

Curriculum and Syllabus

B.TECH.

Computer Science and Engineering

(Applicable for 2018-19 batch and onwards)



**Department of Computer Science and Engineering
School of Engineering and Technology,
H. N. B. Garhwal University,
Srinagar Garhwal, Uttarakhand- 246174**

Curriculum

Requirements of Credits for B.Tech.

No. of Credits in Theory	No. of Credits in Practical	No. of Total Credits
117	43	160

Definitions/ Descriptions

1. Credit Equivalent

	No. of Contact Hours per Week	Equivalent Credits
Lecture+ Tutorial	3+1	3
Practical	3	1

No. of Credits per Semester: 20.

Marks per Credit: 50.

Total Marks per Semester: 1000.

Total Number of Credits earned: 160 (in the whole degree program).

2. Code for Courses:

Code for a course consists of two alphabets followed by three digits and an optional alphabet.

First two alphabets in the code represent the subject area of the course. E.g. (BS: Basic Science; HU: Humanities; EE: Electrical Engineering; CS: Computer Science & Engineering; ME: Mechanical Engineering; EW: Engineering Workshop; GP: General Proficiency; E: Open Elective).

First digit represents the semester. Next two digits represent the sequence number of course in list of courses for a semester.

3. Mandatory Qualifying Courses and Elective Course:

Syllabus contains Mandatory Qualifying Courses to familiarize students with certain study areas/ disciplines of importance. Students have to complete and qualify mandatory qualifying course. Marks obtained for these courses are not to be added for calculating total Marks.

Elective courses are provided in VIII semester to provide student with flexibility to choose courses of their interest from a list of offered electives. Open Electives are the courses offered by other departments for the students.

Semester- wise list of subjects

Semester I

S. No.	Code	Course Title	L	T	P	Contact Hrs./Week	Credits
1	SET/SH/BT/C101	Mathematics I	3	1	-	4	3
2	SET/ME/BT/C102	Basic Mechanical Engineering	3	1	-	4	3
3	SET/SH/BT/C103	Chemistry	3	1	-	4	3
4	SET/ME/BT/C104	Engineering Mechanics	3	1	-	4	3
5	SET/CS/BT/C105	Fundamentals of Information Technology	3	1	-	4	3
6	AECC106	Environmental Science*	2	-	-	2	2
7	SET/ME/BT/C107	Basic Mechanical Engineering Lab	-	-	1	2	1
8	SET/SH/BT/C108	Chemistry Lab	-	-	1	2	1
9	SET/CS/BT/C109	Fundamentals of Information Technology Lab	-	-	1	2	1
10	SET/ME/BT/C110	Engineering Workshop	-	-	2	4	2
Total			17	5	5	32	22

*AECC – Ability Enhancement Compulsory Course

Semester II

S. No.	Code	Course Title	L	T	P	Contact Hrs./Week	Credits
1	SET/SH/BT/C201	Mathematics II	3	1	-	4	3
2	SET/SH/BT/C202	Physics	3	1	-	4	3
3	SET/EE/BT/C203	Basic Electrical Engineering	3	1	-	4	3
4	SET/EC/BT/C204	Basic Electronics	3	1	-	4	3
5	SET/IT/BT/C205	C-Programming	3	1	-	4	3
6	AECC206	General English*	2	-	-	2	2
7	SET/SH/BT/C207	Physics Lab	-	-	1	2	1
8	SET/EE/BT/C208	Electrical Engineering Lab	-	-	1	2	1
9	SET/CS/BT/C209	C programming Lab	-	-	1	2	1
Total			17	5	5	32	22

