statistical functions, compilation of data.

UNIT 4

Graphics and plots, statistical functions for central tendency, variation, skewness and kurtosis, handling of bivarite data through graphics, correlations, programming and illustration with examples

Suggested Books/Resources:

1. Hands-On Programming with R, by Garrett Grolemund, Shroff/O'Reilly; First Edition (2014)
2. Beginning R: The Statistical Programming Language, by Mark Gardener, Wiley (2013)

Suggested Reference Book(s):

1. Benjamin M. Bolker. Ecological Models and Data in R. Princeton University Press, 2008. ISBN 978-0- 691-12522-0.
2. Peter Dalgaard. Introductory Statistics with R. Springer, 2nd edition, 2008. ISBN 978-0-387-79053-4.
3. Brian Everitt and Torsten Hothorn. A Handbook of Statistical Analyses Using R. Chapman & Hall/CRC, Boca Raton, FL, 2006. ISBN 1-584-88539-4.
4. John Maindonald and John Braun. Data Analysis and Graphics Using R. Cambridge University Press, Cambridge, 2nd edition, 2007. ISBN 978-0-521-86116-8.
5. Paul Murrell. R Graphics. Chapman & Hall/CRC, Boca Raton, FL, 2005. ISBN 1-584-88486-X.
6. Phil Spector. Data Manipulation with R. Springer, New York, 2008. ISBN 978-0-387-74730-9.
7. W. N. Venables and B. D. Ripley. Modern Applied Statistics with S. Springer, New York, fourth edition edition, 2002.
8. Alain Zuur, Elena N. Ieno, Neil Walker, Anatoly A. Saveiliev, and Graham M. Smith. Mixed Effects Models and Extensions in Ecology with R. Springer, New York, 2009. ISBN 978-0-387-87457-9.
9. Alain F. Zuur, Elena N. Ieno, and Erik Meesters. A Beginner's Guide to R. Use R. Springer, 2009. ISBN: 978-0-387-93836-3.

Course Outcomes:

- To identify the usages of available R packages and associated Open Source software to meet different scientific objectives.
- To understand how to programming in R, reading data into R, accessing R packages, Assessment
- Able to write R functions, debugging, profiling R code, and organizing and commenting R code. Assessment
- To design and write efficient programs using R to perform routine and specialized data manipulation/management and analysis tasks Assessment
- To do data analysis using R for real life applications

GRAPH THEORY

Course code					
Category	Professional Core Course				
Course title	Graph Theory				
Scheme and Credits	L	T	P	Credits	Semester 7
	3	1	0	4	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

UNIT 1

Basics – Graphs, degree sequences, distance in graphs, complete, regular and bipartite graphs, basic properties. **Structure** and Symmetry – Cut vertices, bridges and blocks, automorphism groups, reconstruction problem.

UNIT 2

Trees and connectivity – Properties of trees, Arboricity, vertex and edge connectivity, Mengers theorem. **Eulerian** and Hamiltonian graphs – Characterization of Eulerian graphs - Sufficient conditions for Hamiltonian graphs.

UNIT 3

Colouring and planar graphs – vertex and edge colouring, perfect graphs, planar graphs, Euler's theorem, Kuratowski's theorem, Colouring of planar graphs, Crossing number and thickness. Matching, factors, decomposition and domination

UNIT 4

Extremal Graph theory – Turan's theorem, Ramsay's theorem, Szemeredi's 97 regularity lemma, applications

Suggested Books/Resources:

1.Graph Theory, by J. A. Bondy and U. S. R. Murthy, Springer Verlag (2008.)
2.Introduction to Graph Theory,by D. B. West, PHI, 2004.

Reference Books:

1 Graph Theory, by R. Diestel : Springer Verlag (Free Download available).(2003

PATTERN RECOGNITION

Course code					
Category	Professional Core Course				
Course title	Pattern Recognition				
Scheme and Credits	L	T	P	Credits	Semester 7
	3	1	0	4	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Objectives:

- This course will introduce the fundamentals of statistical pattern recognition.
- Generative methods such as those based on Bayes decision theory and related techniques of parameter estimation and density estimation.
- Discussion of discriminative methods such as nearest-neighbor classification and support vector machines.
- Applications such as information retrieval, data mining, document image analysis and recognition, computational linguistics, forensics, biometrics and bioinformatics with pattern recognition.

