Syllabus
for
B.Tech. in Information Technology

(As Approved by the 98th Meeting of the Academic Council held on 17.05.2017)

Department of Information Technology

School of Technology
North-Eastern Hill University
Umshing, Shillong-793 022

Curriculum Objectives

This four years B.Tech programme aims to prepare professional engineers for the IT industry. The core part of the curriculum embodies scientific and engineering knowledge basic to the profession. In addition to these core courses the other ingredients of professional knowledge both current and emerging technological processes have been added to it. To provide the students relevant professional knowledge and develop their capacity to tackle unknown engineering problems, the syllabus has balanced the core, specialized and elective subjects, integrating the practical and field exercises with challenging project activities.

1. Course Coding Scheme

1.1 Adopted Course Code:

XX- ABC

1.2 Acronym used in Subject Category (XX)

MA -MAthematics
PH - PHysics
CH - CHemistry
HU - HUmanities
ES - Environmental Science
EC - Electronics and Communication engineering
EE - Electrical Engineering
ME - Mechanical Engineering
CE - Civil Engineering
IT – Information Technology

1.3 Paper Coding for the Papers:

Three Digits Numeric Number (ABC) is used as Paper Code:

XX -	A	B	C
Subject Category	Semester	0:: Theory 1:: Laboratory 2:: Elective-I (Open) 3:: Elective-II (Open) 4:: Elective-III 5:: Elective-IV 6:: Minor Project 7:: Major Project 8:: Grand Viva	Paper Number [In case of Practical papers, this number stands for its corresponding theory subject number]

Example: IT-205 refers to the 5th Theory paper of 2nd Semester of category Information Technology.

Course Structure

Year: I **Semester I**

Sl. No.	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME					Credits
(THEORY)			L	T	P	Internal Assessment			ESE	TOTAL	
						TA	CT	ST			
1	MA-101	Engineering Mathematics-I	3	1	-	20	20	40	60	100	4
2	CH-102	Engineering Chemistry	3	1	-	20	20	40	60	100	4
3	ME-103	Engineering Mechanics	3	0	-	15	15	30	45	75	3
4	PH-104	Engineering Physics	3	1	-	20	20	40	60	100	4
5	EE-105	Basic Electrical Engineering	3	0	-	15	15	30	45	75	3
PRACTICALS / DRAWING / DESIGN											
6	PH-114	Engineering Physics Laboratory	-	-	4	20	-	20	30	50	2
7	CE-116	Engineering Graphics	-	-	4	20	-	20	30	50	2
		Total	15	3	8					550	**22**

L – Lecture **T** – Tutorial **P** – Practical **TA**-Teachers Assessment
CT-Class Test **ST**-Sub-Total **ESE**-End Semester Examination
Contact Hours: 26 Total Marks: 550 Total Credits: 22

Year: I **Semester II**

Sl. No.	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME					Credits
(THEORY)			L	T	P	Internal Assessment			ESE	SUB TOTAL	
						TA	CT	TOT			
1	MA-201	Engineering Mathematics II	3	1	-	20	20	40	60	100	4
2	IT-202	Computer Systems and Programming	3	1	-	20	20	40	60	100	4
3	ES-203	Elements of Environmental Science	3	0	-	15	15	30	45	75	3
4	EC-204	Basic Electronics	3	1	-	20	20	40	60	100	4
5	HU-205	Professional Communication Skills	2	1	-	15	15	30	45	75	3
PRACTICALS / DRAWING / DESIGN											
6	IT-212	Computer Programming Laboratory	-	-	4	20	-	20	30	50	2
7	HU-215	Digital English Language Laboratory	-	-	4	20	-	20	30	50	2
		Total	14	4	8					550	**22**

L – Lecture **T** – Tutorial **P** – Practical **TA**-Teachers Assessment
CT-Class Test **ST**-Sub-Total **ESE**-End Semester Examination
Contact Hours: 26 Total Marks: 550 Total Credits: 22

Year: II **Semester III**

Sl. No.	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME					Credits
(THEORY)			L	T	P	Internal Assessment			ESE	SUB TOTAL	
						TA	CT	TOT			
1	IT-301	Digital Electronics	3	0	-	15	15	30	45	75	3
2	IT-302	Data Structures and Algorithms	3	1	-	20	20	40	60	100	4
3	IT-303	Discrete Mathematics	3	1	-	20	20	40	60	100	4
4	IT-304	Computer Graphics and Multimedia	3	1	-	20	20	40	60	100	4
5	IT-305	Data Communication	3	0	-	15	15	30	45	75	3
PRACTICALS / DRAWING / DESIGN											
6	IT-312	Data Structure Laboratory	-	-	4	20	-	20	30	50	2
7	IT-314	Computer Graphics and Multimedia Lab	-	-	4	20	-	20	30	50	2
		Total	15	3	8					550	**22**

L – Lecture **T** – Tutorial **P** – Practical **TA**-Teachers Assessment
CT-Class Test **ST**-Sub-Total **ESE**-End Semester Examination
Contact Hours: 26 Total Marks: 550 Total Credits: 22

Year: II **Semester IV**

Sl. No.	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME					Credits
(THEORY)			L	T	P	Internal Assessment			ESE	SUB TOTAL	
						TA	CT	TOT			
1	MA-401	Statistics and Random Processes	3	0	-	15	15	30	45	75	3
2	IT-402	Relational Data Base Management Systems	3	1	-	20	20	40	60	100	4
3	IT-403	Formal Language and Automata Theory	3	1	-	20	20	40	60	100	4
4	IT-404	Object Oriented Programming & Methodology	3	1	-	20	20	40	60	100	4
5	IT-405	Computer Organization & Architecture	3	0	-	15	15	30	45	75	3
PRACTICALS / DRAWING / DESIGN											
6	IT-412	Data Base Management Systems Laboratory	-	-	4	20	-	20	30	50	2
7	IT-414	Object Oriented Programming using C++ Laboratory	-	-	4	20	-	20	30	50	2
		Total	15	3	8					550	**22**

L – Lecture **T** – Tutorial **P** – Practical **TA**-Teachers Assessment
CT-Class Test **ST**-Sub-Total **ESE**-End Semester Examination
Contact Hours: 26 Total Marks: 550 Total Credits: 22

Year: III **Semester V**

Sl. No.	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME					Credits
			L	T	P	Internal Assessment			ESE	SUB TOTAL	
		(THEORY)				TA	CT	TOT			
1	IT-501	Compiler Design	3	1	-	20	20	40	60	100	4
2	IT-502	Operating System	3	1	-	20	20	40	60	100	4
3	IT-503	Algorithm Analysis and Design	3	1	-	20	20	40	60	100	4
4	IT-504	Computer Networks	3	1	-	20	20	40	60	100	4
		PRACTICALS / DRAWING / DESIGN									
5	IT-512	Operating System Lab	-	-	4	20	-	20	30	50	2
6	IT-514	Computer Networks Laboratory	-	-	4	20	-	20	30	50	2
7	IT -515	Java Programming Laboratory	-	-	4	20	-	20	30	50	2
		Total	12	4	12					550	**22**

L – Lecture **T** – Tutorial **P** – Practical **TA**-Teachers Assessment
CT-Class Test **ST**-Sub-Total **ESE**-End Semester Examination
Contact Hours: 28 Total Marks: 550 Total Credits: 22

Year: III **Semester VI**

Sl. No.	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME					Credits
(THEORY)			L	T	P	Internal Assessment			ESE	SUB TOTAL	
						TA	CT	TOT			
1	HU-601	Engineering Economics and Accountancy	3	1	-	20	20	40	60	100	4
2	IT-602	Web Technology	3	1	-	20	20	40	60	100	4
3	IT-603	Cryptography & Network Security	3	1	-	20	20	40	60	100	4
4	IT-62X	Elective-I (Open)	3	1	-	20	20	40	60	100	4
PRACTICALS / DRAWING / DESIGN											
5	IT-612	Web Technology Laboratory	-	-	4	20	-	20	30	50	2
6	IT-613	Cryptography & Network Security Laboratory	-	-	4	20	-	20	30	50	2
7	IT-615	Software System Laboratory	-	-	4	20	-	20	30	50	2
		Total	12	4	12					550	**22**

L – Lecture **T** – Tutorial **P** – Practical **TA**-Teachers Assessment
CT-Class Test ST-Sub-Total **ESE**-End Semester Examination
Contact Hours: 28 Total Marks: 550 Total Credits: 22

Elective I (Open):

1. Wireless Networks (IT -621)
2. Real-time System (IT - 622)
3. Distributed System (IT -623)
4. Data Mining (IT -624)
5. Parallel Computing (IT -625)
6. Simulation and Modeling (IT -626)

Year: IV **Semester VII**

Sl. No.	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME					Credits
(THEORY)			L	T	P	Internal Assessment			ESE	SUB TOTAL	
						TA	CT	TOT			
1	IT-701	Software Engineering	3	1	-	20	20	40	60	100	4
2	IT-702	Artificial Intelligence	3	1	-	20	20	40	60	100	4
3	IT -73X	Elective-II (Open)	4	0	-	20	20	40	60	100	4
PRACTICALS / DRAWING / DESIGN											
5	IT-761	Minor Project	-	-	20	-	-	100	150	250	10
		Total	10	2	20					550	**22**

L – Lecture **T** – Tutorial **P** – Practical **TA**-Teachers Assessment
CT-Class Test **ST**-Sub-Total **ESE**-End Semester Examination
Contact Hours: 32 Total Marks: 550 Total Credits: 22

Elective II (Open):

1. E- Commerce (IT-731)
2. Management Information System (IT - 732)
3. Industrial Management (IT -733)
4. Computer Forensic and Cyber Law (IT -734)
5. Operations Research (IT -735)
6. Professional Ethics and IPR (IT -736)

Year: IV **Semester VIII**

Sl. No.	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME					Credits
(THEORY)			L	T	P	Internal Assessment			ESE	SUB TOTAL	
						TA	CT	TOT			
1	IT-84X	Elective-III	4	0	-	20	20	40	60	100	4
2	IT-85X	Elective-IV	4	0	-	20	20	40	60	100	4
PRACTICALS / DRAWING / DESIGN											
3	IT-871	Major Project	-	-	24			120	180	300	12
4	IT-881	Grand Viva	-	-	-				50	50	2
		Total	8	0	24					550	**22**

L – Lecture **T** – Tutorial **P** – Practical **TA**-Teachers Assessment
CT-Class Test **ST**-Sub-Total **ESE**-End Semester Examination
Contact Hours: 32 Total Marks: 550 Total Credits: 22

Elective III:

1. Human Computer Interaction (IT -841)
2. Digital Image Processing (IT - 842)
3. Pattern Recognition (IT -843)
4. Natural Language Processing (IT -844)
5. Soft Computing (IT -845)
6. Bio-informatics (IT -846)

Elective IV:

1. Advanced Cryptography (IT- 851)
2. Advanced Computer Architecture (IT - 852)
3. Mobile Computing (IT -853)
4. Performance Engineering (IT -854)
5. Cloud Computing (IT -855)
6. Machine Learning (IT -856)

Table of Contents

Detail Syllabus

Semester I

MA – 101 Engineering Mathematics-I **3-1-0 = 4**

Subject Code: *MA - 101.*
Subject Name: *Engineering Mathematics-I.*
No. of Hours Per Week: *Lectures-3, Tutorial-1.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT -I

Differential Calculus of Single Variable: Functions, continuity and differentiability *(with emphasis on hyperbolic and inverse hyperbolic functions)***,** Properties of continuous functions on closed intervals, Intermediate value theorem and its applications, Successive differentiation; Taylor's and Maclaurin's series; L'Hospital rule (statements only with applications)

UNIT-II

Complex analysis: Analytic functions, Cauchy-Riemann equations, Cauchy's integral theorem, Cauchy's integral formula, Taylor series and Laurent series. Residue and its applications to evaluating real integrals (statements only with applications).

UNIT- III

Laplace and Fourier Transforms: Laplace transforms, Inverse transform, shifting on the *s* and ***t*** axes, convolutions, partial fractions, Fourier transforms, Solutions of ordinary differential equations by Laplace and Fourier transforms.

UNIT- IV

Linear Algebra: Vector space over the field of real and complex numbers, subspaces, bases and dimension; Matrices and Linear Transformation; Elementary row and column operations; echelon form; normal form; system of linear equations; Eigen values and Eigen vectors; Cayley-Hamilton theorem; diagonalization.

Text Books:

1. E. Kreyszig, "Advance Engineering Mathematics", 8th Ed., J. Willey & Co, 1999.
2. Spiegel, "Fourier Analysis with application & Laplace Transforms", Tata McGraw Hill, 2004.
3. S. Pal and S. C. Bhunia, "Engineering Mathematics", Oxford University Press, 2015.
4. B.S. Grewal, "Higher Engineering Mathematics", 42nd Ed., Khanna Publication, 2012.

Reference Books:

1. Babu Ram, "Engineering Mathematics", Pearson, 2009.
2. Sastry, "Engineering Mathematics", PHI, 2008.
3. M. C. Potter, J. L Goldberg and E.F. Aboufadel, "Advance Engineering Mathematics", Oxford University Press, 2005.

CH – 102 Engineering Chemistry **3-1-0 = 4**

Subject Code: *CH - 102.*
Subject Name: *Engineering Chemistry.*
No. of Hours Per Week: *Lectures-3, Tutorial-1.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT - I

Chemical Thermodynamics: Second law of thermodynamics, entropy and its physical significance, entropy change of ideal gases, free energy, Maxwell's relations, Gibbs-Helmholtz equation, thermodynamic equilibrium, Van't Hoff equation, Clausius-Clapeyron equation, Nernst heat theorem, third law of thermodynamics.

UNIT – II

Organic Chemistry: Structures, functions and classification of biologically important molecules (Amino acids, Peptides, Proteins, Nucleic acids, Carbohydrates); Preparative methods of Amino acids and Peptides; Peptide sequencing; 3D Structure of Proteins; Reactions of monosaccharides *Polymers:* Types of Polymerization; Classification and structures of polymers; Commercial uses of some important polymers (e.g., Nylons, Polyester, Polyurethane, Rubber, Teflon, Polycarbonate, Bakelite, Epoxy resin, Silicones, etc.).

UNIT - III

Electrochemistry: Electrochemical cells, EMF and applications of its measurement, commercially important cells, corrosion (its electrochemistry and remedial measures) *Chemical Kinetics:* Reactions of different orders - general discussion, rate law with examples of zero, first and second order reactions, problems based on zero, first and second order reactions, pseudo-uniorder reaction, activation energy and role of catalyst in a reaction - collision theory and activation energy.

UNIT - IV

Water and its hazard in industry: Soft & Hard water and estimation of hardness of water, hazards of hard water in industry and treatment of industrial water (external and internal methods). *Fundamentals of Spectroscopy*: Microwave, infra-red and UV-VIS spectroscopic techniques.

Text books:

1. Prakash, Tuli, Basu and Madan, “Advanced Inorganic Chemistry”, Vol. I & II (Diamond Ed.), S. Chand, Reprinted, 2006.
2. Morrison and Boyd, “Organic Chemistry”, 6th Ed., Prentice Hall of India, reprinted, 2006.
3. Jain and Jain, “Engineering Chemistry”, Dhanpat Rai Publishing Co., 2008.

Reference Books:

1. S. H. Pine “Organic Chemistry”, 5th Ed. (Special Indian Ed.), Tata McGraw Hill, 2007.
2. Banwell and McCash, “Fundamentals of Molecular Spectroscopy”, 4th Edition, Tata McGraw Hill, 1962.

ME – 103 Engineering Mechanics **3-0-0 = 3**

Subject Code: *ME - 103.*
Subject Name: *Engineering Mechanics.*
No. of Hours Per Week: *Lectures-3, Tutorial-0.*
Marks Distribution: *Internal Assessment: 30, End Semester Examination: 45.*
Questions to be set: *Six (Q.No. 1 of 15 marks combining all the units and Q.No. 2 to Q.No. 6 of 10 marks each taking at least one from each unit).*
Questions to be answered: *Four (Q.No. 1 is compulsory and taking any three from the rest).*
Duration of End Semester Examination: *Two and Half Hours.*

UNIT-I

Force Systems: Moment of a force about a point and about an axis; couple moment; reduction of a force system to a force and a couple. Equilibrium: Free body diagram; equations of equilibrium; problems in two and three dimensions; plane frames and trusses.

UNIT–II

Friction: Laws of Coulomb friction, problems involving large and small contact surfaces; square threaded screws; belt friction; rolling resistance. *Properties of Areas*: Moments of inertia and product of inertia of areas, polar moment of inertia, principal axes and principal moments of inertia.

UNIT–III

Kinematics and Rigid Body Dynamics: Particle dynamics in rectangular coordinates cylindrical coordinates and in terms of path variables; central force motion. Relative velocity, Translation, Pure rotation and plane motion of rigid bodies, D'Alembert's principle, linear momentum, principle of conservation of momentum, impact of solid bodies, work, energy, power, principle of conservation of energy.

Text Books:

1. R. K. Bansal, "A textbook of Engineering Mechanics", Laxmi Publication, 1992.
2. F. P. Beer and F. R. Johnston, "Mechanics for Engineering", TMH, 1987.
3. S. Ramamurtham, "Engineering Mechanics", Dhanpatrai Publishing Company, 2003.

Reference Books:

1. Timoshenko and Young, "Engineering Mechanics", McGraw Hill Publications, 1956.
2. A. Nelson, "Engineering Mechanics-Statics & Dynamics", McGraw Hill Publications (reprint), 2010.