*AECC – Ability Enhancement Compulsory Course

Semester III

S. No.	Code	Course Title	L	T	P	Contact Hrs./Week	Credits
1	SET/AH/BT/C301	Mathematics III	3	1	-	4	3
2	SET/CS/BT/C302	Computer Based Numerical & Statistical Techniques	3	1	-	4	3
3	SET/CS/BT/C303	Data Structures Using C	3	1	-	4	3
4	SET/CS/BT/C304	Computer Organization	3	1	-	4	3
5	SET/CS/BT/C305	Digital Electronics	3	1	-	4	3
6	SET/CS/BT/C306	Computer Based Numerical & Statistical Techniques lab	-	-	1	2	1
7	SET/CS/BT/C307	Data Structures Using C Lab	-	-	2	4	2
8	SET/CS/BT/C308	Digital Electronics Lab	-	-	1	2	1
9	SET/CS/BT/S309	Seminar	-	-	1	2	1
Total			15	5	5	30	20

Semester IV

S. No.	Code	Course Title	L	T	P	Contact Hrs./Week	Credits
1	SET/CS/BT/C401	Object Oriented Programming using C++	3	1	-	4	3
2	SET/CS/BT/C402	Operating System	3	1	-	4	3
3	SET/CS/BT/C403	Discrete Structure	3	1	-	4	3
4	SET/CS/BT/C404	Data Communication and Computer Network	3	1	-	4	3
5	SET/CS/BT/C405	Theory Of Computation	3	1	-	4	3
6	SET/CS/BT/C406	Object Oriented Programming using C++ Lab	-	-	2	6	2
7	SET/CS/BT/C407	Operating System Lab	-	-	1	3	1
8	SET/CS/BT/C408	Data Communication and Computer Network Lab	-	-	1	3	1
9	SET/CS/BT/S409	Mini Project -1	-	-	1	3	1
Total			15	5	5	30	20

Semester V

S. No.	Code	Course Title	L	T	P	Contact Hrs./Week	Credits
1	SET/CS/BT/C501	Database Management System	3	1	-	4	3
2	SET/CS/BT/C502	Java Programming	3	1	-	4	3
3	SET/CS/BT/C503	Design and Analysis of Algorithms	3	1	-	4	3
4	SET/CS/BT/C504	Graph Theory	3	1	-	4	3
5	SET/CS/BT/C505	Software Engineering	3	1	-	4	3
6	SET/CS/BT/C506	DBMS Lab	-	-	1	2	1
7	SET/CS/BT/C507	Java Programming Lab	-	-	1	2	1
8	SET/CS/BT/C508	Design and Analysis of Algorithms Lab	-	-	2	4	2
9	SET/CS/BT/S509	Seminar	-	-	1	2	1
Total			15	5	5	30	20

Semester VI

S. No.	Code	Course Title	L	T	P	Contact Hrs./Week	Credits
1	SET/CS/BT/C601	Compiler Designing	3	1	-	4	3
2	SET/CS/BT/C602	Computer Graphics	3	1	-	4	3
3	SET/CS/BT/C603	Cryptography and Network Security	3	1	-	4	3
4	SET/CS/BT/C604	Data Mining and Data Warehousing	3	1	-	4	3
5	SET/CS/BT/C605	E-Commerce	3	1	-	4	3
6	SET/CS/BT/C606	Compiler Designing Lab	-	-	1	2	1
7	SET/CS/BT/C607	Computer Graphics Lab	-	-	1	2	1
8	SET/CS/BT/C608	Python Lab	-	-	1	2	1
9	SET/CS/BT/S609	Mini Project – 2	-	-	2	4	2
Total			15	5	5	30	20

Semester VII

S. No.	Code	Course Title	L	T	P	Contact Hrs./Week	Credits
1	SET/CS/BT/C701	Artificial Intelligence	3	1	-	4	3
2	SET/CS/BT/C702	Embedded System	3	1	-	4	3
3	SET/CS/BT/C703	Wireless and Mobile Computing	3	1	-	4	3
4		Elective I	3	1	-	4	3
5		Elective II	3	1	1	4	3
6	SET/CS/BT/C706	Artificial Intelligence Lab	-	-	1	2	1
7	SET/CS/BT/C707	Embedded System Lab	-	-	1	2	1
8	SET/CS/BT/C708	Project Work – I	-	-	2	4	2
9	SET/CS/BT/S709	Industrial Training Seminar	-	-	1	2	1
Total			15	5	5	30	20