UNIT 1

Introduction – Definitions, data sets for Pattern Recognition, Different Paradigms of Pattern Recognition, Representations of Patterns and Classes, Metric and non-metric proximity measures

UNIT 2

Feature extraction, Different approaches to Feature Selection
Nearest Neighbour Classifier and variants, Efficient algorithms for nearest neighbor classification

UNIT 3

Different Approaches to Prototype Selection, Bayes Classifier, Decision Trees, Linear Discriminant Function, Support Vector Machines

UNIT 4

Clustering, Clustering Large datasets, Combination of Classifiers
Applications – Document Recognition.

Suggested Text Book:

- Devi V.S.; Murty, M.N. (2011) Pattern Recognition: An Introduction, Universities Press, Hyderabad.
- R. O. Duda, P. E. Hart and D. G. Stork, Pattern Classification, Wiley, 2000. Suggested

Reference Book:

- Theodoridis, Koutroumbas: Pattern Recognition, 2nd ed., Elsevier, Amsterdam, 2003
- C.M. Bishop: Pattern Recognition and Machine Learning. Springer Verlag, Singapore, 2006. 3. C.M. Bishop: Neural Networks for Pattern Recognition. Clarendon Press, Oxford, 1996.
- R. Schalkoff: Pattern Recognition. Statistical, Structural, and Neural Approaches. John Wiley & Sons, Inc., 1992.

Course outcomes:

- Understanding of the fundamentals of statistical pattern recognition. Familiarity
- Generative methods such as those based on Bayes decision theory and related techniques of parameter estimation and density estimation. Assessment
- Discussion of discriminative methods such as nearest-neighbor classification and support vector machines. Assessment
- Clustering of data and related algorithms are to be learned. Assessment
- Clustering in large databases and related algorithms are to be learned. Assessment
- Combinations of Classifiers are to be understood and learned with applications. Usage
- Applications such as information retrieval, data mining, document image analysis and recognition, computational linguistics, forensics, biometrics and bioinformatics with pattern recognition.

SOFT COMPUTING

Course code					
Category	Professional Core Course				
Course title	SOFT COMPUTING				
Scheme and Credits	L	T	P	Credits	Semester 7
	3	1	0	4	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

UNIT 1

Introduction - What is soft computing ? Differences between soft computing and hard computing, Soft Computing constittuents, Methods in soft computing, Applications of Soft Computing.

Introduction to Genetic Algorithms- Introduction to Genetic Algorithms (GA), Representation, Operators in GA, Fitness function, population, building block hypothesis and schema theorem.; Genetic algorithms operators- methods of selection, crossover and mutation, simple GA(SGA), other types of GA, generation gap, steady state GA, Applications of GA

UNIT 2

Neural Networks- Concept, biological neural syste,. Evolution of neural network, McCulloch-Pitts neuron model, activation functions, feedforward networks, feedback networks, learning rules – Hebbian, Delta, Percepron learning and Windrow-Hoff, winner-take-all.

UNIT 3

Supervised learning- Perceptron learning, single l layer/multilayer perceptron, linear separability, hidden layers, back popagation algorithm, Radial Basis Function network; Unsupervised learning - Kohonen, SOM, Counter-propagation, ART, Reinforcement learning, adaptive resonance architecture, applications of neural networks to pattern recognition systems such as character recognition, face recognition, application of neural networks in image processing.

UNIT 4

Fuzzy systems - Basic definition and terminology, set-theoretic operations, Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions, Fuzzy Rules & Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making; Neuro-fuzzy modeling- Adaptive Neuro-Fuzzy Inference Systems, Coactive 110 Neuro-Fuzzy Modeling, Classification and Regression Trees, Data Clustering Algorithms, Rulebase Structure Identification and Neuro-Fuzzy Control , Applications of neuro-fuzzy modeling.

Swarm Intelligence- What is swarm intelligence? Various animal behaviour which have been used as examples, ant colony optimization, swarm intelligence in bees, flocks of birds, shoals of fish, ant-based routing, particle swarm optimization.

Suggested Books/Resources:

- T1. S.N. Shivanandam, Principle of soft computing, Wiley. ISBN13: 9788126527410 (2011)
- Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, "Neuro-Fuzzy and Soft Computing", Prentice-Hall of India, 2003.
- George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic-Theory and Applications", Prentice Hall, 1995. James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Pearson Edn., 2003.

Reference Book

- Mitchell Melanie, "An Introduction to Genetic Algorithm", Prentice Hall, 1998.
- David E. Goldberg, Genetic Algorithms in Search, Optimization & Machine Learning, Addison Wesley, 1997.