PH – 104 Engineering Physics **3-1-0 = 4**

Subject Code: *PH - 104.*
Subject Name: *Engineering Physics.*
No. of Hours Per Week: *Lectures-3, Tutorial-1.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT I:
Classical mechanics and General properties of matter Co-ordinate system: Cartesian, plane polar and Spherical polar coordinate system, Relationship between the coordinate system, velocity and acceleration in plane polar and spherical polar coordinate systems. Dimension analysis, Theory of Errors, *Moment of inertia*: Theorems of parallel and perpendicular axes, Compound pendulum and its theory. *Elasticity:* Interrelation of elastic constants, Torsion of a cylinder.

UNIT II:
Optics Interference: Concept of Interference, types of interference, Young's double slit experiment, Newton's ring experiment: Theory and application*, Diffraction:* Fraunhofer diffraction at a single slit, diffraction grating. Fresnel diffraction, zone plate, *Polarization:* Types of polarization, Nicol prism as polarizer and analyzer, half wave plate and quarter wave plate and applications.

UNIT III:
Atomic, molecular and nuclear Physics: Rutherford model, Bohr model and Sommerfeld model of hydrogen atom. Vector atom model; Spectra of hydrogen atom, Concept of a molecule, molecular spectra, Raman effect. Nuclear binding energy, Nuclear reaction and Q-value, Nuclear fission, chain reaction, concept of a nuclear reactor, nuclear fusion and stellar energy.

UNIT IV:
Electromagnetism: Electric field intensity and electric potential and the relation between them, Gauss law, Lorentz force, Biot-Savart law, Ampere's law, Faraday law, Maxwell's equation, Electromagnetic (e. m.) wave equation, solution of e. m. wave, transverse nature of e. m. wave.

Text Books:
1. P K Chakrabarthy, “Mechanics and General Properties of Matter”, Books & Allied Ltd., 2001.
2. B B Laud, “Electromagnetics”, 2nd Ed., New age international, 1997.
3. A Beiser, “Concepts of Modern physics”, Tata McGraw Hill, New Delhi, 1997.
4. H K Malik and A K Singh, “Engineering Physics”, Tata McGraw Hill, New Delhi, 2010.

Reference Books:
1. F W Sears, M W Zemansky and H D Young, “University Physics”, Narosa Publishing House, 1982.
2. G R Fowles and G L Cassiday, “Analytical Mechanics”, 7th Ed., Ceingage Learning, Indian Edition, 2005.
3. P V Naik, “Principles of Physics”, Prentice Hall of India Pvt. Ltd., 2000.
4. S G Lipson, H Lipson and D S Tannhauser, “Optical Physics”, Cambridge University Press, 1995.

EE – 105 Basic Electrical Engineering **3-0-0 = 3**

Subject Code: *EE - 105.*
Subject Name: *Basic Electrical Engineering.*
No. of Hours Per Week: *Lectures-3, Tutorial-0.*
Marks Distribution: *Internal Assessment: 30, End Semester Examination: 45.*
Questions to be set: *Six (Q.No. 1 of 15 marks combining all the units and Q.No. 2 to Q.No. 6 of 10 marks each taking at least one from each unit).*
Questions to be answered: *Four (Q.No. 1 is compulsory and taking any three from the rest).*
Duration of End Semester Examination: *Two and Half Hours.*

UNIT – I

Engineering Circuit Analysis: Circuit elements, Ohm's law, Kirchoff's law, Nodal Analysis, Mesh Analysis, Source transformations, Linearity and Superposition, Thevenin and Norton Theorems, Maximum power transfer theorem, Star-Delta and Delta-Star Conversion.

UNIT – II

Series and Parallel RLC Circuits: Simple RL and RC Circuits, Unit Step Forcing Function, source free RLC Circuits, Sinusoidal Forcing Function, Complex Forcing Function, Phasor Concept, Impedance and Admittance, Phasor diagrams, Response as a Function of, Instantaneous Power, Average Power, RMS values of Current and Voltage, Apparent Power and Power Factor, Complex Power, Introduction to Three Phase Circuits.

UNIT – III

DC Machines: Principle of DC Generator, Methods of excitation, Characteristics and Applications, Principle of DC Motor, Types, Speed – Torque Characteristic, Speed Control. Transformers: Working principle of Transformers, Induction Motor: Construction, Production of rotating field, Slip, Torque and Slip, Single Phase Induction Motor.

Text Books:

1. W.H. Hayt, J.E. Kemmerly and S.M. Durbin, "Engineering Circuit Analysis", 6th Ed., TMH, 2006.
2. D.P. Kothari, I. J. Nagrath, "Theory and Problems of Basic Electrical Engineering", PHI, 2004.
3. B.L. Thereja and A.K. Thereja, "Electrical Technology", Vol-II, S. Chand, Reprint, 2006.

Reference Books:

1. Van Valkenburg, "Network Analysis", 3rd Ed., PHI, 2005.
2. D. Roy Choudhury, "Networks and Systems", New Age Publishers, 1998.

PH – 114 Engineering Physics Laboratory **0-0-4 =2**

Subject Code: *PH - 114.*
Subject Name: *Engineering Physics Laboratory.*
No. of Hours Per Week: *Four.*
Marks Distribution: *Internal Assessment: 20, End Semester Examination: 30.*
Questions to be set: *Ten (Any one question shall be allotted on lottery basis)*
Duration of End Semester Examination: *Three Hours.*

List of Experiments:

1. To determine the acceleration due to gravity by bar pendulum/Kater's pendulum.
2. To determine the Young's modulus of a wire by micrometers method/ of a bar by flexural method.
3. To determine rigidity modulus of a wire by statistical method/dynamical method.
4. To determine the focal length & power of a concave lens by combination with auxiliary convex lens by the displacement method.
5. To find the wavelength of monochromatic light by using Newton's ring method.
6. To determine the wavelength of sodium light by Michelson's interferometer.
7. To determine the wavelength of prominent lines of mercury by plane diffraction grating.
8. To determine he specific rotation of sugar solution by polarimeter.
9. To determine the magnetic moment of a bar magnet (M) and the earth's horizontal intensity (H) (by deflection and vibration magnetometers).
10. To determine the resistance per unit length of a meter bridge wire by Carey- Foster Method.
11. To study decay of current in RC circuit.
12. To determine frequency of a tuning fork by Melde's method.
13. To determine the thermal conductivity of a bad conductor Lee's method.
14. To obtain the hysteresis curves (B-H) for a ferromagnetic material (thin rod or wire) on a CRO using solenoid and then to determine the related magnetic constants.
15. To study the Hall Effect and determine the Hall Coefficient.
16. To determine the Planck's constant by a Photocell.
17. To determine the e/m value of an electron by any method.

Text Books:

1. Samir Kumar Ghosh, "A Text book of Practical Physics", New Central Book Agency, Kolkata, 2006.
2. Gupta and Kumar, "Practical Physics", Pragati Prakashan, Meerut, U.P., 2005.
3. C. L. Arora, "Advance B.Sc. Practical Physics", S. Chand, 2004.

Reference Books:

1. H J Pain, "The Physics of Vibrations and Waves", 6th Ed., Wiley Student Edition, 2005.
2. P V Naik, "Principles of Physics", Prentice Hall of India Pvt. Ltd., 2000.

CE– 116 Engineering Graphics **0-0-4 = 2**

Subject Code: *CE - 116.*
Subject Name: *Engineering Graphics.*
No. of Hours Per Week: *Four Hours.*
Marks Distribution: *Internal Assessment: 20, End Semester Examination: 30.*
Questions to be set: *Ten (Any one question shall be allotted on lottery basis)*
Duration of End Semester Examination: *Three Hours.*

List of Drawing Plates/Sheets:

1. Introduction of Drawing (Sheet layout and Sketching, lines, Lettering and Dimensioning).
2. Geometrical Constructions (Bisecting a lines, Perpendicular lines, divide a lines, Construction of Polygons).
3. Conics and Engineering Curves (Ellipse, Parabola, Hyperbola).
4. Conics and Engineering Curves (Cycloid, Epicycloid, Hypocycloid, Trochoid, Involute).
5. Projection of Points.
6. Projection of Lines.
7. Projection of Planes.
8. Projection of Solid (Cube, Prism, Pyramids).
9. Projection of Solid (Cylinder, Cone and Sphere).
10. Isometric projection of solids (Prisms, Pyramids, Cylinders, Cone and Sphere).
11. Development of Surfaces (Truncated Cylinder, Square Prism, Pyramid, Truncated Cone).
12. Introduction to CAD Tools (Scale, Units, Draw, Modifying, Dimension, Sheet Layout, Plotting).

Text Books:

1. T. E. French, C.J. Vierck and R. J. Foster, “Engineering Drawing and Graphics Technology”, TMH, 1987.
2. N. D. Bhatt and V.M. Panchal, “Elementary Engineering Drawing”, Charotar Publishing House, 1996.

Reference Books:

1. K.Venugopal, “Engineering Drawing and Graphics”, New Age, 2005.
2. Dhananjay A. Johle, “Engineering Drawings”, McGraw Hill Education Pvt. Ltd., 2008.

Semester-II

MA – 201 Engineering Mathematics-II **3-1-0 = 4**

Subject Code: *MA - 201.*
Subject Name: *Engineering Mathematics - II.*
No. of Hours Per Week: *Lectures-3, Tutorial-1.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT - I

Calculus of several variables: Partial derivatives. Chain rule, Standard Jacobians for change of variables, Gradient and directional derivatives, Tangent and normal planes, Exact Differentials, Euler's theorem on homogeneous functions, Repeated and multiple integrals, maxima and minima for several variables, method of Lagrange's multipliers.

UNIT - II

Vector Calculus: Vector valued function of one or more variables (up to 3), derivatives ofsuch a function of one variable. Gradient of a scalar valued function, Geometrical properties of gradient. Divergence and Curl of vector valued functions, Line,surface, and volume integrals. Green's theorem, Gauss's divergence theorem and Stoke's theorem in Cartesian coordinates (statements only with applications).

UNIT – III

Numerical Methods: Bisection method, Newton-Rapson's and Secant methods for roots of nonlinear equations. Polynomial interpolation, divided differences. Numerical Differentiation and Numerical integration, trapezoidal and Simpson's rules..

UNIT-IV

Ordinary Differential Equations (ODE): Ordinary linear differential equations of nth order, solutions of homogeneous equations, Wronskian, Operator method (simple problems only with emphasis on second order homogeneous equations).Variation of Parameters for second order linear ODE with variable coefficients. Nonlinear equations and Clairaut's equations.

Text Books:

1. E. Kreyszig, "Advanced Engineering Mathematics", 8th Ed, J. Willey & Co, 1999.
2. S. Pal and S. C. Bhunia, "Engineering Mathematics'', Oxford University Press, 2015.
3. B.S. Grewal, "Higher Engineering Mathematics", 42nd Edition, Khanna Publication, 2012.

Reference Books:

1. Babu Ram, "Engineering Mathematics", Pearson, 2009.
2. Sastry, "Engineering Mathematics", PHI, 2008.
3. M. C. Potter, J. L Goldberg and E.F. Aboufadel, "Advance Engineering Mathematics", Oxford University Press, 2005.

IT – 202 Computer Systems and Programming **3-1-0 = 4**

Subject Code: *IT - 202.*
Subject Name: *Computer Systems and Programming.*
No. of Hours Per Week: *Lectures-3, Tutorial-1.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination Marks: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT-I

Digital computer fundamentals: Generation and classification of computers, basic organization of computers, number systems, algorithm and flowchart, functions of system software, programming languages. *Imperative Programming (Using C):* Overview of C, constants, variables, keywords, data types, operators and expressions, C instructions.

UNIT-II

Branching and looping operation. *Functions*: Function prototypes, defining a function, accessing a function, passing arguments to a function and recursion. Storage classes and C preprocessor.

UNIT-III

Arrays and Pointers: Defining an array, processing an array, multidimensional arrays, strings, string handling functions. Pointer fundamentals, pointer declarations, pointer arithmetic, pointer as function arguments, array of pointers, Dynamic memory allocations.

UNIT-IV

Structures and Unions: Defining and processing of structure and union, array of structure, array within structure, passing of structure as function argument. *File Management:* Introduction, defining and opening a file, closing a file, input/output operations on files, error handling during I/O operations, random access to files, command line arguments.

Text Books:

1. E. Balaguruswami, “Programming in ANSI C”, 2nd Ed., Tata McGraw Hill, 2004.
2. Y. Kanetkar, “Let us C”, BPB Publication, 2004.
3. V. Rajraman, “Fundamental of Computer”, 4th Ed., PHI, 2006.

Reference Books:

1. Reema Thareja, “Computer fundamentals and programming in C”, Oxford university press, 2013.
2. A. Kelley and I. Pohl, “A Book on C”, 4th Ed., Pearson Education, 1998.

ES – 203 Elements of Environmental Science **3-0-0 = 3**

Subject Code: *ES - 203.*
Subject Name: *Elements of Environmental Science.*
No. of Hours Per Week: *Lectures-3, Tutorial-0.*
Marks Distribution: *Internal Assessment: 30, End Semester Examination: 45.*
Questions to be set: *Six (Q.No. 1 of 15 marks combining all the units and Q.No. 2 to Q.No. 6 of 10 marks each taking at least one from each unit).*
Questions to be answered: *Four (Q.No. 1 is compulsory and taking any three from the rest).*
Duration of End Semester Examination: *Two and Half Hours.*

UNIT - I

Environment, Ecosystems and Biodiversity: Concept of environment*:* components of environment and their interactions; abiotic and biotic factors; Ecosystems: characteristic feature and structure and function of forest, grassland, desert and aquatic ecosystem (Ponds, streams, lakes, rivers, oceans, estuaries); Ecological pyramid; energy flow and nutrient cycling; Biodiversity: value of biodiversity; loss and conservation of biodiversity.

UNIT - II

Environmental problems and issues: Environmental problems and issues: greenhouse effect, ozone depletion, acid rain; Renewable and non-renewable resources; natural resources, associated problem and its conservation: forest, water, mineral, food, energy and land resources; environmental impact assessment; environment protection act.

UNIT - III

Environmental Pollution and Management: Environmental pollution: sources and types of air, water, soil, radioactive and noise pollution; Industrial pollutants and their impact on environment and human health; Toxicants and toxicity; toxic chemicals: heavy metals and pesticides; Safety and prevention of industrial pollution; bio-transformation and bioremediation; Aerobic and anaerobic treatment of waste water; waste management and cleaner production.

Text Books

1. W. P. Cunningham and W.B. Saigo, “Environmental Science”, McGraw Hill, New York, 1999.
2. E. P. Odum and G. W. Barrett, “Fundamentals of Ecology”, Thomson Asia Pvt. Ltd., Singapore, 2005.
3. E. Bacci, “Contaminants in the Environment”, CRC Press, 1994.

Reference Books

1. N. J. Sell, “Industrial Pollution Control: Issues and Techniques”, Wiley Publication, 1992.
2. Venugopal Rao, “Textbook of Environmental Engineering”, PHI, 2003.

EC – 204 Basic Electronics **3-1-0 = 4**

Subject Code: *EC - 204.*
Subject Name: *Basic Electronics.*
No. of Hours Per Week: *Lectures-3, Tutorial-1.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT- I

Properties of Semiconductors: Energy bands in solids, E-K Diagram; intrinsic & extrinsic semiconductors;carriers transport phenomena: drift & diffusion current, mobility & resistivity. Generation & recombination of carriers; Hall effect, PN-Junction Diode: General idea; characteristics; Transition capacitance and diffusion capacitance.

UNIT- II

Applications of PN-Junction Diodes: Half wave, full wave center-tapped and bridge rectifiers; Clipping & clamping circuits. Characteristics and Applications of Special Purpose Diodes: Zener, Photo, Varactor, Schottky, Tunnel diode & Light emitting diode, Photovoltaics.

UNIT- III

Transistors: Constructions, symbols, principle of operations, configurations and characteristics of BJT and FET(JFET & MOSFET), Application of BJT as amplifier, Unijunction Transistor (UJT), Transistor Biasing: Q point, Graphical analysis (DC & AC load line), Various bias circuits.

UNIT- IV

Special Diodes: Tunnel Diode, Varactor diode, Schottky diode, CCD, Impatt diode, Gunn diode etc.- their characteristics and applications.

Text Books:

1. D. Chattopadhay and P. C. Rakshit, "Electronics Fundamentals and Applications", 12th Ed., New Age International (P) Ltd., 2014.
2. J. Millman and C. Halkias, "Integrated Electronics", 42nd Reprint, TMH, 2006.
3. R. Boylestead and L. Nashelsky, "Electronic Devices and Circuits Theory", 9th Ed., PHI, 2006.
4. M. S. Sukhija and T.K. Nagsarkar, "Basic Electrical and Electronics Engineering", Oxford, 2012.
5. B. Streeman and S. Banerjee, "Solid State Electronics Devices", 6th Ed., PHI, 2006.

Reference Books:

1. A. P. Malvino, "Electronic Principles", 6th Ed., TMH, 1998.
2. R. P. Jain, "Modern Digital Electronics", 3rd Ed., TMH, 2003.
3. R. J. Tocci, "Digital Systems", 6th Ed., PHI, 2001.