Elective I	S. No.	Code	Course Title
	1	SET/CS/BT/E721	Security Architecture & Operating System Security
	2	SET/CS/BT/E722	Neural Network
	3	SET/CS/BT/E723	Real Time System

Elective II	S. No.	Code	Course Title
	1	SET/CS/BT/E731	Cloud Computing
	2	SET/CS/BT/E732	Distributed Computing
	3	SET/CS/BT/E733	Digital Image Processing

Semester VIII

S. No.	Code	Course Title	L	T	P	Contact Hrs./Week	Credits
1	SET/CS/BT/C801	UNIX Shell Programming	3	1	-	4	3
2	SET/CS/BT/C802	Cyber Security and Ethical Hacking	3	1	-	4	3
3		Elective III	3	1	-	4	3
4		Elective IV	3	1	-	4	3
5	SET/CS/BT/C805	Unix Shell Programming lab	-	-	1	2	1
6	SET/CS/BT/C806	Cyber Security and Ethical Hacking lab	-	-	1	2	1
7	SET/CS/BT/C807	Project and Dissertation	-	-	6	12	6
Total			12	4	8	32	20

Elective III	S. No.	Code	Course Title
	1	SET/CS/BT/E821	Mobile Application Development
	2	SET/CS/BT/E822	Platform Technology
	3	SET/CS/BT/E823	Bioinformatics
	4	SET/CS/BT/E824	Natural Language Processing

Elective IV	S. No.	Code	Course Title
	1	SET/CS/BT/E831	Multimedia Technology
	2	SET/CS/BT/E832	Machine Learning
	3	SET/CS/BT/E833	Optical Network
	4	SET/CS/BT/E834	Big Data Analytics

Note

- (1) Topic for the Seminar shall be chosen by students in consultation with faculty. Topic shall not be mentioned in the syllabus anywhere, however, it should be related to Information Technology.
- (2) Mini Project work can be carried out individually or by a group of maximum of five students under the guidance of faculty. A committee of examiners will evaluate the projects.
- (3) Students in B. Tech. 7th and 8th semester shall choose 2 elective subjects from the respective tables. An elective subject shall be provided only for 15 or more students.
- (4) Major Project work shall be carried out during the 7th and 8th semester. Students can undertake Major Project individually or in group of not more than three students, under the supervision of guide and co-guide. Students have to present Synopsis of Major Project during the 7th semester. Project topic /title shall be evaluated by the project evaluation committee of faculty in the department before the end of 7th semester. However, Major Project would be evaluated in the end of 8th semester.

Detailed Syllabi

SEMESTER – I

Theory		L	T	P	T.A.	C.T.	TOT	ESE.	SUB. TOTAL	Credit equivalence
Code	Course									
SET/SH/BT/C101	Mathematics I	3	1	-	10	20	30	70	100	3
SET/ME/BT/C102	Basic Mechanical Engineering	3	1	-	10	20	30	70	100	3
SET/SH/BT/C103	Chemistry	3	1	-	10	20	30	70	100	3
SET/ME/BT/C104	Engineering Mechanics	3	1	-	10	20	30	70	100	3
SET/IT/BT/C105	Fundamental of Information Technology	3	1	-	10	20	30	70	100	3
AECC106	Environmental Science	2	-	-	10	20	30	70	100	2
SET/ME/BT/C107	Basic Mechanical Engineering Lab	-	-	1	30	-	30	70	100	1
SET/SH/BT/C108	Chemistry Lab	-	-	1	30	-	30	70	100	1
SET/CS/BT/C109	Fundamental of Information Technology lab	-	-	1	30	-	30	70	100	1
SET/ME/BT/C110	Engineering Workshop	-	-	2	30	-	30	70	100	2
Total		14	5	5	16 5	170	375	625	1000	20

L – Lecture, T – Tutorial, P – Practical, T.A – Teacher's Assessment, C.T - Class Test, TOT – Total, ESE - End Semester Examination.