Project Work II & Dissertation

Course code					
Category	Professional Core Course				
Course title	**PROJECT WORK-II**				
Scheme and Credits	L	T	P	Credits	Semester 8
			20	20	
Class work					
Exam	500 Marks				
Total	500 Marks				
Duration of Exam	03 Hours				

The object of Project Work II & Dissertation is to enable the student to extend further the investigative study taken up under EC P1, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership. The assignment to normally include:

- In depth study of the topic assigned in the light of the Report prepared under EC P1;
- Review and finalization of the Approach to the Problem relating to the assigned topic;
- Preparing an Action Plan for conducting the investigation, including team work;
- Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment as needed;
- Final development of product/process, testing, results, conclusions and future directions;
- Preparing a paper for Conference presentation/Publication in Journals, if possible;
- Preparing a Dissertation in the standard format for being evaluated by the Departtment;
- Final Seminar Presentation before a Departmental Committee.

Mobile Computing

Course code					
Category	Professional Core Course				
Course title	**Mobile Computing**				
Scheme and Credits	L	T	P	Credits	Semester 8
	3	1	0	4	
Class work	25				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

UNIT 1

Introduction to Mobile Computing- Mobile Computing Functions, Mobile Computing Devices, Mobile Computing Architecture, Evaluation of Wireless Technology. Cellular Concepts- Frequency reuse, Channel assignment strategies, Handoff strategies. Interference and system capacity Co-channel Interference, Adjacent channel Interference, Channel planning for wireless system, Power control for reducing Interference. Improve coverage and capacity in cellular system- Cell splitting, Sectoring, Repeaters for range extension, A micro cell zone concept.

UNIT 2

Introduction- GSM services and features, GSM architecture, GSM channel types, Example of GSM Call: GSM to PSTN call, PSTN to GSM call. GSM frame structure, Signal processing in GSM, Location tracking and call setup.

GSM location update, Mobility database, Failure Restoration: VLR Failure Restoration, HLR Failure Restoration.

VLR Identification algorithm, VLR overflow control: Registration, Algorithm,Cancellation, Algorithm,Call Origination, Algorithm, Call Termination.

UNIT 3

GPRS Architecture, GPRS Networks Nodes, GPRS Network Operations, Data Services in GPRS, Applications and Limitations of GPRS. Introduction to 3G and 4G Technologies-UMTS, CDMA 2000, Any one 4G Technology. Information Security- Attacks, Component of Information Security. Security Techniques and Algorithms- Streams Ciphering and Block Ciphering, Symmetric Key Cryptography, Public Key Cryptography.

UNIT 4

Security Frame Works for Mobile Environment- 3GPP Security, Mobile VPN, Multifactor Security, Smart Card Security, Mobile virus, Mobile Worm. Introduction to Mobile Operating System (Only features) - Windows CE, Symbian OS, Linux for Mobile Devices, Android. Android Overview, Android Architecture, Life Cycle of Android Activity. Android Tools Installation- JDK1.6, Eclipse Emulator, Android SDK Starter Package, Create Android Based simple Program like Hello Android on Emulator.

Module1:

Technical Background - Transmission Fundamentals , Communication Networks , Protocols and the TCP/IP Suite

Module2: Wireless Communication Technology : Cellular Wireless Networks , Antennas and Wave Propagation , Modulation Techniques , Multiple Access in Wireless System

Module3: Mobile Adaptive Computing , Mobility Management , Data Dissemination and Management

Module4: Context-Aware Computing 106

Module5: Introduction to Mobile Middleware , Middleware for Application Development: Adaptation and Agents , Service Discovery Middleware: Finding Needed Services

Module6: Introduction to Ad Hoc and Sensor Networks , Challenges , Protocols

Module7: Wireless Security , Approaches to Security , Security in Wireless Personal Area Networks , Security in Wireless

Local Area Networks ,Security in Wireless Metropolitan Area Networks (802.16) , Security in Wide Area **Networks**

Text Books:

1.Wireless Communications and Networking, Willam Stallings, Pearson Education. (2002) 2

."Fundamentals of Mobile & Pervasive Computing " by Frank Adelstein, Sandeep Ks Gupta ,ISBN : 9780070603646, TMH (2005)

Reference Books:

1.Jochen Schiller, "Mobile Communications," Addison-Wesley (2009) 2.R. Dayem, "Mobile Data & Wireless Lan Technologies," Prentice-Hall (2005)