HU – 205 Professional Communication Skills **2-1-0 = 3**

Subject Code: *HU - 205.*
Subject Name: *Professional Communication Skills.*
No. of Hours Per Week: *Lectures 2, Tutorial-1.*
Marks Distribution: *Internal Assessment: 30, End Semester Examination: 45.*
Questions to be set: *Six (Q.No. 1 of 15 marks combining all the units and Q.No. 2 to Q.No. 6 of 10 marks each taking at least one from each unit).*
Questions to be answered: *Four (Q.No. 1 is compulsory and taking any three from the rest).*
Duration of End Semester Examination: *Two and Half Hours.*

UNIT- I

*General Principles of Communication and Oral Communication***:** The Process of Communication, Principles of Communication(communication barriers, levels of Communication, Communication network, verbal, non-verbal) and Professional Communication. The Speech Mechanism, IPA Symbols (vowel and consonant sounds), minimal pairs, word transcription, stress and intonation, active listening, types of listening, traits of a good listener, active versus passive listening.

UNIT- II

Constituents of Effective Writing and Vocabulary: The sentence and its parts, articles, the verb phrase, tense and aspect, the active and passive, the adjective, interrogative and negative sentences, concord, preposition. Paragraph development, summary writing and reading, comprehension word formation processes: affixation, compounding, converting, use of words in different parts of speech, idioms and phrases.

UNIT- III

Business Correspondence and Communication Strategies: Characteristics of Business Letters, Drafting: Bio-data/ Resume/Curriculum vitae (theory) *Report Writing:* Structure, Types of Reports (theory) Presentation Skills, Public speaking and group discussion (theory) and Soft Skills (theory).

Text Books

1. B. K. Das, K. Samantray, "An Introduction to Professional English and Soft Skills", CUP, New Delhi, 2009.
2. R.C. Sharma and K. Mohan, "Business correspondence and Report Writing", Tata McGraw Hill, New Delhi, 2002.
3. A. Doff, C. Jones, "Language In Use, Upper- Intermediate Classroom Book", CUP, New Delhi, 2004.

Reference Books

1. J. D. O'Connor, "Better English Pronunciation", CUP, London, 2006.
2. P. Patnaik, "Group Discussion and Interview Skills", CUP, New Delhi, 2011.

IT – 212 Computer Programming Laboratory **0-0-4 = 2**

Subject Code: *IT -212.*
Subject Name: *Computer Programming Laboratory.*
No. of Hours Per Week: *Four Hours.*
Marks Distribution: *Internal Assessment: 20, End Semester Examination: 30.*
Questions to be set: *Ten (Any one question shall be allotted on lottery basis)*
Duration of End Semester Examination: *Three Hours.*

List of Programs:

1. **Assignments on Operators and Expressions:** C programs using operators and expressions.
2. **Assignments on Branching:** C programs using if, if-else, if-elseif-else, switch-case construct of C.
3. **Assignments on Looping:** C programs incorporating for loop, while loop and do-while loop.
4. **Assignments on Array:** C programs using array (1D and 2D)
5. **Assignments on String:** String manipulation and use of standard library functions in C.
6. **Assignments on Function:** C programs using function, Demonstration of call by-value and call-by-address, passing array (1D and 2D) to a function, C programs to understand recursive function.
7. **Assignments on Pointer:** C programs using pointer, function and array.
8. **Assignments on Structure & Union:** C program using structure, demonstration of difference between structure and union.
9. **Assignments on File handling:** C programs involving opening, closing, reading/writing and random access in a file.
10. **Assignment on Command Line Arguments**: C programs involving passing parameters through command line argument.

Text Books:

1. B.S.Gotfried, “Programming in C”, Schuam Outline Series, TMH, 2005.
2. Y. Kanetkar, “Let us C”, BPB Publication, 2004.
3. E. Balaguruswami, “Programming in ANSI C”, 2nd Ed., Tata McGraw Hill, 2004.

HU – 215 Digital English Language Laboratory **0-0-4 = 2**

Subject Code: *HU - 215.*
Subject Name: *Digital English Language Laboratory.*
No. of Hours Per Week: *Four Hours.*
Marks Distribution: *Internal Assessment: 20, End Semester Examination: 30.*
Questions to be set: *Ten (Any one question shall be allotted on lottery basis).*
Duration of End Semester Examination: *Three Hours.*

Laboratory Practices:
1. Articulation and practice of vowel sounds
2. Articulation and practice of consonant sounds
3. Practice word stress using three or more syllable words
4. Intonation practice
5. Practice situational dialogues
6. Practice presentations skills
7. Telephone skills
8. Debating
9. Job Interviews
10. Group Discussion (GD)
11. Public Speaking
12. Comprehension Practice
13. Public Speaking
14. Drafting Emails
15. Drafting Business Letters
16. Drafting CVs
17. Reporting

Text Books:

1. Jones, Daniel, “Cambridge English Pronouncing Dictionary with CD”, New Delhi, 2011.
2. “Cambridge Learners Dictionary with CD”, CUP, New Delhi, 2009.

Semester-III

IT – 301 Digital Electronics **3-0-0 = 3**

Subject Code: *IT - 301.*
Subject Name: *Digital Electronics.*
No. of Hours Per Week: *Lectures-3, Tutorial-0.*
Marks Distribution: *Internal Assessment: 30, End Semester Examination: 45.*
Questions to be set: *Six (Q.No. 1 of 15 marks combining all the units and Q.No. 2 to Q.No. 6 of 10 marks each taking at least one from each unit).*
Questions to be answered: *Four (Q.No. 1 is compulsory and taking any three from the rest).*
Duration of End Semester Examination: *Two and Half Hours.*

UNIT- I

Signed numbers; Canonical representations-minterm, maxterm; Karnaugh map simplification up to six variables, Quine- McCluskey minimization, r's and r-1's complement arithmetic, binary coded decimal codes, Gray codes.

UNIT- II

Combinational circuits: adders: half and full; ripple carry adder, carry-look-ahead adder; subtractors: half and full; comparators; parity circuits; decoders, encoders, multiplexers, demultiplexers and their applications; code converter.

UNIT- III

Sequential logic devices and circuits: latches, SR, JK, D and Tip-ops; shift-registers; digital system design, ASM, FSM, synchronous and asynchronous module counter, Digital IC families (DTL, TTL, CMOS). Logic families: TTL inverter circuit description and operation; CMOS inverter circuit description and operation; other TTL and CMOS gates;

Text Books:

1. M. Mano, “Digital Design”, 3rd Ed., PHI, 2006.
2. R. P. Jain, “Modern Digital Electronics”, 3rd Ed., TMH, 2009.
3. Tocci and Widmer, “Digital Systems: Principles and Applications”, 8th Ed., PHI, 2006.
4. M. Mano, “Digital Logic and Computer Design”, PHI, 1996.

Reference Books:

1. Sanjay Sharma, “Digital Electronics and Logic Design”, 4th Ed., S.K. Kataria & Sons, 2015.
2. G. K. Kharate, “Digital Electronics”, 1st Ed., Oxford University Press, 2014.
3. A. Anand Kumar, “Fundamental of Digital Circuits”, 2nd Ed., PHI, 2009.
4. Donald P. Leach, “Digital Principles and Applications”, 6th Ed., TMH, 2006.

IT – 302 Data Structures and Algorithms **3-1-0 = 4**

Subject Code: *IT - 302.*
Subject Name: *Data Structure and Algorithms.*
No. of Hours Per Week: *Lectures-3, Tutorial-1.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT-I

Introduction: Types of Data Structures, List- array and linked list representation, insertion, deletion and searching of elements in a list, circular linked list- insertion, deletion, and search operation, Stack- array and linked list representation, operations on stacks, its application in prefix, postfix and infix expression, Queue- array and linked list representation, insertion and deletion operations in queue, and Circular queue.

UNIT-II

Non-linear Data Structure: Introduction to Tree, Representation of Tree, Binary Trees, Tree traversals, *Binary Search Tree*: Introduction and representation, Searching, insertion and deletion operation in a Binary Search Tree.

UNIT-III

AVL Tree: representation, searching, inserting and deleting in AVL tree, B-trees- representation, searching, insertion and deletion in a B-Tree.

UNIT-IV

Graphs: Introduction to graph theory, array and linked list representations, Breadth-first and Depth-first Search. *Spanning tree*: Introduction, Kruskal's algorithm, *Hashing:* Hashing functions, searching using hash technique, Collision avoidance techniques- linear probing, separate chaining.

Text Books:

1. S Lipschutz, "Data Structures", 4th Ed, TMH, 2006.
2. V. Aho Alfred, Hopperoft John E., UIlman Jeffrey D., "Data Structures and Algorithms", Addison Wesley, 1983.
3. Horowitz Ellis & Sartaj Sahni, "Fundamentals of Data Structures", Galgotia Pub., 2008.

Reference Books:

1. Y Langsum, M J Augenstein, A M Tenenbaum, "Data Structures using C and C++", 2nd Ed., PHI, 1998.

IT – 303 Discrete Mathematics **3-1-0 = 4**

Subject Code: *IT - 303.*
Subject Name: *Discrete Mathematics.*
No. of Hours Per Week: *Lectures-3, Tutorial-1.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT-I

Relations: Types of relations; Matrix representation of relations, Representation of relations as graphs; Ordering; Partial Ordering. *Functions:* Functions; mappings; injection, surjections and bijection; composition of functions; inverse functions; Recursive functions. Introduction to Lattice *Logic***:** propositional logic (formulae, truth tables, proof systems), predicate logic (formulae, interpretations, proof systems).

UNIT-II

Combinatorics: permutation, combination, summations, partitions. Introduction to recurrence relation and generating function.

UNIT-III

*Graph Theory***:** paths, connectivity, Euler graph, Hamiltonian path, sub graphs, isomorphic and homeomorphic graphs, complete graphs, bipartite graphs, trees, graph coloring.

UNIT-IV

*Algebraic Structures***:** semigroups, groups, subgroups, homomorphisms, rings, integral domains, fields. The application of residue arithmetic to Computers- Group Codes.

Text Books:

1. J. P. Tremblay and R. P. Manohar, "Discrete Mathematics with Applications to Computer Science", Tata McGraw-Hill, 2001.
2. S. Lipschutz and M. L. Lipson, "Schaum's Outline of Theory and Problems of Discrete Mathematics", 3rd Ed., Tata McGrawHill , 2009.
3. B. Ram, "Discrete Mathematics", Pearson, 2011.

Reference Books:

1. C. L. Liu, "Elements of Discrete Mathematics", 2nd Ed., Tata McGraw-Hill, 2000.
2. R. L. Graham, D. E. Knuth, and O. Patashnik, "Concrete Mathematics", 2nd Ed., Addison-Wesley, 1994.
3. N. Deo, "Graph Theory with Applications to Engineering and Computer Science", Prentice Hall of India, 1974.
4. K. Krithivasan, "Discrete Mathematics and its Applications to Combinatorics and Graph Theory", 7th Ed., McGraw Hill Education, 2008.

IT – 304 Computer Graphics and Multimedia **3-1-0 = 4**

Subject Code: *IT - 304.*
Subject Name: *Computer Graphics and Multimedia.*
No. of Hours Per Week: *Lectures-3, Tutorial-1.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT-I

Introduction to computer graphics & graphics systems: Overview of computer graphics, representing pictures, preparing, presenting & interacting with pictures for presentations; Visualization & image processing; Raster scan display *Scan conversion:* Points & lines, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generation algorithm; Ellipse generating algorithm; Scan line polygon fill algorithm, Boundary fill algorithm, Flood fill algorithm.

UNIT-II

2D transformation & viewing: Basic transformations: translation , rotation, scaling, reflection; Matrix representations and homogeneous coordinates; Viewing pipeline, Window to viewport coordinate transformation, clipping operations, point clipping , line clipping , Polygon Clipping *3D transformation & viewing:* 3D transformations: translation, rotation, scaling & other transformations, Rotation about an arbitrary axis in space, reflection through an arbitrary plane; viewport clipping, 3D viewing.

UNIT-III

Curves: Curve representation, surfaces, designs, Bezier curves, B-spline curves, end conditions for periodic B-spline curves, rational B-spline curves. *Hidden surfaces:* Depth comparison, Z-buffer algorithm, Back face detection.

UNIT-IV

Introduction to Multimedia: Multimedia today, Impact of Multimedia, Multimedia Systems, Components and Its Applications. *Text:* Types of Text, Ways to Present Text, Aspects of Text Design, Character, Character Set, Codes, Unicode, Encryption. *Audio:* Basic Sound Concepts, Types of Sound, Digitizing Sound, Computer Representation of Sound (Sampling Rate, Sampling Size, Quantization), Audio Formats, Audio tools, MIDI. *Image:* Formats, Image Color Scheme and Model, *Digital Video:* Recording Formats and Standards (JPEG, MPEG, H.261) Transmission of Video Signals. *Synchronization:* Temporal relationships, synchronization accuracy specification factors, quality of service

Text Books:

1. Hearn, Baker, " Computer Graphics C version" 4th Ed.,Pearson education, 2011.
2. Z. Xiang, R. Plastock, " Schaum's outlines Computer Graphics" 2nd Ed., TMH, 2000.

Reference Books:

1. Foley, Vandam, Feiner, Hughes, "Computer Graphics principles", 3rd Ed., Pearson Education, 2011.
2. W. M. Newman, R. F. Sproull, "Principles of Interactive computer Graphics", TMH, 1979.

IT – 305 Data Communication **3-0-0 = 3**

***Subject Code**: IT – 305.*
***Subject Name**: Data Communication.*
***No. of Hours Per Week**: Lecture– 3, Tutorial -0*
***Marks Distribution**: Internal Assessment:* 30, *End Semester Examination*: 45
***Question to be set:** Six (Q.No. 1 of 15 marks combining all the units and Q.No. 2 to Q.No. 6 of 10 marks each taking at least one from each unit).*
***Question to be answered**: Four (Q.No. 1 is compulsory and taking any three from the rest).*
***Examination duration**: Two and Half Hours.*

UNIT-I

Overview of Data Communications: Introduction to Communications Network, Types of Networks- Point-to-point Circuits, Circuit-switched Networks, Message-switched Networks, Packet-switched Networks, Types of Packet-Switched Networks- Wide Area Networks (WAN), Internet Service Providers (ISPs), Local Area Networks (LANs). *Basics of Digital Communications:* Introduction to digital communication, Data and Signal, Analog and Digital Signal, Time domain and Frequency domain representation of Signal, Bandwidth, Transmission Impairments and Channel Capacity, Sources of Impairment, Attenuation, Distortions, Data Rate Limits- Nyquist's theorem, Shannon's Capacity

UNIT-II

Transmission Medium: Guided Transmission Media- Twisted pair cables, Co-axial cables, Fiber optic cables- Working principle, Advantages & disadvantages, UnGuided Transmission Media- Electromagnetic spectrum, Wireless Transmission, Wireless Propagation, Line-of-Sight Transmission, free-space path loss, infrared & satellite communication system *Data Encoding and Modulation:* Baseband Communication (Analog/Digital), Data Encoding and Modulation, Types of Analog Modulation: Amplitude Modulation, Frequency Modulation and Phase Modulation, Pulse Modulation System: Pulse Amplitude Modulation (PAM), Pulse Width Modulation (PWM)

UNIT-III

Encoding Analog Data as Digital Signal: Pulse Code Modulation (PCM), Encoding Digital Data as Digital Signals, Line Coding Schemes: NRZ, RZ, Manchester, Block Coding, Scrambling Digital Modulation: Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK), Quadrature Amplitude Modulation (QAM), Fundamentals of modems. *Multiplexing and Spreading:* Multiplexing and Application, Frequency Division Multiplexing (FDM), Wavelength Division Multiplexing (WDM) Time Division Multiplexing (TDM), Spread Spectrum Techniques

Text Books:

1. W. Stallings, "Data and Computer Communications", 7th Ed., Prentice Hall of India, 2004.
2. B. A. Forouzan, "Data Communications and Networking", 3rd Ed., McGraw Hill, 2004.

Reference Books:

1. J. F. Kurose and K. W. Ross, "Computer networking: A Top-down Approach Featuring the Internet", 3rd Ed., Addison-Wesley, 2005.
2. G. Held, "Ethernet Networks: Design, Implementation, Operation, Management", 4th Ed., John Wiley & Sons, 2002

IT – 312 Data Structure Laboratory **0-0-4 = 2**

Subject Code*: IT – 312.*
Subject Name*: Data Structure Laboratory.*
No. of Hours Per Week*: Four Hours.*
Marks Distribution*: Internal Assessment:* 20, *End Semester Examination*: 30.
Questions to be set: *Ten (Any one question shall be allotted on lottery basis).*
Examination duration*: Three Hours.*

List of Programs:

1. Implementation of Singly Linked List and perform insertion, deletion, display and search operation on it.
2. Implementation of Doubly Linked List and perform insertion, deletion, display and search operation on it.
3. Implementation of Circular Linked List and perform insertion, deletion, display and search operation on it.
4. Array implementation of Stack, Queue, and Circular queue data structures.
5. Linked List implementation of Stack, Queue and Circular queue data structures.
6. Implementation on conversion of infix expression to prefix and postfix using Stack,
7. Implementation on evaluation of expression using Stack.
8. Linked list representation of binary tree and perform insertion, deletion operation on it.
9. Implementation of tree traversals techniques (in order, preorder and post order traversals).
10. Implementation of binary search tree and perform searching on it.
11. Implementation of Breath first search in a graph.
12. Implementation of Depth first search in a graph.
13. Implementation of Hashing using chaining and linear probing technique.