MATHEMATICS- I (SET/SH/BT/C101)		
Module Name	Content	No. of Hrs.
Vector Calculus	Interpretation of vectors & scalars, gradient, divergence and curl of a vector and their physical interpretation, Gauss divergence theorem and Stoke's theorem.	8
Matrices	Elementary row and column transformation, linear dependence, rank of matrix, consistency of system of linear equation and solution of linear system of equations. Characteristic equation, Cayley-Hamilton theorem, eigen values and eigen vectors, diagonalization, complex matrices.	13
Differential Calculus	Libnitz theorem, partial differentiation, Euler's theorem, asymptotes, curve tracing, envelops and evolutes. Change of variables, Jacobians, expansion of functions of one and several variables. Cylindrical and spherical coordinate system. Approximation of errors. Extrema of function of several variables, Langrange's method.	13
Probability and Statistics	Binomial distribution, normal distribution and Poisson's distribution. Correlation and regression.	8
Total No. of Hours		42
Textbooks	<ol style="list-style-type: none"> 1. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers 2. H K Das, "Advanced Engineering Mathematics", S Chand 3. Erwin Kreyszig, "Advanced Engineering Mathematics" 	
References	<ol style="list-style-type: none"> 1. Shanti Narayan, "A Text Book of Matrices", S. Chand 2. Finney Thomas, "Calculus and Analytical Geometry", Narosa Publication House 3. N. Piskunov, "Differential and Integral Calculus" 	

BASIC MECHANICAL ENGINEERING (SET/ME/BT/C102)		
Module Name	Content	No. of Hrs.
Basic Concept of Thermodynamics	Definition of thermodynamics, system, Thermodynamic equilibrium, property, state, path, process, cyclic process, work and heat, Enthalpy. Zeroth, First law and Second law of thermodynamics. Problems	6
Introduction to Machine Tools.	Introduction to metal cutting, Specification and operations of Lathe, Shaper, Planer, Drilling, Milling machine.	6
Properties of Steam and Boilers.	Formation of steam at constant pressure, properties of steam, Steam-Tables, Measurement of dryness fraction by calorimeter, Introduction to boiler, classification of boilers, function of boiler mounting & accessories, constructional details of Cochran and Babcock and Wilcox boilers.	10
Shear Force and Bending Moment	Definitions, Shear force and Bending Moment, Shear force and Bending Moment Diagram for cantilever and simply supported beam. Calculation of maximum SF and BM and point of contra flexure under the load of concentrated load, uniformly distributed load combination of concentrated load, uniformly distributed load. Problems.	10
Stress and Strain Analysis	Simple stress and strain: Introduction, Normal shear stresses, stress-strain diagrams for ductile and brittle materials, Elastic constants, one dimensional loading of members of varying cross sections, Principal stress and strain, Mohr's stress circle. Problems.	10
Total No. of Hours		42
Textbooks	1. I.J. Nagrath, "Basic Electrical Engineering," Tata Mc. Graw Hill.	
References	<ol style="list-style-type: none"> 1. A. E. Fitzgerald, D.E., Higginbotham and A Grabel, "Basic Electrical Engineering", Mc Graw Hill. 2. Rizzoni, Principles and Applications of Electrical Engineering, TMH 3. V. Del Toro. " Principles of electrical Engineering, "Prentice hall 4. W.H. Hayt & J.E. Kemmerly," Engineering circuit Analysis, "Mc Graw Hill 5. H. Cotton, "Advanced Electrical Technology" Wheeler Publishing 	

CHEMISTRY (SET/SH/BT/C103)		
Module Name	Content	No. of Hrs.
Advanced Theory of Chemical Bonding	Valence bond and molecular orbital theory. Structure of NH ₃ , H ₂ O, SO ₃ , PCl ₅ , XeO ₂ molecules. Types of linkages, Hybridization, Hydrogen bonding, Metallic bonding.	4
Equilibrium on Reactivity	Bronsted and Lewis Acids, pH, pka, pkb scale, buffer solution.	4
Polymers	Structures of the following polymers, viz, Natural and synthetic rubbers, Polyamide and Polyester fibres, polymethylmethacrylate, poly acrylonitrile and polystyrene. A brief account of conducting polymers (polypyrrole & polythiophene) & their applications.	3
Complex Compounds	Introduction, Valence bond and crystal field theory.	4
Chemical Kinetics & Catalysis	Order of reactions, Parallel and reversible reactions. Catalysis-homogeneous and heterogeneous catalysis. Characteristics of catalytic reactions, catalytic promoters and poisons, auto catalysis and negative catalysis. Activation energy of catalysis, intermediate compound formation theory and adsorption theory.	3
Atmospheric Chemistry & Air Pollution	Environment and ecology, environmental segments, structure and composition of atmosphere, radiation balance of earth and Green House Effect, formation and depletion of Ozone layer, chemical and photochemical reactions of various species in atmosphere, air pollution- sources, reactions and sinks for pollutants, acid rains and smog formation. Pollution control methods.	5
Corrosion & Lubricants	Introduction, causes of corrosion, theories of corrosion- direct chemical attack, electrochemical theory of corrosion, factors influencing corrosion, corrosion inhibitors, passivity, types of corrosions, protection from corrosion and protective coatings. Theory, classification and mechanism of lubrication.	5
Water and Waste Water Chemistry	Introduction, hardness of water, characteristics imparted by impurities, analysis of contaminants, treatment of water by Zeolite, L-S process, boiler feed water, waste water treatment.	6
Fuels & Combustion	Classification of fuels, non-conventional energy, biogas, biomass and solar energy, calorific value – gross and net, characteristics of good fuel, determination of calorific value, solid fuels, analysis of coal, liquid fuels.	5
Stereochemistry of organic-compounds	Mechanism of chemical reaction, Beckman, Hoffman, Reimer Tiemann, Cunnizzaro, Diels- Alder and Skraup synthesis.	3
Total No. of Hours		42

Textbooks	<ol style="list-style-type: none"> 1. Jain, Jain, "Engineering Chemistry" 2. Sharma, Kumar, "Engineering Chemistry"
References	<ol style="list-style-type: none"> 1. R. T. Morrison and R N Boyd, "Organic Chemistry", 6th Edition, Prentice Hall, New Delhi, 2. J. D. Lee, "Concise Inorganic Chemistry", Chapman & Hall 3. W. L. Jolly, "Modern Inorganic Chemistry", McGraw-Hill 4. P.W. Atkins, "Physical Chemistry", 6th Edition, Oxford University Press 5. Barrow, "Physical Chemistry" 6. Manahan, "Environmental Chemistry" 7. D. L. Pavia, GM. Lampman, GS. Kriz and J.R Vyvyan, I, "Spectroscopy", Cengage Learning India Pvt. Ltd, New Delhi, 2007 8. R.M. Silverstein, F.X. Webster and D.J. Kiemle, "Spectrometric Identification of Organic Compounds", 7th edition, John-Wiley and Sons, New York, 2005 9. William Kemp, "Organic Spectroscopy", 3rd edition, Palgrave, New York, 2005 10. C.N. Banwell and E. M. McCash, "Fundamentals of Molecular Spectroscopy", McGraw- Hill, International, UK, 1995 11. F. Carey, "Organic Chemistry", 5th Edition, McGraw Hill Publishers, Boston, 2003