Text book:

1. S Lipschutz, “Data Structures”, 4th Ed., TMH, 2006.

IT – 314 Computer Graphics and Multimedia Laboratory **0-0-4 = 2**

Subject Code*: IT – 314.*
Subject Name*: Computer Graphics and Multimedia Laboratory.*
No. of Hours Per Week*: Four Hours.*
Marks Distribution*: Internal Assessment: 20, End Semester Examination: 30.*
Questions to be set: *Ten (Any one question shall be allotted on lottery basis)*
Examination duration*: Three Hours.*

List of Programs:

Experiments using C/OpenGL/Java

1. Implementation of Algorithms for drawing 2D Primitives - Line (DDA, Bresenham) – all slopes
2. Circle Generation (Midpoint, Bresenham),
3. Ellipse Generation (Midpoint)
4. 2D Geometric transformations – Translation of a Line,
5. Rotation, Reflection of a Line.

Experiments using OpenGL

6. 3D Transformations - Translation, Rotation, Scaling
7. 3D Projections – Parallel, Perspective
8. Creating 3D Scenes

Experiments using Adobe Flash, Photoshop

9. Image Editing and Manipulation - Basic Operations on image using any image editing software, Creating gif animated images, Image optimization
10. 2D Animation – To create Interactive animation using any authoring tool (Motion Tween, Shape Tween, Guided Motion Tween, Digital Clock, Analog Clock, Masking)

Text Books:

1. D. Hearn and M. P. Baker, “Computer Graphics”, 3rd Ed., Prentice Hall, 2004.
2. Ralf Steinmetz and Klara Nahrstedt, “Multimedia: Computing, Communications & Applications”, Pearson, 2012.

Semester-IV

MA – 401 Statistics and Random Processes **3-0-0 = 3**

Subject Code: *MA - 401.*
Subject Name: *Statistics and Random Processes.*
No. of Hours Per Week: *Lectures-3, Tutorial-0.*
Marks Distribution: *Internal Assessment: 30, End Semester Examination: 45.*
Questions to be set: *Six (Q.No. 1 of 15 marks combining all the units and Q.No. 2 to Q.No. 6 of 10 marks each taking at least one from each unit).*
Questions to be answered: *Four (Q.No. 1 is compulsory and taking any three from the rest).*
Duration of End Semester Examination: *Two and Half Hours.*

UNIT- I

Introduction to probability : Events, Set, set operations, classical and relative frequency based definitions of probability, axiomatic definition of probability, conditional probabilities, independence, total probability, Baye's rules and applications, *Random variables* : Continuous and discrete random variables, cumulative distribution function (cdf), probability mass function (pmf), probability density functions (pdf) and properties.

UNIT- II

Some special distributions: Binomial and Poisson discrete distributions, Uniform, exponential, Gaussian and Raleigh continuous distributions. Expected value of a random variable(s), mean, variances and moments of random variables. Function of single random variable. *Two dimensional random variables*: joint distribution and density functions, marginal probability distribution, conditional probability distribution, independence.

UNIT- III

Functions of two random variables, Multivariate random variables, covariance and correlations, independence, law of large numbers, central limit theorem *Random Process*: Discrete and continuous time processes, probabilistic description of random process, mean, auto correlation and auto covariance functions. *Stationarity*: strict sense stationary (SSS), wide sense stationary (WSS) processes, auto correlation functions of a WSS process and its properties, Cross correlation functions, Power spectral densities and properties. Gaussian process, Poison process and Markov processes.

Text Books:

1. A. Papoulis and S.U. Pillai, "Probability, Random Variables, and Stochastic Process", 4th Ed., McGraw Hill, 2002.
2. H. Stark and J.W. Woods, "Probability and Random Processes with applications to Signal Processing", Pearson Education, 2002.

Reference Books:

1. P.Z. Pebbles, "Probability, Random Variables and random signals principles", 4th Ed., McGraw Hill, 2000.
2. T. Veerarajan, "Probability, Statistics and Random Processes", 2nd Ed., McGraw Hill, 2003.

IT – 402 Relational Database Management Systems **3-1-0 = 4**

Subject Code: *IT – 402.*
Subject Name: *Relational Database Management Systems.*
No. of Hours Per Week: *Lectures-3, Tutorial-1.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT-I

*Introduction***:** Overview, File systems Vs. DBMS, Levels of abstraction, ER Modeling. *Relational Model*: Overview, Relations and Integrity Constraints, Relational Algebra and Calculus.

UNIT-II

Schema Refinement: Problem of data redundancy, Functional dependencies, Closure, Attribute Closure, Normal Forms: 1NF-3NF, BCNF; Decompositions.

UNIT-III

SQL: Basic SQL Query, Nested Queries, Aggregate queries, Views. *Query optimization and evaluation***:** Steps in query processing, Selection operation, Join operation, Query optimization, Query Evaluation.

UNIT-IV

*Concurrency control and recovery***:** Concepts of transactions, ACID, Concurrent Execution, Schedules, Serializability, Lock based concurrency control: Simple, Two phase and Graph based. *Crash recovery*: Introduction to crash recovery, Log based recovery, Check pointing.

Text Books:

1. Henry F. Korth, Silberschatz Abraham and Sudarshan, "Database System Concepts", McGraw Hill, 2011.
2. Raghu Ramakhrishnan and Johannes Gehrke, "Database Management Systems", McGraw Hill, 2003.

Reference Books:

1. Bipin C. Desai, "An Introduction to Database System", Galgotia Publishing, 1998.
2. R. Elmasri and B. Navathe, "Fundamental of Database Systems", Addison-Wesley, 2010.

IT – 403 Formal Language and Automata Theory **3-1-0 = 4**

Subject Code: *IT - 403.*
Subject Name: *Formal Language and Automata Theory.*
No. of Hours Per Week: *Lectures-3, Tutorial-1.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT-I
Basic concepts: alphabets, languages, and grammars. *Regular Languages*: regular expressions. Myhill-Nerode theorem, regular grammars, closure properties, Pumping lemma, decidable properties of regular languages. *Deterministic and nondeterministic finite automata:* equivalence of DFAs and NFAs, minimization of DFAs.

UNIT-II
Context free languages: *context free grammars (CFGs):* derivations, derivation trees, ambiguous grammars, inherently ambiguous languages, *normal forms of CFGs:* Chomsky Normal Form and Greibach Normal Form.

UNIT-III
*Pushdown automata (PDAs)***:** deterministic and nondeterministic PDAs (DPDAs and NPDAs), deterministic CFLs, closure properties of CFLs, Pumping lemma and Ogden's Lemma, decidable properties of CFLs.

UNIT-IV
*Turing machines***:** Definition, Designing of Turing machine, computable function, Church's hypothesis, Context sensitive languages: context sensitive grammars, linear bounded automata.

Text Books:

1. Daniel I. A. Cohen, "Introduction to Computer Theory", 2nd Ed., Wiley, 1996.
2. J. E. Hopcroft, R. Motwani and J. D. Ullman, "Introduction to Automata Theory, Languages and Computation", 2nd Ed., Pearson Education, 2000.

Reference Books:

1. M. Sipser, "Introduction to the Theory of Computation", Thomson, 2004.
2. H. R. Lewis and C. H. Papadimitriou, "Elements of the Theory of Computation", Pearson Education Asia, 2001.
3. D. C. Kozen, "Automata and Computability", Springer-Verlag, 1997.

IT – 404 Object Oriented Programming and Methodology **3-1-0 = 4**

Subject Code: *IT – 404.*
Subject Name: *Object Oriented Programming and Methodology.*
No. of Hours Per Week: *Lectures-3, Tutorial-1.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT-I

*Introduction***:** Basic concepts of OOP (Abstraction, Encapsulation, Inheritance, Polymorphism), Procedural programming vs OOP *Objects and Classes*: Concepts of class and objects, member access operators, access functions (private and public) constructors and destructor, static members, arrays of objects, returning objects from functions, Friend functions and classes

UNIT-II

*Inheritance***:** Types of inheritance, defining derived class, public, private and protected inheritance, accessing base class members, ambiguity in multiple inheritance, virtual base classes, abstract classes, derived class constructor with arguments.

UNIT-III

*Polymorphism***:** Compile time polymorphism-operator overloading, function overloading, Run-time polymorphism-Virtual function, and pure virtual function.

UNIT-IV

*Templates***:** instantiation, class template, function templates, function template overloading, *Exception handling***:** Error handling, grouping of exceptions, catching exceptions, catch all, re-throw.

Text Books:

1. E. Balaguruswamy, “Object oriented programming with C++”, TMH, 2013.

Reference Books:

1. Bjarne Stroustrup, “The C++ Programming Language”, Addison Wesley, 2002.

IT – 405 Computer Organization and Architecture **3-0-0 = 3**

Subject Code: *IT – 405.*
Subject Name: *Computer Organization & Architecture.*
No. of Hours Per Week: *Lectures-3, Tutorial-0.*
Marks Distribution: *Internal Assessment= 30, End Semester Examination Marks = 45.*
Questions to be set: *Six (Q.No. 1 of 15 marks combining all the units and Q.No. 2 to Q.No. 6 of 10 marks each taking at least one from each unit).*
Questions to be answered: *Four (Q.No. 1 is compulsory and taking any three from the rest).*
Duration of End Semester Examination: *Two and Half Hours.*

UNIT –I

Basic Components and their interconnection in a computer System, different abstraction levels of computation from problem definition to circuit level implementation, review of digital circuits and digital components. Data representation, different arithmetic algorithms, basic ALU organization

UNIT-II

Instruction Set Architecture (ISA): Von Neumann vs. Data Flow. Instruction set, Instruction format, Instruction mode: ISA design tradeoff, Register Transfer Language and micro operation, design of control unit: microprogrammed and hardwired control unit.

UNIT- III

Memory and I/O access: Memory maps, Read Write operations, Programmed I/O, Concept of handshaking, Polled and Interrupt driven I/O, DMA data transfer; I/O subsystems: I/O interfacing, Inside the Memory: memory organization, static and dynamic memory; Cache memory and Memory Hierarchy- Cache memory access techniques; Virtual memory, Introduction to parallel Processing.

Text Books:

1. M. M. Mano, "Computer System Architecture", Pearson, 3rd Ed., 2007.
2. Stallings, "Computer Organization & Architecture", 8th Ed., Pearson Education, 2009.

Reference Books:

1. Hennessey and Patterson, "Computer Architecture: A quantitative Approach", 5th Ed., Morgan Kaufman Publication, 2012.

IT – 412 Database Management Systems Laboratory **0-0-4 = 2**

Subject Code: *IT - 412*
Subject Name: *Database Management Systems Laboratory*
No. of Hours Per Week: *Four Hours.*
Marks Distribution: *Internal Assessment: 20, End Semester Examination: 30*
Questions to be set: *Ten (Any one question shall be allotted on lottery basis)*
Examination duration: *Three Hours*

List of Programs:

1. Program for creating, altering and dropping tables with integrity constraints.
2. Program for retrieving and modifying data from a database.
3. Program for retrieving data from database using IN, BETWEEN, LIKE, ORDER BY, GROUP BY and HAVING clause.
4. Program using of scalar and aggregate functions.
5. Program for retrieving data from a database using Equi, Non Equi, Outer and Self Join.
6. Program using subqueries.
7. Program use of views, indexes and sequences.
8. Program using of implicit & explicit cursors in data handling.
9. Program using exception handling.
10. Program using stored procedures & functions in data manipulation.
11. Program using trigger in data manipulation.

Text Books:

1. Ivan Bayross, "SQL, PL /SQL – The Programming Language of Oracle", BPB Press, 2009.
2. Steven Feuerstein, "Oracle PL/SQL Programming", Shroff Publishers, 2014.
3. Kevin Loney and George Koch, "Oracle 9i – The Complete Reference", Oracle Press, 2002.

IT – 414 Object Oriented Programming using C++ Laboratory **0-0-4 = 2**

Subject Code: *IT – 414.*
Subject Name: *Object Oriented Programming Laboratory.*
No. of Hours Per Week: *Four Hours.*
Marks Distribution: *Internal Assessment: 20, End Semester Examination: 30*
Questions to be set: *Ten (Any one question shall be allotted on lottery basis)*
Examination duration: *Three Hours.*

List of Programs:

1. Define a class Complex and overload operators +, - , *, <<, >> for complex numbers.
2. Define a class Matrix and overload operators +, - , *, <<, >>.
3. Define a class String and write a C++ program to overload + for concatenation, >= , <= , == for comparison of two strings.
4. Programs illustrating overloading and overriding methods in C++.
5. Programs illustrating the implementation of various forms of inheritance (Ex. Single Hierarchical, Multilevel inheritance etc.) in C++
6. Program, which illustrates the implementation of multiple inheritances in C++.
7. Define a basic two-dimensional Shape class from which objects such as rectangle, circle which can be derived. Let the user specify the position, size, of drawing 2-D object.
8. Implement ‘static class member function’ using class Item which has a static member count.
9. Implement insertion and deletion in Stack with exception handling and templates.
10. Implement Queue operations insertion, deletion with exception handling and templates.

Text books:

1. E. Balaguruswamy, “Object Oriented Programming with C++”, TMH, 2005.
2. H. Schildt, “ C++: The Complete Reference”, 4th Edition, TMH, 2003

Semester-V

IT – 501 Compiler Design **3-1-0 = 4**

Subject Code: *IT - 501.*
Subject Name: *Compiler Design.*
No. of Hours Per Week: *Lectures-3, Tutorial-1.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT-I
Overview of phases of a compiler, Languages and grammar, a simple one-pass compiler, incorporating symbol table, abstract *Lexical analysis***:** Finite automata, from a regular expression to an NFA, *Lexical analyzer*: Design of Lexical analyzer generator.

UNIT-II
*Parsing***:** Top-down and Bottom-up parsers, shift-reduce parser, recursive descent parser, LL (1); LR(0), SLR, LALR parsers, Syntax-directed translation, parser generator

UNIT-III
*Semantic Analysis***:** Syntax-directed translation, Declaration processing, Type checking. *Intermediate Code Generation*: Intermediate languages, assignment statements, Boolean expression.

UNIT-IV
Code generation: Basic blocks, optimization of basic blocks. Flow-graphs; Register allocation, simple code generator; *Code optimization*: An introduction to the optimization techniques, sources of optimization.

Text Books:

1. A.V Aho, R. Sethi, and J.D. Ullman, “Compiler Design”, Pearson Education, 2003.

Reference Book:

1. Jean-Paul Tremblay and Paul G. Sorrenson, “The Theory and Practice of Compiler Writing”, McGraw Hill, 1985.
2. S. Chattopadhyaya, “Compiler Design”, PHI, 2005.

IT – 502 Operating System **3-1-0 = 4**

Subject Code: *IT- 502.*
Subject Name: *Operating System.*
No. of Hours Per Week: *Lectures-3, Tutorial-1.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT -I

Introduction: Objectives and functions of OS, Evolution of Operating Systems, Structural overview *Process description and control*: Process states, Process description, Process control, Process and threads, Examples of process description and control *Uniprocessor scheduling*: Types of CPU scheduling, CPU Scheduling algorithms.

UNIT-II

Concurrency: Principles of concurrency, mutual exclusion, Software and Hardware approaches, Semaphores, Monitors, Message passing, readers/ writers problem, Principles of deadlock, Deadlock prevention, Detection and avoidance, Dining philosopher's problem, Example systems.

UNIT- III

Memory Management: Memory management requirements, Loading program into main memory, Virtual memory, Hardware and control structures, OS software, Examples of memory management.

UNIT- IV

I/O management and disk scheduling, File management and security: Overview of file management, File organization and access, File directories, File sharing, Record blocking, Secondary storage management, Example systems. *Case study*: Unix file system, inodes, inode assignment to a new file, super block.

Text Books:

1. A. Silbershatz, P.B. Galvin and Gagne, "Operating System Concepts", Addison- Wesley, 2005.
2. Maurice J. Bach "The design of the UNIX operating system", Eastern Economy Edition, Prentice Hall of India Pvt. Ltd., New Delhi, 2004.

Reference Books:

1. A. S. Tanenbaum "Operating System Design and Implementation", 3rd Ed., Practice Hall of India, 2004.
2. W. Stalling, "Operating Systems: Internals and Design Principles", 5th Ed., Prentice Hall of India, 2007.
3. H. N. Dietel "An Introduction to Operating Systems", Addison Wesley, 1990.

IT – 503 Algorithm Analysis and Design **3-1-0 = 4**

Subject Code: *IT - 503.*
Subject Name: *Algorithm Analysis and Design.*
No. of Hours Per Week: *Lectures-3, Tutorial-1.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT –I

Algorithms and Complexity: asymptotic notations, orders, worst-case and average-case, amortized complexity. Sorting and order statistics: Insertion Sort, Heap Sort, Sorting in linear time, Medians and order statistics.

UNIT-II

Basic Techniques: divide & conquer: Quicksort, Merge sort, Dynamic programming: Overview, difference between dynamic programming and divide and conquer, Matrix chain multiplication, Traveling salesman Problem, longest Common sequence, Greedy method: Knapsack problem, Job sequencing with deadlines, Huffman codes, Backtracking: 8-Queen Problem, Sum of subsets. Branch and bound: LC searching Bounding, FIFO branch and bound, LC branch and bound application: 0/1 Knapsack problem, Traveling Salesman Problem.

UNIT-III

Data Structures for Set Manipulation Problems: Fundamental operations on set, Hashing, Binary search, Binary search trees, Optimal binary search trees, A simple-disjoint-set union algorithm, Tree structures for UNION-FIND problem, Application and extensions of the UNION-FIND algorithm, Balanced tree schemes, Dictionaries and priority queues, Mergeable heaps, Concatanable queues, Partitioning. *Graph Algorithms*– BFS and DFS, connected components, spanning trees, shortest paths, max-flow

UNIT-IV

NP- Problems: The classes P and NP problems, NP-completeness of the satisfiability problem, Additional NP-complete problems, NP-hard Problems.

Text Books:

1. Cormen, Leiserson and Rivest "Introduction to Algorithms", 2nd Ed., Prentice Hall of India, 2004.
2. Aho, Hopcroft and Ullman "The design and Analysis of Algorithms", Addition-Welsley, 1975.

Reference Books:

1. E. Horowitz and S. Sahani, "Fundamentals of Algorithms", Galgotia Publications, 2007.
2. Udi Manber, "Introduction to Algorithms", Addison-Wesley, 2009.

IT – 504 Computer Networks **3-1-0 = 4**

Subject Code: *IT - 504*
Subject Name: *Computer Networks*
No. of Hours Per Week: *Lectures-3, Tutorial-1*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT -I

Introduction: History and development of computer networks, Network architecture models- ISO-OSI and TCP/IP, Data encoding, Framing, Error detection, Reliable data transmission, Network performance. *Medium access control:* Multiple access protocols- ALOHA, CSMA/CD, FDMA, TDMA, CDMA.

UNIT-II

Internetworking: Switching and bridging, Basic Internet Protocol, IPv6, ARP, DHCP, ICMP *Routing algorithms:* Distance vector, Link state, Hierarchical routing, Subnetting, Supernetting Classless addressing, Network Address Translation (NAT).

UNIT- III

End-to-end protocols: Inter-process communication, Transmission Control Protocol (TCP)- establishing & releasing connections, Flow control and buffering, connection management, transmission policy, User Datagram protocol (UDP), Real-time Transport Protocol (RTP), Remote Procedure Call (RPC) *Congestion control:* Congestion control in IP, TCP congestion control, Congestion-avoidance mechanisms, Socket Programming-basics, socket functions, writing client/server programs.

UNIT- IV

Data representation: Presentation formatting, multimedia data *Applications:* Traditional applications- E-mail, World Wide Web (WWW), Multimedia Applications- Session control and call control (SDP, SIP, H.323), Resource allocation for multimedia applications, Infrastructure services- Domain Name Service (DNS), Simple Network Management Protocol (SNMP), Firewall.

Text Books:

1. Larry L. Peterson and Bruce S. Davie, “Computer Networks- A Systems Approach”, 5th Ed., Morgan Kaufmann, 2013.
2. Douglas E. Comer, “Internetworking with TCP/IP- Principles. Protocols, and Architecture”, 5th Ed., Vol-1, PHI, 2006.

Reference Books:

1. JF Kurose and KW Ross, “Computer Networking: A Top-Down Approach”, 5th Ed., Addison-Wesley, 2009.
2. Andrew S. Tanenbaum and David J. Wetherall, "Computer Networks", 5th Ed., Pearson, 2010.
3. Forouzan, “Data Communications and Networking” 5th Ed., Mcgraw Hill Education, 2013.

IT – 512 Operating System Laboratory **0-0-4 = 2**

Subject Code: *IT - 512.*
Subject Name: *Operating System Laboratory.*
No. of Hours Per Week: *Four.*
Marks Distribution: *Internal Assessment: 20, End Semester Examination: 30.*
Questions to be set: *Ten (Any one question shall be allotted on lottery basis).*
Duration of End Semester Examination: *Three Hours.*

List of Programs*:*

1. Simple Unix-C (at least two) programs using system calls to read and write strings on standard I/O devices and files.
2. Implementation of starting a new process, replacing a process image, duplicating a process image, waiting for a process, zombie process.
3. Implementation of Dining Philosopher problem using shared memory and semaphore.
4. Implementation of bounded-buffer problem using shared memory and semaphore.
5. Implementation of FCFS process scheduling techniques.
6. Implementation Shortest Job First (both preemptive and non-preemptive version) process scheduling techniques.
7. Implementation Round Robin process scheduling techniques.
8. Implementation for simulating page replacement algorithms like FIFO, Optimal and LRU.
9. Implementation of threads using POSIX or using thread class in Java.
10. Implementation of (at least one) deadlock avoidance techniques.

Text Books:

1. Stevens, “UNIX programming”, Pearson Education, Pearson Education, 2004.

IT – 514 Computer Networks Laboratory **0-0-4 = 2**

Subject Code: *IT – 514.*
Subject Name: *Computer Networks Lab.*
No. of Hours Per Week: *Four.*
Marks Distribution: *Internal Assessment: 20, End Semester Examination: 30.*
Questions to be set: *Ten (Any one question shall be allotted on lottery basis).*
Duration of End Semester Examination: *Three Hours.*

List of Programs*:*

1. Implementation of Byte stuffing framing technique
2. Implementation of Bit stuffing framing technique
3. Implementation of Stop-and-Wait ARQ protocol
4. Implementation of Selective-Repeat ARQ protocol
5. Implementation of Go-back-N ARQ protocol
6. Implementation of Echo-back Server using TCP/UDP socket
7. Date & Time extraction from a given server using TCP/UDP socket
8. Implementation of Quote Server using TCP/UDP socket
9. Serving a client by creating a new process using TCP/UDP socket
10. Serving a client by creating a new thread using TCP/UDP socket
11. Implementation of a simple FTP server using TCP/UDP socket
12. Implementation of ping command using TCP/UDP socket

Text Books:

1. W. Richard Stevens, "UNIX Network programming", 3rd Ed., PHI Learning Pvt. Ltd, 2009
2. K. Davis, John W. Turner and Nathan Yocom, "The Definitive Guide to Linux Network Programming", 1st Ed., Apress, 2004.

Reference Books:

1. R. S. Stone, "Beginning LINUX programming", WROX publication, 1999.

IT – 515 Java Programming Laboratory **0-0-4 = 2**

***Subject Code**: IT – 515.*
***Subject Name**: Java Programming Laboratory.*
***No. of Hours Per Week**: Four.*
***Marks Distribution**: Internal Assessment: 20, End Semester Examination: 30.*
***Questions to be set:** Ten (Any one question shall be allotted on lottery basis).*
***Examination duration**: Three Hours.*

List of Experiments:

1. Use Eclipse or Netbeans platform and acquaint with the various menus. Create a test project, add a test class and run it. See how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods and classes. Try debug step by step with a small program of about 10 to 15 lines which contains at least one if else condition and a for loop.
2. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -, *, % operations. Add a text field to display the result. Handle any possible exceptions like divided by zero.
3. Develop Experiment no. 2 using applet. Display suitable messages/prompts.
4. Write a Java program to perform Number Format Exception and Arithmetic Exception Handling. Display the exception in a message dialog box.
5. Write a Java program that implements a multithreaded application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
6. Write a Java program that connects to a database using JDBC and does add, delete, modify and retrieve operations.
7. Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "Stop" or "Ready" or "Go" should appear above the buttons in selected color. Initially there is no message shown.
8. Write a Java program to create an abstract class named Shape that contains two integers and an empty method named printArea(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method printArea() that prints the area of the given shape.
9. Suppose that a table named Table.txt is stored in a text file. The first line in the file is the header, and the remaining lines correspond to rows in the table. The elements are separated by commas. Write a java program to display the table using Labels in Grid Layout.
10. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired (Use Adapter classes).
11. Write a Java program that loads names and phone numbers from a text file where the data is organized as one line per record and each field in a record are separated by a tab ( ). It takes a name or phone number as input and prints the corresponding other value from the hash table (hint: use hash tables).
12. Implement the above program with database instead of a text file.
13. Write a Java program that takes tab separated data (one record per line) from a text file and inserts them into a database.
14. Write a java program that prints the metadata of a given table.

Text Book:

1. Herbert Schildt and dale skrien, “Java Fundamentals - A comprehensive Introduction”, TMH, 2012

Reference Books:

1. P. J. Deitel and H.M. Deitel, “Java for Programmers”, Pearson education, PHI, 2012

Semester-VI

HU – 601 Engineering Economics and Accountancy **3-1-0 = 4**

Subject Code: *HU – 601.*
Subject Name: *Engineering Economics and Accountancy.*
No. of Hours Per Week: *Lectures-3, Tutorial-1.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT – I
Concept of demand and supply, elasticity of demand, types of market structure, firm and industry, business cycle, input and out analysis, plant location decision.

UNIT – II
Management principles and functions, managerial skills, decision making process, types of organization structures, Maslow's hierarchy of needs, types of communication, leadership styles.

UNIT – III
Marketing concept, factors affecting consumer behavior, types of market segments, product life cycle, pricing methods, distribution channels, advertising and sales promotion, value engineering.

UNIT – IV
Financial Accounting: Balance sheet and related concepts, Profit & Loss Statement and related concepts, Financial Ratio Analysis, Cash flow analysis, Funds flow analysis, Comparative financial statements, Analysis and Interpretation of financial statements. *Investments*- Risks and return evaluation of investment decision, Average rate of return, Payback Period, Net Present Value, Internal rate of return.

Text Books:

1. R.R. Barthwal, "Industrial Economics: An Introductory Text Book", New Age, 2000.
2. H. L. Ahuja, "Managerial Economics", S. Chand and Company Ltd., New Delhi, 2007.
3. Murugan , M and Sakthivel, "Management Principles and Practices" , New Age International Publishers, New Delhi, 2008.

Reference Books:

1. Prasanna Chandra. "Fundamentals of Financial Management", Tata Mcgraw Hill Publishing Ltd., 4th Ed., 2005.

IT – 602 Web Technology **3-1-0 = 4**

Subject Code: *IT - 602.*
Subject Name: *Web Technology.*
No. of Hours Per Week: *Lectures-3, Tutorial-1.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT-I
Introduction to www, http and web architecture, *HTML*: Overview, tags, elements, image, table, links, frames and forms.

UNIT- II
Cascading Style Sheets (CSS): Text or font properties, background, border, margin, padding properties, page layout properties, element type properties and user interface properties. *JavaScript*: Overview, forms processing, objects, functions, popup and HTML DOM.

UNIT-III
Extensible Markup Language (XML): Overview, syntax, document type definition, XML and Java, Parsers, SAX parsers, DOM parsers. AJAX.

UNIT-IV
J2EE architecture, Servlet, JSP, JDBC: Introduction, JDBC architecture, JDBC API, retrieving and updating data and transaction support, Overview of JavaBeans, Example APIs.

Text Books:

1. Thomas Powell, “Web Design: The Complete Reference”, McGraw-Hill, 2002.
2. Allamaraju and Buest , “Professional JAVA Server Programming”, SPD Publication, 2003
3. Eric Armstrong, “The J2EE Trademarked 1.4 Tutorial”, Sun Microsystems, 2005.

Reference Books

1. C.Xavier, “Web Technology & Design”, New Age Publication, 2003.
2. Austin and Pawlan, “Advanced Programming for JAVA2 Platform”, Pearson, 2000.
3. A. S. Godbole & A.Kahate, “Web Technologies”, TMH, 2003
4. Ivor Horton, “Beginning J2EE 1.4”, SPD Publication, 2005
5. Scott Oaks, “Java Security”, O’reilly, 2005

IT – 603 Cryptography and Network Security **3-1-0 = 4**

Subject Code: *IT - 603.*
Subject Name: *Cryptography and Network Security.*
No. of Hours Per Week: *Lectures-3, Tutorial-1*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT –I

Basic Objective of Cryptography, Secret Key and Public Key Cryptography, Security threats, attacks, policy and mechanism, various security attack models, Classical Cryptography, Notion of Perfect Secrecy.

UNIT-II

Block Cipher, DES, AES, Modes of Block Cipher, various Cryptanalytic attacks on Block Cipher, Stream Cipher, attacks on stream cipher.

UNIT- III

Number Theoretic Algorithm and Review of Discrete Mathematical Structure, Public Key Cryptography algorithm based on Integer Factorization Problem, Quadratic Congruence, Discrete logarithmic Problem in multiplicative group and Elliptic curve group; attacks: side channel attack. Cryptographic Hash Functions, Digital Signature Scheme.

UNIT- IV

Key Management, Public Key Infrastructure. Key Distribution Protocol, Authentication Protocol, Electronic Mail Security, Web Security, IPSec, SSL, SET. Virus/Worms, Trojan, Spyware, Intrusion Detection and Prevention System, Firewall.

Text Books:

1. Stinson, “Cryptography, Theory & Practice”, 3rd Ed., CRC, 2006.
2. Stallings, “Cryptography & Network Security, Theory & Practice”, 3rd Ed., Pearson, 2009.

Reference Books:

1. Menezes, “Network Security & Cryptography”, Cenegage Learning, 2011.

IT – 62X Elective – I (Open) **4-0-0 = 4**

Subject Code*: IT – 62X*
Subject Name*: Elective – I (Open).*
No. of Hours Per Week*: Lecture – 4, Tutorial -0.*
Marks Distribution*: Internal Assessment: 40, End Semester Examination: 60.*
Question to be set*: Eight (one from each unit and remaining four from the combination of more than two units).*
Question to be answered*: Any Five.*
Examination duration*: Three Hours.*

To be chosen by students from available papers in consultation with the faculty members of the department.

IT – 612 Web Technology Laboratory **0-0-4 = 2**

Subject Code: *IT - 612.*
Subject Name: *Web Technology Laboratory.*
No. of Hours Per Week: *Four*
Marks Distribution: *Internal Assessment: 20, End Semester Examination: 30.*
Questions to be set: *Ten (Any one question shall be allotted on lottery basis)*
Duration of End Semester Examination: *Three Hours.*

List of Programs:

1. Designing web pages using HTML.
2. Designing web pages using HTML and CSS.
3. Design of interactive web pages using JavaScript.
4. Design of interactive web pages using Ajax.
5. Design of web applications to demonstrate Servlets.
6. Designing web applications to demonstrate JSP.
7. Designing web applications to demonstrate Session Tracking.
8. Assignment to process request from user, generating dynamic response and accessing database using JDBC and JSP.
9. Assignment to process request from user, generating dynamic response and accessing database using JDBC and Servlet.
10. Assignment to demonstrate session management using Servlet and JSP.

Text Books:

1. C. Xavier, “Web Technology & Design”, New Age Int. Publisher, 2003.
2. Hans Bergstein, “JAVA Server Pages”, O’Reilly, 2003

IT – 613 Cryptography and Network Security Laboratory **0-0-4 = 2**

Subject Code: *IT - 613.*
Subject Name: *Cryptography & Network Security Laboratory.*
No. of Hours Per Week*: Four.*
Marks Distribution: *Internal Assessment: 20, End Semester Examination: 30.*
Questions to be set: *Ten (Any one question shall be allotted on lottery basis).*
Examination duration*: Three Hours.*

List of Programs:

1. Implementation of at least two classical Cryptographic algorithms (PLAYFARE, VIGENERE Cipher).
2. Implementation of cryptographic Hash function using scripting tools.
3. Writing programs for generating differential table of a block cipher for verifying its vulnerability to differential cryptanalysis attack,
4. Writing programs for mounting distinguishing attack /algebraic attack on stream cipher.
5. Performing port scanning using tools like NMAP, Super Scanner etc.
6. Installation of Wireshark and perform experiments for sniffing router traffic using it.
7. Exploring vulnerability of different Application Layer Level Protocol using scripting language/tools.
8. Finding Software vulnerability using free software like Nessus etc.
9. Writing codes using scripting language for mounting Denial of Service attacks through various techniques.
10. Attacks on Digital Certificates using OpenSSL tool.
11. Installation and configuration of tools like snort etc. for identifying attacks analyzing packet capture file.
12. Configuration of Firewall using IPTABLE.

Text Books:

1. Forouzan, “Cryptography & Network Security”, 4th Ed., Tata McGrawHill, 2011.
2. Gregg, “Network Security Test Lab- A Step by Step Guide”, Willey, 2015.

IT – 615 Software System Laboratory **0-0-4 = 2**

Subject Code: *IT - 615.*
Subject Name: *Software System Laboratory.*
No. of Hours Per Week*: Four.*
Marks Distribution*: Internal Assessment: 20, End Semester Examination: 30.*
Questions to be set: *Ten (Any one question shall be allotted on lottery basis).*
Examination duration*: Three Hours.*

List of Programs:

1. Shell programs to demonstrate the basic aspects of shell programming: decision control structure, loops etc.
2. Scripts to familiarize the functionality of sed stream editor
3. Programs to familiarize the pattern matching and data processing task using awk.
4. Shell scripts to develop simple tools for routine system administration tasks, like periodic cleaning of the file system from unwanted files, automatic backup etc
5. Object Oriented Programs in python using basic objects like list, stack, queue, tree etc.
6. Use of make utility in compiling a large program consisting of multiple component files using descriptor files.
7. Creating of source files and generating PDF (at least 3) documents using LaTeX.
8. Creating of source files and display mathematical symbols and formula, arrays using LaTeX.
9. LEX programs for identification of different C language tokens.
10. YACC programs for arithmetic, boolean and logical expressions evaluation.

Text Books:

1. Kernighan & Pike, “The Unix Programming Environment”, PHI, 1984.
2. Philips, “Python 3 Object Oriented Programming”, PACKT, 2010.
3. L. Lamport, “Latex”, Addition Wisley, 2000.