BASIC ENGINEERING MECHANICS(SET/ME/BT/C104)		
Module Name	Content	No. of Hrs.
Force System	Introduction: Force system, dimensions and units in mechanics, laws of mechanics, vector algebra, addition and subtraction of forces, cross and dot products of vectors, moment of a force about a point and axis, couple and couple moment, transfer of a force to a parallel position, resultant of a force system using vector method, Problems involving vector application Equilibrium: Static and dynamic equilibrium, static in determinacy, general equations of equilibrium, Varignon's theorem, Lami's theorem, equilibrium of bodies under a force system, Problems.	10
Trusses And Frames	Truss and Frames: Truss, classification of truss, assumptions in truss analysis, perfect truss, analysis of perfect plane truss using method of joints and method of sections, Problems.	10
Centre Of Gravity And Moment Of Inertia	Centroid, Centre of mass and Centre of gravity, Determination of centroid, centre of mass and centre of gravity by integration method of regular and composite figures and solid objects, Problems Moment of Inertia: Area moment of inertia, mass moment of inertia, parallel axis and perpendicular axis theorems, radius of gyration, polar moment of inertia, product of inertia, principle axis, problem based on composite figures and solid objects.	10
Kinematics And Dynamics	Kinematics: Concept of rigid body, velocity and acceleration, relative velocity, translation and rotation of rigid bodies, equations of motion for translation and rotation, problems. Particle Dynamics: Energy methods and momentum methods, Newton's laws, work energy equation for a system of particles, linear and angular momentum equations, projectile motion, problem	10
Total No. of Hours		40
Textbooks	1. R S Khurmi, "Engineering Mechanics" 2. P K Nag "Engineering Thermodynamics"	
References	1. Van Wylen G.J. & Sonntag R.E. : Fundamentals of classical thermodynamics, John Wiley & Sons, Inc. NY. 2. Wark Wenneth : Thermodynamics (2nd edition), Mc Graw Hill book Co. NY. 3. Holman, J.P. : Thermodynamics, MC Graw Hill book Co. NY. 4. Yadav R. : Thermodynamics and Heat Engines, Vol I & II (SI Edition) Central Publishing House Allahabad. 5. Yadav R. : Steam & Gas Turbines. 6. Kshitish Chandra Pal : Heat Power, Orient Longman Limited, 17, Chitranjan Avenue, Calcutta. 7. S. Rao, B.B. Parulekar, 'Energy Technology', Khanna Pub., New Delhi. 8. G. H. Ryder : "Strength of Materials". 9. F. L. Singer : "Strength of Materials".	

BASIC ENGINEERING MECHANICS (ME 204)		
Module Name	Content	No. of Hrs.
Force System	Introduction: Force system, dimensions and units in mechanics, laws of mechanics, vector algebra, addition and subtraction of forces, cross and dot products of vectors, moment of a force about a point and axis, couple and couple moment, transfer of a force to a parallel position, resultant of a force system using vector method, Problems involving vector application Equilibrium: Static and dynamic equilibrium, static in determinacy, general equations of equilibrium, Varignon's theorem, Lami's theorem, equilibrium of bodies under a force system, Problems.	10
Trusses And Frames	Truss and Frames: Truss, classification of truss, assumptions in truss analysis, perfect truss, analysis of perfect plane truss using method of joints and method of sections, Problems.	10
Centre Of Gravity And Moment Of Interia	Centroid , Centre of mass and Centre of gravity, Determination of centroid, centre of mass and centre of gravity by integration method of regular and composite figures and solid objects, Problems Moment of Inertia: Area moment of inertia, mass moment of inertia, parallel axis and perpendicular axis theorems, radius of gyration, polar moment of inertia, product of inertia, principle axis, problem based on composite figures and solid objects.	13
Kinematics And Dynamics	Kinematics: Concept of rigid body, velocity and acceleration, relative velocity, translation and rotation of rigid bodies, equations of motion for translation and rotation, problems. Particle Dynamics: Energy methods and momentum methods, Newton's laws, work energy equation for a system of particles, linear and angular momentum equations, projectile motion, problem	12
Total No. of Hours		45
Textbooks	1. R S Khurmi, "Engineering Mechanics" 2. P K Nag "Engineering Thermodynamics"	
References	1. Van Wylen G.J. & Sonntag R.E. : Fundamentals of classical thermodynamics, John Wiley & Sons, Inc. NY. 2. Wark Wenneth : Thermodynamics (2nd edition), Mc Graw Hill book Co. NY. 3. Holman, J.P. : Thermodynamics, MC Graw Hill book Co. NY. 4. Yadav R. : Thermodynamics and Heat Engines, Vol I & II (SI Edition) Central Publishing House Allahabad.	