Elective-I (Open)

IT – 621 Wireless Networks **4-0-0 = 4**

Subject Code: *IT - 621.*
Subject Name: *Wireless Networks.*
No. of Hours Per Week: *Lectures-4, Tutorial-0*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT -I

Introduction to wireless network architectures: Cellular networks, wireless local area networks, multi-hop networks, *Cellular network design*: Cell capacity and reuse, Interference, Characterization of wireless channels-channel model, large scale path loss and Shadowing, Fading, multipath propagation. *Wireless LANs:* 802.11, 802.15.4, and 802.16 *Wireless communication standards:* first, second, third, fourth and fifth generation wireless communication.

UNIT-II

Physical layer for wireless networks: Spread spectrum vs. narrow band technology, Basics of FHSS, DSSS and OFDM, Diversity and MIMO *MAC protocol for Wireless Networks:* Multiple access techniques, Random access, Carrier Sense Multiple Access (CSMA), Conflict free Mobile IP, Handoff management.

UNIT- III

Introduction to multi-hop wireless network routing: Ad-hoc routing protocols- AODV, DSR and OLSR. *Routing in sensor and mesh networks:* Issues and challenges, Mesh routing protocols, Sensor routing protocols *QoS provisioning in multi-hop networks:* Challenges in wireless networks, admission control, flow based QoS schemes, QoS in routing.

UNIT- IV

Wireless TCP: TCP performance in Wireless networks, Transport protocols for wireless networks, Congestion sharing. Centralized and distributed explicit and precise rate control. *Wireless Application Protocol (WAP):* Protocol stack, security issues. *Basics of Internet of Things (IoT):* Applications, architecture, models, and challenges.

Text Books:

1. Vijay K. Garg, “Wireless Communications and Networking”, 1st Ed., Morgan Kaufmann, 2008.
2. T. S. Rappaport, “Wireless Communications: Principles and Practice”, 2nd Ed., Pearson Education India, 2010.

Reference Books:

1. Jun Zheng and Abbas Jamalipour, “Wireless Sensor Networks: A Networking Perspective”, Wiley, 2014.

IT – 622 Real-Time Systems **4-0-0 = 4**

Subject Code: *IT – 622.*
Subject Name: *Real-Time Systems.*
No. of Hours Per Week: *Lectures-4, Tutorial-0.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT- I

Introduction to Real Time System (RTS): Application of RTS, A Basic Model of RTS, Characteristics of RTS, Safety and Reliability, Types of Real-Time Tasks, Timing Constraints. *Real-Time Task Scheduling*: Concept, Types of real time task and their characteristics, Task scheduling, Clock-Driven Scheduling, Hybrid Schedulers, Event-driven scheduling, EDF scheduling.

UNIT- II

Resource sharing among Real-time Tasks, Priority Inversion, Priority Inheritance Protocol (PIP), Higher Locker Protocol (HLP), Priority Ceiling Protocol (PCP), Different types of Priority Inversion under PCP, Important features of PCP, Some issues in using a Resource Sharing Protocol.

UNIT- III

Scheduling Real-Time Tasks in Multiprocessor and Distributed Systems: Multiprocessor task Allocation, Dynamic Allocation of Tasks, Fault Tolerant Scheduling of Tasks, Clocks in Distributed Real Time Systems, Centralized Clock Synchronization, Distributed Clock Synchronization *Commercial Real-Time Operating Systems*: Unix as a Real Time Operating System, Windows as a Real-Time Operating System, POSIX.

UNIT- IV

Real-Time Communication: Examples of Real-Time Communication in Applications, Basic Concepts, Real-Time Communication in LAN, Soft Real-Time Communication in LAN, Hard Real-Time Communication in LAN, Bounded Access Protocol, Performance Comparison, Real-Time Communication over Internet, Routing, Multi-cast Routing, Resource Reservation, Traffic Shaping and Policing, Scheduling Mechanism, QoS Models. *Real-Time Databases*: Examples applications of Real-Time Databases, Real-Time Databases Application Design Issues.

Text Books:

1. Rajib Mall, “Real-Time Systems: Theory and Practice”, Pearson, 2008.
2. Jane W. Liu, “Real-Time Systems”, Pearson Education, 2001.
3. Krishna and Shin, “Real-Time Systems”, McGraw Hill Publication, 1999.

Reference Books:

1. Alan C. Shaw, “Real-Time Systems and Software”, Wiley, 2001.
2. Philip Laplante, “Real-Time Systems Design and Analysis’, 2nd Ed., Prentice Hall of India, 2009.

IT – 623 Distributed Systems **4-0-0=4**

Subject Code: *IT - 733.*
Subject Name: *Distributed Systems.*
No. of Hours Per Week: *Lectures-4, Tutorial-0.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT- I

Introduction to Distributed Systems: Goals of distributed system, hardware and software concepts, design issues. *Communication in distributed systems*: Layered protocols, Client – Server model, remote procedure call and group communications.

UNIT- II

Synchronization in Distributed Systems: Clocks synchronization, Mutual exclusion, Election algorithms, Bully algorithm, ring algorithm, atomic transactions, dead lock in distributed systems, Distributed dead lock prevention, distributed system, fault tolerance and real time distributed system.

UNIT- III

Processes and Processors in Distributed Systems: Thread, systems models, Processor allocation, Scheduling in distributed system, fault tolerance and real time distributed system, Load balancing approach.

UNIT- IV

Distributed file system: Distributed file system design, distributed file system implementation, trends in distributed file system. *Distributed shared memory*: What is shared memory, consistency models, page based shared memory, shared variable distributed shared memory, Object based DSM.

Text Books:

1. Andrew S. Tanenbaum, “Distributed Operating System”, PHI, 2008.
2. G. F. Coulouris and J. Dollimore, “Distributed Systems: Concepts and Design”, Addison-Wesley, 2009.

Reference Books:

1. M. Singhal and N. Shivratri, “Advanced Concepts in Operating Systems”, TMH, 2001.

IT – 624 Data Mining **4-0-0 = 4**

Subject Code: *IT – 624.*
Subject Name: *Data Mining.*
No. of Hours Per Week: *Lectures-4, Tutorial-0.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT-I

Introduction: Basic concept of data mining, Need of mining data, Data mining tasks, Overview of KDD process, Data processing: Overview of data cleaning, integration, transformation, reduction: discretization.

UNIT-II

Classification: Simple distance based algorithm, kNN, Naïve Bayes, *Decision tree*: C4.5, ANN: Overview of single layer perception, Confusion matrix, Accuracy, ROC.

UNIT-III

Clustering: Similarity and distance measures, Partitional: KMeans, PAM, *Hierarchical*: Single linkage, *Density based*: DBSCAN.

UNIT-IV

Association Rules: Basic concept, Interestingness measures, Apriori, FP-growth, Sampling algorithm, Parallel and Distributed Apriori algorithm.

Text Books:

1. M. H. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education, 2001.
2. J. Han and M. Kamber, "Data Mining: Concepts and Techniques". 2nd Ed., Elsevier, 2006.

Reference Books:

1. I. H. Witten and E. Frank. Data Mining: Practical Machine Learning Tools and Techniques. Morgan Kaufmann. 2000.
2. D. Hand, H. Mannila and P. Smyth, "Principles of Data Mining", Prentice-Hall, 2001.
3. A K Pujari. "Data Mining Techniques", University Press, 2005.

IT – 625 Parallel Computing **4-0-0 = 4**

Subject Code: *IT – 625.*
Subject Name: *Parallel Computing.*
No. of Hours Per Week: *Lectures-4, Tutorial-0.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT -I

Introduction to Parallel Computing: Motivation behind parallelism, Need of parallel computing, Parallel computing paradigms, Applications of parallel computing *Parallel Programming Platforms:* Parallelism in microprocessor architectures, Physical organization of parallel platforms, Communication model of parallel platforms, Routing mechanisms for interconnection networks

UNIT-II

Parallel Programming: Concepts- Coverage, Granularity, Locality, Types of parallel programming- Programming based on message passing, data parallelism, shared memory systems *Principles of Parallel Algorithm Design:* Introduction to parallel algorithms, Data structures for parallel algorithms, Parallel computation models, Decomposition techniques, Characteristics of tasks and interactions, Mapping techniques for load balancing

UNIT- III

Parallel programming APIs: Message Passing Interface (MPI), POSIX threads (Pthreads), Open Multi-Processing (OpenMP), Basics of CUDA platform, thread, block, grid, kernel, thread synchronization, communication and errors, the CUDA driver and runtime API, Developing and debugging CUDA programs

UNIT- IV

Algorithms in CUDA: Basic algorithms**-** Reduce, Scan, Counting sort, Radix sort, Bitonic sort *Parallel algorithms in CUDA:* Breadth-first search, Depth first search, Single source shortest path, Matrix operations, Fast Fourier Transform

Text Books:

1. Ananth Grama, George Karypis, Vipin Kumar and Anshul Gupta, "An introduction to Parallel computing: Design and Analysis of Algorithms", 2nd Ed., PEARSON, 2004.
2. Jason Sanders and Edward Kandrot, "CUDA by Example: An Introduction to General-Purpose GPU Programming", Addison Wesley, 2010.

Reference Books:

1. Peter Pacheco, "An Introduction to Parallel Programming" Morgan Kaufmann, 2011.

IT – 626 Simulation and Modeling **4-0-0 = 4**

Subject Code: *IT - 736.*
Subject Name: *Simulation and Modeling.*
No. of Hours Per Week: *Lectures-4, Tutorial-0.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT –I

Modeling and Simulation of Continuous time System: Modeling of system in form of differential equations and their simulation using CSMP and Analogue computer method.

UNIT-II

Concept of Probability in Modeling: Probability mass and probability density function. Arrival patterns, exponential distribution, Poisson distribution. Use of GPSS as simulation language.

UNIT- III

Dynamic System: Definition, representation in graphical form, formulation of dynamic system problem in the shortest route problem, solution of dynamic system. State-space formulation and solution technique. Feedback systems and use of MATLAB and C^{++} for simulation of deterministic and stochastic systems.

UNIT- IV

Building and Verification of Simulation Models, Calibration and Validation of Models, Validation of Model Assumptions, Validating Input, Output Transformations.

Text Books:

1. Gordon, "System Simulation", 2nd Ed., PHI, 1978.
2. Deo, "System Simulation using Digital Computer", 2nd Ed., PHI, 1978.
3. Leigh, "Simulation & Modelling", Peter Perigrims Limited, 1983.

Reference Books:

1. Law & Kelton, "Simulation Modelling & Analysis", McGraw Hill, 1982.

Semester-VII

IT – 701 Software Engineering **3-1-0 = 4**

Subject Code: *IT – 701.*
Subject Name: *Software Engineering.*
No. of Hours Per Week: *Lectures-3, Tutorial-1.*
Marks Distribution: *Internal Assessment= 40, End Semester Examination Marks = 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT-I

Introduction: Software life-cycle models, Software requirements specification, formal requirements specification-axiomatic and algebraic specifications, Function-oriented software design.

UNIT-II

Information Systems and Software Engineering: Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, planning and managing the project, design, coding, testing, implementation, maintenance.

UNIT-III

Project Management: Issues in Project Management, Software Project Management Plan. Software Cost Estimation Techniques, Algorithmic Cost Modeling, The COCOMO Model, Project Scheduling, Software Project Planning.

UNIT-IV

Object-oriented design: UML, software testing, Software quality- SEI CMM and ISO-9001, Software reliability and fault-tolerance. Computer-aided software engineering (CASE).

Text book:

1. Rajib Mall, "Fundamentals of Software Engineering", Prentice Hall of India Pvt. Ltd., 2009.
2. Roger S. Pressman, "Software Engineering A Practitioner's Approach", McGraw Hill International, 2005.

Reference Books:

1. P.Jalote, "Integrated Approach to Software Engineering", Narosa Publisher, 1997.
2. Sommerville, "Software Engineering", 7th Ed., Addison-Wesley, 2005.
3. C. Ghezzi, M. Jazayeri and D. Mandrioli, "Fundamentals of Software Engineering", 2nd Ed., Prentice Hall of India, 2003.

IT – 702 Artificial Intelligence **3-1-0 = 4**

Subject Code: *IT - 702.*
Subject Name: *Artificial Intelligence.*
No. of Hours Per Week: *Lectures-3, Tutorial-1.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT- I

Introduction: Introduction to AI and intelligent agents. Problem Solving: Solving Problems by Searching, *heuristic search techniques:* Hill Climbing, Simulated Annealing , A*, Constraint satisfaction problems.

UNIT- II

Game Playing and stochastic search methods: Overview, the Minimax Search Procedure, Adding Alpha-Beta Cutoffs, Additional Refinements, Iterative Deepening. *Stochastic search methods:* Stochastic Hill Climbing, Genetic algorithm.

UNIT- III

Knowledge Representation: Building a Knowledge Base: Propositional logic, Predicate logic, First Order Logic. AI production System, Basics of Resolution, Conversion to Clause Form, Theorem Proving in First Order Logic, Forward vs. Backward Reasoning .

UNIT- IV

*Statistical Reasoning***:** probability and Bayes' theorem, Certainty factors and Rule-Based Systems, Bayesian Networks *Learning:* Overview of different forms of learning, Learning Decision Trees, Introduction to Neural Networks.

Text Books:

1. Nils J. Nelson, "Principle of Artificial Intelligence", Narosa Publishing House, 2002.
2. E. Rich and K. Knight, "Artificial Intelligence", McGraw Hill, 1991.

Reference Books:

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", 2nd Ed, Prentice Hall, 2003.
2. P. H. Winston and B. K. P. Horn, "LISP", 3rd Ed., Addison-Wesley, 1989.
3. P. Norvig, "Paradigms of Artificial Intelligence Programming: Case studies in Common LISP", Morgan Kauffman, 1991.
4. Bratko, "Prolog Programming for Artificial Intelligence", 3rd Ed., Addison-Wesley, 2001.
5. JC Spall, "Introduction to stochastic search and optimization: estimation, simulation and control", Wiley, 2005.

IT – 73X Elective – II (Open) **4-0-0 = 4**

Subject Code*: IT – 73X.*
Subject Name*: Elective – II (Open).*
No. of Hours Per Week*: Lecture – 4, Tutorial -0.*
Marks Distribution*: Internal Assessment 40, End Semester Examination: 60.*
Question to be set*: Eight (one from each unit and remaining four from the combination of more than two units).*
Question to be answered*: Any Five.*
Examination duration*: Three Hours.*

To be chosen by students from available papers in consultation with the faculty members of the department**.**

IT - 761 Minor Project **0-0-20 =10**

Subject Code*: IT – 761.*
Subject Name*: Minor Project.*
No. of Hours Per Week*: 20 Hours.*
Marks Distribution*: Internal Assessment: 100, End Semester Examination: 150.*

Each student will undertake a sizeable project involving survey of literature, development of new techniques and/or implementation of systems, writing of reports etc. under the guidance of one or more faculty members from the department. End Semester examination shall be carried out through a seminar on his/her work and the report.

Elective-II (Open)

IT – 731 E-Commerce **4-0-0 = 4**

Subject Code: *IT - 731.*
Subject Name: *E-Commerce.*
No. of Hours Per Week: *Lectures-4, Tutorial-0.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT- I

*Electronic commerce environment and opportunities***:** Introduction, The Electronic commerce Environment, Electronic Marketplace Technologies *Modes of electronic commerce***:** Overview, EDI, Migration to open EDI, E commerce with WWW/ Internet , Commerce Net Advocacy – Web commerce going forward.

UNIT- II

*Internet Resources for Commerce***:** Introduction – Technologies for Web Servers – Internet Applications for commerce – Internet Charges – Internet Access and Architecture – Searching the Internet.

UNIT- III

Approaches to safe electronic Commerce: Overview, Source, Transport Protocols, Secure Transactions, Secure Electronic Payment Protocol, Secure Electronic Transaction, Certificates for Authentication, Security on Web Servers and enterprise networks, Electronic cash and electronic payment schemes, Internet Monetary Payment and Security requirements, payment and purchase order process – online electronic cash.

UNIT- IV

*Master card/ Visa Secure electronic transaction***:** Introduction – Business requirements - Concepts - Payment Processing. Email and Secure Email Technologies for Electronic Commerce: Introduction – The means of Distribution – A model for Message Handling – How Does a Email Work.

Text books:

1. Daniel Minoli, Emma Minoli, “Web Commerce Technology Handbook”, McGraw Hill, 1999

Reference books:

1. Ravi Kalakotar, Andrew B.Whinston, “Frontiers of Electronic Commerce”, Addison-Wesley, 1996

IT – 732 Management Information System **4-0-0 = 4**

Subject Code: *IT – 732.*
Subject Name: *Management Information System.*
No. of Hours Per Week: *Lectures-4, Tutorial-0.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT-I:
Conceptual Background of Management, Organization, and System: Management: Definition and functions of Management. Organization: A general model of Organization and its internal environment. *Organization behavior:* organization structure and culture, Group Conflict -types, Management Information System–definition, Importance of MIS, MIS function in organization, MIS management. System: components of a system- Open system Vs Closed system.

UNIT- II :
Management and Decision Making: Management Level: top level management, middle level management and low level management. Different managerial role- Informational Role, Informative Role and Decisional Role
Managerial decision making: Types of decision- decision making process –Rational decision making. Effectiveness vs. efficiency, MIS Planning *Management Information System Framework:* A management information systems framework: (consisting Transaction processing system TPS, Management reporting system MRS, Decision support system DSS).

UNIT- III:
Decision Support System (DSS) and Executive Information System (EIS): Decision support system (DSS): Introduction, Component of DSS, characteristics of DSS, model management system LAMP, DSS Generators IFPS (Interactive financial planning system). Expert system and Artificial Intelligence AI: introduction, current application of expert System, advantages, knowledge Engineering, expert system shell, VP- expert Executive information system (EIS): Executive roles & decision making, Executive decision making environment.

UNIT-IV:
Enterprise Resource Planning ERP, Business Process Reengineering BPR and Supply Chain Management SCM: Materials Requirement planning (MRP), Closed loop MRP, Manufacturing Resource Planning (MRP – II), Enterprise resource planning: Functional architecture of ERP, Benefits of ERP, ERP implementation, Business Process Reengineering, Supply chain management: Introduction, Definition of SCM, Features of SCM, SCM Stages, Cases in MIS: Case study method, Analytical Case, Issue Case, Written Case Analysis, Illustrations.

Text Books:
1. Murthy C.S.V, "Management Information System: Text & Application", Himalaya Publishing House, Mumbai, 2004.
2. Charles Parker, Thomas Cage, "MIS strategy & action (Management Info System)", McGraw-Hill.

Reference Books:
1. Laudon and Laudon, "Management Information Systems: Managing the digital firm", 9th Ed., PHI, 2006.
2. Leon, "Enterprise Resource Planning", TMH.
3. Kelkar, "Management Information Systems- A concise study", PHI.

IT – 733 Industrial Management **4-0-0 = 4**

Subject Code: *IT – 733.*
Subject Name: *Industrial Management.*
No. of Hours Per Week: *Lectures-4, Tutorial-0.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT – I
Introduction to Economics: Definitions, Nature, Scope, Difference between Microeconomics & Macroeconomics, *Theory of Demand & Supply*; meaning, determinants, law of demand, law of supply, equilibrium between demand & supply *Elasticity*: elasticity of demand, price elasticity, income elasticity, cross elasticity.

UNIT – II
Types of cost, production process, types of production, plant layout, production planning and control, Inventory control techniques. *Markets*: meaning, types of markets & their characteristics (Perfect Competition, Monopoly, Monopolistic Completion, Oligopoly).

UNIT – III
Management principles and functions, managerial skills, decision making process, types of organization structures, Maslow's hierarchy of needs, types of communication, leadership styles.

UNIT – IV
Marketing concept, factors affecting consumer behavior, types of market segments, product life cycle, pricing methods, distribution channels, advertising and sales promotion, value engineering.

Text Books:

1. R. R. Barthwal, "Industrial Economics: An Introductory Text Book", New Age, 2000.
2. H. L. Ahuja, "Managerial Economics", S. Chand and Company Ltd., New Delhi, 2007.

Reference Books:

1. Murugan , M and Sakthivel, "Management Principles and Practices" , New Age International Publishers, New Delhi, 2008.

IT – 734 Computer Forensic and Cyber Law **4-0-0 = 4**

Subject Code: *IT - 734.*
Subject Name: *Computer Forensic and Cyber Law.*
No. of Hours Per Week: *Lectures-4, Tutorial-0.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT –I

Introduction to Traditional Computer Crime: Traditional problems associated with Computer Crime, Introduction to Identity Theft & Identity Fraud, Types of Computer Forensic techniques – Incident and incident response methodology – Forensic duplication and investigation. Preparation for IR: Creating response tool kit and IR team. Forensics Technology and Systems, Understanding Computer Investigation, Data Acquisition.

UNIT-II

Processing Crime and Incident Scenes: Working with windows and linux systems *Current Computer Forensics Tools*: Software/ Hardware Tools like SANS SIFT, ProDiscover, Volatility etc.

UNIT- III

Validating Forensics Data, Data Hiding Techniques, Performing Remote Acquisition, Network Forensics, Email Investigations, Cell Phone and Mobile Devices Forensics

UNIT- IV

Fundamentals of Cyber Law: Jurisprudence of Cyber Law, Object and Scope of the IT Act 2000, Introduction to Indian Cyber Law, Unicitral Model Law, ISP Guideline. Intellectual property issues and cyber space, Indian perspective, Overview of Intellectual property related legislation in India, Patent, Copy Right, Trademark law, Law related to semiconductor layout & design.

Text Books:

1. Harish Chander, "Cyber Law and IT Protection", PHI Publication, New Delhi,2012
2. Phillips, Enfinger, Steuart, "Computer Forensics and Investigations", Cengage Learning India Edition, 2008.

Reference Books:

1. John R. Vacca, "Computer Forensics", Cengage Learning, 2005
2. Richard E.Smith, "Internet Cryptography", 3rd Ed., Pearson Education, 2008
3. Marjie T. Britz, "Computer Forensics and Cyber Crime: An Introduction", 3rd Ed., Prentice Hall, 2013.

IT – 735 Operations Research **4-0-0 = 4**

Subject Code: *IT - 735.*
Subject Name: *Operations Research.*
No. of Hours Per Week: *Lectures-4, Tutorial-0.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT –I

Introduction to Operation Research: Basics definition, scope, objectives, limitations of Operations Research. Linear Programming Problem- Formulation of LPP, Graphical solution of LPP, Simplex Method, Artificial variables, Big M and two phase method.

UNIT-II

Duality and Sensitivity Analysis: Primal- Dual construction, Symmetric and Asymmetric Dual, Weak Duality Theorem, Main Duality Theorem, Dual Simplex Method, Sensitivity Analysis.

UNIT- III

Transportation Problem: Formulation, solution, unbalanced Transportation problem. Finding basic feasible solutions- Northwest corner rule, least cost method and Vogel's approximation method. *Assignment Problem*: Formulation. Hungarian method for optimal solution, Solving unbalanced problem, Traveling salesman problem and assignment problem.

UNIT- IV

Network models: Introduction, CPM and PERT, Crashing Networks. *Waiting Line Models*: Elements of queuing models. Poisson arrival and exponential service time distributions, M/M/1 Queue.

Text Books:

1. K. V. Mittal, and C. Mohan, "Optimization Methods in n Operations Research and Systems Analysis", New Age, 2003.
2. H.A. Taha, "Operations Research - An Introduction", 7th Ed., Prentice Hall, 2002
3. G. Srinivasan "Operations Research: Principles and Applications", PHI Learning Private Limited, 2010
4. C. Mohan and Kusum Deep, "Optimization Techniques", New Age, 2009.

Reference Books:

1. L. Kleinrock, "Queueing Systems", Vol.1, John Wiley, 1985

IT – 736 Professional Ethics and IPR **4-0-0 = 4**

Subject Code: *IT-736.*
Subject Name: *Professional Ethics and IPR.*
No. of Hours Per Week: *Lectures-4, Tutorial-0.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT-I

Professional ethics and obligations: Ethics: Professional ethics and Personal ethics, Engineering as a profession, Engineering ethics-preventive ethics and Aspirational ethics, engineering ethics code. *Approaches of ethical behavior*: Consequentialism, Utilitarianism and Deontological approaches Duties, rights and respect for a person, ethical dilemmas, honesty, moral autonomy Obligations of Engineering profession. *Ethical issues case study*: space shuttle challenger 1986.

UNIT-II:

Engineer's responsibility for safety and risk: Engineer's moral responsibility for safety and human right: safety and risk, concept of safety, type of risk, risk assessment and communication, risk benefit analysis, product liability, Development ethics., engineers and employer relationship, whistle blowing and its moral justifications. Safety case study: Bhopal gas tragedy 1984, twin tower case study, the Chernobyl disaster 1999, Columbia challenger disaster 2003.

UNIT-III:

Computer Ethics and global issues: Computer Ethics: meaning- Social impact of computers, Computer and gender issues, privacy, cyber crime in recent days. Computer codes of ethics, Weapon development, ethics and research, Analyzing ethical problem in Research, Computer ethics case study

UNIT- IV:

Intellectual Property, Infringement and Grant of patent in India: Intellectual property, definition, types and functions, Patents- trademark- software design- Industrial designs,-semiconductor and integrated circuits layout design, IPR infringement –types and piracy under Indian Laws. Grant of patent in India- procedure, surrender and revocation of patents and compulsory licensing, Acquisition of inventions by the Government. Contents of draft application for patents, IPR infringement case studies.

Text Books:

1. Vinod V. Sopl, "Managing Intellectual Property: The Strategic Imperative", PHI, 2006.
2. Charles Harri Michael S Pritchard and Michael J Robins, "Engineering Ethics: Concepts and cases", Wordsworth Thompson Learning, Belmont Calif, 2000.

Reference Books:

1. Huff and Finholt, "Social Issues in Computing: Putting Computing in Place", McGraw Hill.
2. Govindarajan, Natarajan and Senthil Kumar, "Engineering Ethics" PHI.
3. Jones and Bartlett,"Cyber Ethics: Morality and Law in Cyber Space".
4. Schinzinger Roland Mike and Martin, "Introduction to Engineering Ethics", Boston MA: TMH, 2000.
5. Robin Attfield, "A theory of value and obligation", London, Croom Helm, 1987.

Semester-VIII

IT – 84X Elective – III **4-0-0 = 4**

***Subject Code**: IT – 84X.*
***Subject Name**: Elective – III.*
***No. of Hours Per Week**: Lecture – 4, Tutorial -0.*
***Marks Distribution**: Internal Assessment 40, End Semester Examination: 60.*
***Question to be set**: Eight (one from each unit and remaining four from the combination of more than two units).*
***Question to be answered**: Any Five.*
***Examination duration**: Three Hours.*

To be chosen by students from available papers in consultation with the faculty members of the department**.**

IT – 85X Elective – IV **4-0-0 = 4**

***Subject Code**: IT – 85X.*
***Subject Name**: Elective – IV.*
***No. of Hours Per Week**: Lecture – 4, Tutorial -0.*
***Marks Distribution**: Internal Assessment 40, End Semester Examination: 60.*
***Question to be set**: Eight (one from each unit and remaining four from the combination of more than two units).*
***Question to be answered**: Any Five.*
***Examination duration**: Three Hours.*

To be chosen by students from available papers in consultation with the faculty members of the department**.**

IT - 871 Major Project **0-0-24 = 12**

***Subject Code**: IT – 871.*
***Subject Name**: Major Project.*
***No. of Hours Per Week**: 24 Hours.*
***Marks Distribution**: Internal Assessment: 120, End Semester Examination: 180*

Each student will undertake a sizeable project involving survey of literature, development of new techniques and/or implementation of systems, writing of reports etc. under the guidance of one or more faculty members from the department. End Semester examination shall be carried out through a seminar on his/her work and the report.

IT - 881 Grand Viva **0-0-0 = 2**

***Subject Code**: IT - 881*
***Subject Name**: Grand Viva*
***Marks Distribution**: End Semester Exams*: 50

Overall course proficiency will be evaluated through a grand viva/seminar covering all the subjects studied during entire B.Tech(IT) course.

Elective-III

IT – 841 Human Computer Interaction **4-0-0 = 4**

Subject Code: *IT - 841.*
Subject Name: *Human Computer Interaction.*
No. of Hours Per Week: *Lectures-4, Tutorial-0.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT-I

Introduction: Why Design for Usability, Historical Perspective: machinery, the PC, the GUI, the Web. *Human Perception and Information Presentation:* Perception, gestalt perception, typography, Color, Graphic design, Displays, Paper, and other Output Devices, Information Visualization. *The Human Body and Device Design***:** Input Devices and Ergonomics, Virtual Reality.

UNIT-II

Low-Level Human Cognition: Time-scales and the Illusion of Multi-Tasking, GOMS Keystroke-Level Modeling, Hypothesis Testing and Statistical Significance. *Higher Cognition and Interaction Styles***:** Metaphor, Direct Manipulation, Widget Survey, Command Languages, Other Interaction Styles, Choosing Among Interaction Styles.

UNIT-III

Observing Users: Mindset, Subject-Running Techniques, Usability Studies *Usability Analysis:* Error Handling, Error Prevention, Cognitive Walkthroughs, Heuristic Evaluation, Usability Guidelines, Choosing Among Usability Methods *Specifying and Prototyping:* Low-Fidelity Prototyping, Transition Diagrams, Visual Basic Prototyping.

UNIT-IV

Task Analysis and User-centered Design: Systems Analysis, Techniques: Task Decomposition, CARD, Ethnographic Observation, Allocation of Functions, Usability Engineering in the Business Context.
Interface Design and Programming: Forms Design, Interface Design Patterns, Development Tools, Events and Handlers, MVC, Responsiveness Issues. *Web Usability:* Content Analysis, Information Architecture, Supporting Navigation, Implementation: html, CSS, Javascript, Browser and Device (In), Dependence, Assigning Functions to Client and Server.

Text Book:

1. Ben Shneiderman and Catherine Plaisant, "Designing the User Interface", 5th Ed., Addison Wesley, 2010

Reference Book:

1. Alan Dix, J Finlay, G D Abowd, R Beale, Human-Computer Interaction, 3rd Ed., Pearson Education, 2008

IT – 842 Digital Image Processing **4-0-0 = 4**

***Subject Code**: IT – 842.*
***Subject Name**: Digital Image Processing*
***No. of Hours Per Week**: Lecture – 4, Tutorial -0.*
***Marks Distribution**: Internal Assessment: 40, End Semester Examination: 60.*
***Question to be set**: Eight (one from each unit and remaining four from the combination of more than two units).*
***Question to be answered**: Any Five.*
***Examination duration**: Three Hours.*

UNIT-I

Introduction to Image Processing, elements of visual perception, image digitization, digital image representation, fundamental steps in image processing, color image fundamentals, basic relationship between pixels, mathematical operators in image processing.

UNIT-II

Basic intensity transformations, histogram processing, fundamental of spatial filtering, smoothing and sharpening spatial filters, introduction to Fourier transform, properties of 2d-fourier transform (DFT), filtering in frequency domain, image restoration.

UNIT-III

Point, line and edge detection, thresholding based segmentation, region based segmentation, Watershed segmentation.

UNIT-IV

Redundancy in images, Image compression models, elements of information theory, lossy compression, lossless compression, image compression standards, image reconstruction from projections, parallel beam and fan beam projection, Fourier slice theorem, filtered back projection algorithms.

Text Books:

1. C. Rafael, Gonzalez and R.E. Woods, “Digital Image Processing”, Addison Wesley, 2008.
2. A. K. Jain, “Fundamentals of Digital Image Processing”, Prentice Hall, Englewood Cliffs, 2002.

Reference Books:

1. R. J. Schalkoff, “Digital Image Processing and Computer Vision”, John Wiley, 2004.
2. W. K. Pratt, “Digital Image Processing”, John Wiley, 2002.
3. S Jayaraman, S Esakkirajan and T. Veerakumar, “Digital Image Processing”, McGraw Hill, 2009.

IT – 843 Pattern Recognition **4-0-0 = 4**

***Subject Code**: IT - 843.*
***Subject Name:** Pattern Recognition.*
***No. of Hours Per Week**: Lectures-4, Tutorial-0.*
***Marks Distribution**: Internal Assessment: 40, End Semester Examination: 60.*
***Questions to be set**: Eight (one from each unit and remaining four from the combination of more than two units).*
***Questions to be answered**: Any Five.*
***Duration of End Semester Examination**: Three Hours.*

UNIT-I

Introduction: Basic pattern recognition tasks; The basic structure of a pattern recognition system; Three learning paradigms; The sub-problems of pattern recognition; The nature of statistical pattern recognition; Comparing classifiers.

UNIT-II

Bayes Decision Theory: General framework; Optimal decisions; Bayes maximum likelihood rule, Nearest Neighbor Classifiers Three approaches to classification: density estimation, regression and discriminant analysis;

UNIT-III

Feature Selection: Different approaches to Feature Selection; Branch and Bound, Sequential forward and backward selections, GSFS and GSBS, (L, R) algorithm. Criterion function: Probabilistic Separability criterion, Error probability based criterion, Entropy based criterion.

UNIT-IV

Unsupervised learning and clustering, Clustering Large datasets, Syntactic pattern recognition, Decision trees, Applications – Document Recognition.

Text Books:

1. Theodoridis and Koutroumbas, “Pattern Recognition”, Academic Press, 2009.
2. V. S. Devi and M. N. Murty, “Pattern Recognition: An Introduction”, University Press, 2011

Reference Book:

1. R. O. Duda, P. E. Hart and D. G. Stork, “Pattern Classification”, Wiley, 2000.

IT – 844 Natural Language Processing **4-0-0 = 4**

***Subject Code**: IT - 844.*
***Subject Name**: Natural Language Processing.*
***No. of Hours Per Week**: Lectures-4, Tutorial-0.*
***Marks Distribution**: Internal Assessment: 40, End Semester Examination: 60.*
***Questions to be set**: Eight (one from each unit and remaining four from the combination of more than two units).*
***Questions to be answered**: Any Five.*
***Duration of End Semester Examination**: Three Hours.*

UNIT-I

Introduction: Knowledge in speech and language processing – Ambiguity – Models and Algorithms – Language, Thought and Understanding. Regular Expressions and automata: *Regular expressions* – Finite-State automata. Morphology and Finite-State Transducers.

UNIT-II

Linguistics resources- Introduction to corpus, elements in balanced corpus, TreeBank, PropBank, WordNet, VerbNet etc. Resource management with XML, Management of linguistic data with the help of GATE, NLTK. N-grams, smoothing, entropy, ME, SVM, CRF.