Fundamentals of Information Technology (SET/CS/BT/C105)		
Module Name	Content	No. of Hrs.
Introduction	Definition of Electronic Computer, History, Generations, Characteristic and Application of Computers, Classification of Computers, Computer Hardware and Basic Computer Organization: CPU- ALU, CU; RAM/ROM, Various I/O devices, Peripherals, Storage Media;	6
Computer Languages	Binary, Hexadecimal Number System; Basic Binary Logic Operations; Binary Addition and Subtraction; Generation of Languages, Assembly Language, High level language; Translators, Interpreters, Compilers, Compilers; Flow Charts, Dataflow Diagram, Pseudo codes; Assemblers, Introduction to 4GLs;	8
OS & Office	Software- System and Application Software; Elementary Concepts in Operating System; Textual Vs GUI Interface, Introduction to DOS, MS Windows	6
Computer Networks	Elements of Communication system; Brief Introduction to Computer Networks- Introduction of LAN and WAN. Network Topologies, Client-server Architecture;	6
IT Application and Multi media	Basic Awareness of NICNET and ERNET; E Commerce, E governance; Brief Introduction to Different Formats of Image, Audio, Video;	8
Information Concepts & Processing:	Definitions of Information , Need of information, quality of information, value of information, concept of information, Entropy category and Level of information in Business Organization, Data Concepts and Data Processing, Data Representation, Application of IT to E-commerce, Electronic Governance, Multimedia, Entertainment, Introduction to Information System.	8
Total No. of Hours		42
Textbooks	1. Sinha, Sinha, "Computer Fundamentals"	
References	1. D S Yadav, "Foundations of IT", New Age, Delhi 2. Rajaraman, "Introduction to Computers", PHI 3. Peter Nortans "Introduction to Computers", TMH. 4. Patterson D.A. & Hennessy J.L., "Computer Organization and Design", Morgan Kaufmann Publishers	