UNIT-III

Part of Speech tagging- Stochastic POS tagging. HMM, Transformation based tagging (TBL), Spoken language syntax; Grammars and human processing. Parsing with Context-Free Grammars: Parsing as search, The early algorithm, Finite-State parsing methods.

UNIT-IV

Semantics- Meaning representation, semantic analysis, lexical semantics. Applications of NLP, Spell-checking, Summarization, Sentiment Analysis and Opinions on the Web.

Text Books:

1. Daniel Jurafsky and James H Martin. “Speech and Language Processing”, 2nd Ed., Pearson Education, 2009.

Reference Book:

1. A. Bharati, R. Sangal, V. Chaitanya, “Natural language processing: a Paninian perspective”, PHI, 2003.
2. T. Siddiqui, U. S. Tiwary, “Natural language processing and Information retrieval”, OUP, 2008.

IT – 845 Soft Computing **4-0-0 = 4**

Subject Code: *IT- 845.*
Subject Name: *Soft Computing.*
No. of Hours Per Week: *Lectures-4, Tutorial-0.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT- I

Soft Computing: Introduction, requirement, different tools and techniques, usefulness and applications. *Fuzzy sets and Fuzzy logic:* Introduction, Fuzzy sets versus crisp sets, Fuzzy Membership Function, operations on fuzzy sets, Fuzzy relations and relation equations, Fuzzy logic, Linguistic hedges, Fuzzification and De-Fuzzification, Fuzzy controllers.

UNIT- II

Artificial Neural Network: McCulloch-Pitts Neural Network, Hebb's learning, Adaline, Perceptron, Multilayer feed forward network, Back propagation, Different issues regarding convergence of Multilayer Perceptron, Competitive learning, Self-Organizing Feature Maps, Adaptive Resonance Theory, Associative Memories, Applications.

UNIT- III

Evolutionary and Stochastic techniques: Genetic Algorithm (GA), different operators of GA, analysis of selection operations, Hypothesis of building blocks, Schema theorem and convergence of Genetic Algorithm, Simulated annealing and Stochastic models, Boltzmann Machine, Applications.

UNIT- IV

Rough Set: Introduction, Imprecise Categories Approximations and Rough Sets, Reduction of Knowledge, Decision Tables, and Applications. Hybrid Systems, Integration of Neural Networks, Fuzzy Logic and Genetic Algorithms, Neural-Network-Based Fuzzy Systems, Fuzzy Logic-Based Neural Networks, Genetic Algorithm for Neural Network Design and Learning, Fuzzy Associative Memories, Fuzzy Logic and Genetic Algorithm for Optimization.

Text Books:

1. Chin-Teng Lin & C. S. George Lee, “Neural Fuzzy Systems”, Prentice Hall, 2006.
2. Klir & Yuan, “Fuzzy Sets and Fuzzy Logic”, PHI, 1997.
3. S. Haykin, “Neural Networks”, 2nd Ed., Pearson Education, 2001.
4. D. E. Goldberg, “Genetic Algorithms in Search and Optimization, and Machine Learning”, Addison-Wesley, 1989.

Reference Books:

1. S. Rajasekaran & G. A. V. Pai, “Neural Networks, Fuzzy logic, and Genetic Algorithms”, PHI, 2003
2. Jang, Sun, & Mizutani, “Neuro-Fuzzy and Soft Computing”, PHI, 2008
3. V. Kecman, “Learning and Soft Computing”, MIT Press, 2001.
4. Z. Pawlak, Kluwer, “Rough Sets”, Academic Publisher, 1991.

IT – 846 Bio-Informatics **4-0-0 = 4**

***Subject Code**: IT - 846.*
***Subject Name**: Bio-Informatics.*
***No. of Hours Per Week**: Lectures-4, Tutorial-0.*
***Marks Distribution**: Internal Assessment: 40, End Semester Examination: 60.*
***Questions to be set**: Eight (one from each unit and remaining four from the combination of more than two units).*
***Questions to be answered**: Any Five.*
***Duration of End Semester Examination**: Three Hours.*

UNIT -I

Introduction to Molecular Biology: Concepts of Cell, tissue, types of cell, components of cell, organelle. Functions of different organelles, Concepts of DNA: Basic Structure of DNA; Double Helix structure; Watson and crick model. Exons and Introns and Gene Concept *Concepts of RNA*: Basic structure, Difference between RNA and DNA. Types of RNA. Concept of Protein: Basic components and structure. Introduction to Central Dogma: Transcription and Translation Introduction to Metabolic Pathways. Sequence Databases 2 Introductions to Bioinformatics. Recent challenges in Bioinformatics. Protein Sequence Databases, DNA sequence databases. Sequence database search programs like BLAST and FASTA *NCBI different modules*: GenBank; OMIM, Taxonomy browser, PubMed.

UNIT-II

Sequence Analysis and Gene Finding: Sequence Alignment: Introduction, local and global alignment, pair wise and multiple sequence alignment, Dynamic Programming Concept. Alignment algorithms: Needleman and Wunsch algorithm, Smith-Waterman. Introduction to Probabilistic models used in Computational Biology 8 Probabilistic Models; Hidden Markov Model: Concepts, Architecture, Transition matrix, estimation matrix. Application of HMM in Bioinformatics: Gene-finding, profile searches, regulatory site identification of a gene. Bayesian networks Model: Architecture, Principle, and Application in Bioinformatics.

UNIT- III

Phylogenetic analysis and Protein structure: Phylogeny: Phylogenetic analysis, Definition and description of phylogenetic trees and various types of trees, Method of construction of Phylogenetic trees : distance based method (UPGMA, NJ), Maximum Parsimony and Maximum Likelihood method Large parsimony and small parsimony problems, Probabilistic approaches, Grammar-based approaches; Concept of Protein: Basic components and structure, Protein structure comparison and classification, Principles of protein folding and methods to study protein folding.

UNIT- IV

Current Advancements in Bioinformatics: Goals of a Microarray experiment; Normalization of Microarray data; Detecting differential gene expression; Principal component analysis; Clustering of microarray data; Fundamental concepts of Pathways and Regulatory networks, Concepts of Protein-Protein Interaction (PPI), Concepts of Drug Design.

Text Books:

1. Jones, Pevzner, "An Introduction to Bioinformatics Algorithms", MIT Press, 2004.
2. Durbin, Eddy, Krogh and Mitchison, "Biological Sequence Analysis", Cambridge University Press, 1998.

Reference Books:

1. D.W. Mount, "Bioinformatics: Sequence and Genome Analysis", 2nd ed., CBS, 2004.

Elective-IV

IT– 851 Advanced Cryptography **4-0-0 = 4**

Subject Code: *IT - 851.*
Subject Name: *Advanced Cryptography.*
No. of Hours Per Week: *Lectures-4, Tutorial-0.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT –I

Review of number theory and algebra, computational complexity, probability and information theory, primality testing, Factorization.

UNIT-II

Cryptography and cryptanalysis, symmetric key encryption, DES, Triple DES, AES, RC4, modes of operation.

UNIT-III

Public key encryption, RSA cryptosystem, Diffie-Hellman, elliptic curve cryptography, pairings based cryptography, Rabin cryptosystems, ElGamal cryptosystems, Goldwasser-Micali, Blum-Goldwasser cryptosystems.

UNIT-IV

Message authentication, digital signature schemes: RSA, ElGamal, ECDSA, Attacks on digital signature, Security handshake pitfalls, Strong password protocols.

Text Books:

1. B.A. Forouzan and D. Mukhopadhyay, “Cryptography and network security”, Tata McGraw-Hill, 2011.
2. Douglas R. Stinson, “Cryptography Theory and Practice”, Chapman & Hall/CRC, Tylor & Francis group, Newyork,2006.
3. Atul Kahate, “Cryptography and Network security”, Tata McGraw-Hill, 2003.

Reference Books:

1. W. Mao, “Modern Cryptography: Theory & Practice”, Pearson Education, 2004.
2. C. Kaufman, R. Perlman and M. Speciner, “Network Security: Private Communication in a public World”, 2nd Ed., Prentice Hall, 2002.
3. W. Stallings, “Cryptography and Network Security Principles and practice”, 3rd Ed., Pearson Education Asia, 2003.
4. H. Delfs and H. Knebl, “Introduction to Cryptography: Principles and Applications”, Springer-Verlag, 2002.

IT – 852 Advanced Computer Architecture **4-0-0 = 4**

***Subject Code**: IT– 852.*
***Subject Name**:* Advanced Computer Architecture.
***No. of Hours Per Week**: Lectures-4, Tutorial-0.*
***Marks Distribution**: Internal Assessment: 40, End Semester Examination: 60.*
***Questions to be set**: Eight (one from each unit and remaining four from the combination of more than two units).*
***Questions to be answered**: Any Five.*
***Duration of End Semester Examination**: Three Hours.*

UNIT -I

Review of Basic Organization and Architectural Techniques: RISC processors, Characteristics of RISC processors, RISC Vs CISC, Classification of Instruction Set Architectures, Review of performance measurements, Basic parallel processing techniques: instruction level, thread level and process level, Classification of parallel architectures.

UNIT-II

Instruction Level Parallelism: Basic concepts of pipelining: Arithmetic pipelines, Instruction pipelines, Hazards in a pipeline: structural, data, and control hazards, Overview of hazard resolution techniques, Dynamic instruction scheduling, Branch prediction techniques, Instruction-level parallelism using software approaches, Superscalar techniques, Speculative execution Review of modern processors: Pentium Processor and ARM Processor

UNIT- III

Memory Hierarchies and Peripheral Devices: Basic concept of hierarchical memory organization, Main memories, Cache memory design and implementation, Virtual memory design and implementation, Secondary memory technology, RAID. Bus structures and standards, Synchronous and asynchronous buses, Types and uses of storage devices, Interfacing I/O to the rest of the system, Reliability and availability, I/O system design, Platform architecture

UNIT- IV

Thread Level and Process Level Parallelism: Centralized vs. distributed shared memory, Interconnection topologies, Multiprocessor architecture, Symmetric multiprocessors, Cache coherence problem, Synchronization, Memory consistency, Multicore architecture, Review of modern multiprocessors, Distributed computers, Clusters, Grid, Mainframe computers.

Text Books:

1. Hennessey and Patterson, "Computer Architecture: A quantitative Approach", 5th Ed., Morgan Kaufman Publication, 2012.
2. J.P. Shen and M.H. Lipasti, "Modern Processor Design", McGraw Hill, Crowfordsville, 2005.

Reference Books:

1. David E. Culler, Jaswinder Pal Singh, "Parallel computing architecture: A hardware/software approach", Morgan Kaufmann /Elsevier Publishers, 1999.
2. Kai Hwang and Zhi.Wei Xu, "Scalable Parallel Computing", Tata McGraw Hill, New Delhi, 2003.

IT – 853 Mobile Computing **4-0-0 = 4**

Subject Code: *IT – 853.*
Subject Name: *Mobile Computing.*
No. of Hours Per Week: *Lectures-4, Tutorial-0.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT -I

*Introduction***:** Overview of mobile technologies, Anatomy of a mobile device, Survey of mobile devices, Applications of mobile computing, Issues in mobile computing, Limitations of mobile computing, Mobile computing architecture and models. *Wireless Communication Technologies***:** Basics of Cellular networks, Co-channel interference, Wireless Networks (802.11, 802.15.4)

UNIT-II

Support of mobility: Mobile IP, Handoff management, Location management, HLR--VLR schemes, Hierarchical scheme, TCP in the mobile setting, Global Positioning System (GPS) *Mobile Databases*: Mobile database systems, data management, transaction management, query processing, Disconnectivity and consistency in operation, SQLite and Small SQL databases

UNIT- III

*File System for Mobile Computing***:** Characteristics of mobile file systems, Disconnected File Operations, CODA file system *Security Issues In Mobile Computing***:** Security Issues, Authentication, Encryption, Cryptographic Tools: Hash, Message Authentication Code (MAC), Digital Signature

UNIT- IV

*Android Application Development***:** Introduction to Android- Layers, android components, mapping application to process. Basics of Android application development, Hardware tools, Software tools, Android SDK features, GUI design, event handling, interfacing with other applications *The future of Mobile Computing*: Upcoming technologies, heterogeneous networks, Internet of Things (IoT), Convergence of Media and Communication Devices

Text Books:

1. Jochen Schiller, "Mobile Communications" 2nd Ed., Pearson Education India, 2008.
2. Bill Phillips, Chris Stewart, Brian Hardy, and Kristin Marsicano "Android Programming", 2nd Ed., the Big Nerd Ranch Guide, 2015.
3. Rappaport, "Wireless Communications: Principles and Practice", 2nd Ed., Pearson Education India, 2010.

Reference Books:

1. E. Hellman, "Android Programming- Pushing the limits", Wiley, 2014.

IT – 854 Performance Engineering **4-0-0 = 4**

Subject Code: *IT - 854.*
Subject Name: *Performance Engineering.*
No. of Hours Per Week: *Lectures-4, Tutorial-0.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT - I

Introduction: Overview, The Role of Performance Requirements in Performance Engineering, Examples of Issues Addressed by Performance Engineering Methods, Business and Process Aspects of Performance Engineering, Disciplines and Techniques Used in Performance Engineering, Performance Modeling, Measurement and Testing, Roles and Activities of Performance Engineer, Performance Metrics

UNIT - II

Basic Performance Analysis: Basic Performance Laws, Utilization Law, Little's Law, A Single-Server Queue, Networks of Queues, Introduction and Elementary Performance Properties, Open and Closed Queuing Network Models, Simple Single-Class Open Queuing Network Models, Simple Single-Class Closed Queuing Network Model, Performance Measures and Queuing Network Representation

UNIT - III

System Measurement Techniques and Instrumentation: Distinguishing between Measurement and Testing, Resource Usage Measurement, Measuring Processor Usage, Processor Utilization by Individual Processes, Disk Utilization, Bandwidth Utilization, Queue Lengths, Measurement of Multicore or Multiprocessor Systems, Measuring Memory-Related Activity, Memory Occupancy, Paging Activity, Measuring Systems with One Host and with Multiple Hosts, Clock Synchronization of Multiple Hosts, Gathering Measurements from Multiple Hosts, Response Time Measurements

UNIT - IV

Performance Testing: Performance Test Planning and Performance Models, Preparing a Performance Test, Performance Testing Challenges posed by Systems with Multiple Hosts, Performance Testing Scripts and Checklists, Best Practices for Documenting Test Plans and Test Results.

Text Books:

1. André B. Bondi, "Foundations of Software and System Performance Engineering", Addison-Wesley, 2015

Reference Books:

1. Kishor S. Trivedi, "Probability & Statistics with Reliability, Queuing and Computer Science Applications", Wiley India, 2009.

IT – 855 Cloud Computing **4-0-0 = 4**

Subject Code: *IT-855.*
Subject Name: *Cloud Computing.*
No. of Hours Per Week: *Lectures-4, Tutorial-0.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT I

Introduction to Cloud Computing, Need for cloud, Evolution of Cloud Computing, Types of Cloud, Characteristics of Cloud Computing, Benefits and Challenges of Cloud Computing, Cloud deployment models: private, public, hybrid and community cloud.

UNIT II

Resource-as-a-Service (RaaS), Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS), Examples of each services. Introduction to MapReduce, GFS, HDFS, Hadoop Framework.

UNIT III

Need for Virtualization, Pros and Cons of Virtualization, Types of Virtualization, System VM, Process VM, Virtual Machine Monitor, Virtual Machine Properties, HLL VM, Hypervisors- Xen, KVM, VMWare, Virtual Box, Hyper-V.

UNIT IV

Cloud Application, Cloud Challenges, Cloud Security and Privacy Issues, Mobile Cloud.

Text Books:

1. Rajkumar Buyya, James Broberg and Andrzej Goscinski, “Cloud Computing Principles and Paradigms”, Wiley Publication, 2013.
2. R. Bloor, M. Kanfman, Halpar F. Judith and Hurwitz, “Cloud Computing for Dummies”, Wiley India Edition, 2010.
3. James E Smith, Ravi Nair, “Virtual Machines”, Morgan Kaufmann Publishers, 2006.

Reference Books:

1. Divyakant Agrawal, K. SelcukCandan and Wen-Syan Li, “New Frontiers in Information and Software as a Service”, Springer Proceedings, 2011

IT – 856 Machine Learning **4-0-0 = 4**

Subject Code: *IT - 856.*
Subject Name: *Machine Learning.*
No. of Hours Per Week: *Lectures-4, Tutorial-0.*
Marks Distribution: *Internal Assessment: 40, End Semester Examination: 60.*
Questions to be set: *Eight (one from each unit and remaining four from the combination of more than two units).*
Questions to be answered: *Any Five.*
Duration of End Semester Examination: *Three Hours.*

UNIT-I
Introduction to machine learning. Supervised learning: Bayes Classifier, Support Vector Machines, Nearest Neighbor, *Decision Trees:* C4.5, Regression: least squares regression.

UNIT-II
Neural Network: Single Layer Perceptron, Multilayer Perceptron, Feed-Forward and Back-Propagation, Deep Learning.

UNIT-III
Unsupervised learning: K-means, PCA, EM algorithm. Graphical models: Hidden Markov Models, Bayesian networks.

UNIT-IV
Soft Classifiers: Fuzzy Classifier, Rough Classifier.

Text Books:

1. C.M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.
2. R.O. Duda, P.E. Hart and D.G. Stork. "Pattern Classification", 2nd Ed., Wiley-Interscience, 2000.

Reference Books:

1. T. Mitchell, "Machine Learning", McGraw Hill, 2000.