ENVIRONMENTAL SCIENCE(AECC106)		
Module Name	Content	No. of Hrs.
Introduction to Environmental Sciences	Multidisciplinary nature of Environmental Sciences; Scope and importance; Concept of sustainability and sustainable development.	2
Ecosystems	What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems : a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)	6
Natural Resources: Renewable and Non-renewable Resources	Land resources and land use change; Land degradation, soil erosion and desertification. Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state). Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.	8
Biodiversity and Conservation	Levels of biological diversity : genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots, India as a mega-biodiversity nation; Endangered and endemic species of India, Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.	8
Environmental Pollution	Environmental pollution : types, causes, effects and controls; Air, water, soil and noise pollution Nuclear hazards and human health risks, Solid waste management: Control measures of urban and industrial waste. Pollution case studies.	8
Environmental Policies & Practices	Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture, Environment Laws: Environment Protection Act 1986; Air (Prevention & Control of Pollution) Act 1981; Water (Prevention and control of Pollution) Act 1974; Wildlife Protection Act 1972; Forest Conservation Act 1980. International agreements: Montreal protocol, Kyoto protocol and Convention on Biological Diversity (CBD). Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.	7
Human Communities and the Environment	Human population growth: Impacts on environment, human health and welfare. Resettlement and rehabilitation of project affected persons; case studies. Disaster management: floods, earthquake, cyclones and landslides. Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan. Environmental ethics: Role of Indian and other religions and cultures in environmental conservation. Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).	6
Field work	Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc., Visit to a local polluted site-Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds and basic principles of identification. Study of simple ecosystems-pond, river, lake, forest patch, grassland, Delhi Ridge, etc.	5
Total No. of Hours		50
Textbooks	<ol style="list-style-type: none"> 1. Carson, R. 2002. "<i>Silent Spring</i>". Houghton Mifflin Harcourt. 2. Gadgil, M., & Guha, R. 1993. "<i>This Fissured Land: An Ecological History of India</i>". Univ. of California Press. 3. Gleeson, B. and Low, N. (eds.) 1999. "<i>Global Ethics and Environment</i>", London, Routledge. 4. Gleick, P. H. 1993. "<i>Water in Crisis</i>". Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. 	
References	<ol style="list-style-type: none"> 1. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. "<i>Principles of Conservation Biology</i>. Sunderland: Sinauer Associates", 2006. 2. Grumbine, R. Edward, and Pandit, M.K. 2013. "Threats from India's Himalaya dams". <i>Science</i>, 339: 36-37. 3. McCully, P. 1996. "<i>Rivers no more: the environmental effects of dams</i>" (pp. 29-64). Zed Books. 4. McNeill, John R. 2000. "Something New Under the Sun: An Environmental History of the Twentieth Century". 5. Odum, E.P., Odum, H.T. & Andrews, J. 1971. "<i>Fundamentals of Ecology</i>". Philadelphia: Saunders. 6. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. "Environmental and Pollution Science". Academic Press. 7. Rao, M.N. & Datta, A.K. 1987. "<i>Waste Water Treatment</i>". Oxford and IBH Publishing Co. Pvt. Ltd. 8. Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012. "<i>Environment</i>." 8th edition. John Wiley & Sons. 9. Rosencranz, A., Divan, S., & Noble, M. L. 2001. "<i>Environmental law and policy in India</i>". Tripathi 1992. 	

BASIC ELECTRICAL ENGINEERING LAB (SET/ME/BT/C107)		
Module Name	Content	No. of Hrs.
Module 1	1. Study of analog voltmeter and ammeter 2. Study of digital multimeter 3. Study of CRO	3x2
Module 2	1. Verification of KCL and KVL. 2. Verification of Thevenin, Norton Network theorems. 3. Verification of Superposition Network theorem. 4. Verification of MPT Network theorem	3x2
Module 3	1. Measurement of efficiency of a single phase transformer by load test. 2. Determination of parameters and losses in single phase transformer by OC and SC test. 3. Measurement of power in a three phase circuit by two wattmeter method. 4. Verification of Single Phase Energy Meter constant. 5. Study of three phase induction motor.	3x5
Module 4	1. Verification of junction diode, zener diode characteristics. 2. Verification of Clipping and clamping circuits. 3. Verification of H.W. and F.W. rectifier circuit: with and without filter circuit and to determine the ripple factor. 4. Verification of CE characteristics of BJT.	3x4
Module 5	1. Verification of basic logic gates.	3x1
Total No. of Hours		42

CHEMISTRY LAB (SET/SH/BT/C108)		
Module Name	Content	No. of Hrs.
	1. To determine the percentage of available chlorine in the supplied sample of bleaching powder. 2. To determine the ferrous content in the supplied sample of iron ore by titrimetric analysis against standard $K_2Cr_2O_7$ solution using $K_3Fe(CN)_6$ as external indicator. 3. To determine the chloride content in supplied water sample using Mohr's method. 4. To determine the constituents and amount of alkalinity of the supplied water sample. 5. To determine the temporary and permanent hardness of water sample by complexometry. 6. To find chemical oxygen demand of a waste water sample using Potassium Dichromate. 7. To determine iron concentration in the sample of water by Spectrophotometric method. 8. To determine the molecular weight of a polystyrene sample by using viscometric method. 9. To determine pH of a solution by using digital pH meter and titration of such a solution pH metrically. 10. Analysis of a coal sample by proximate analysis method.	3 x 10
Total No. of Hours		30

Fundamental of Information Technology Lab (SET/IT/C109)		
Module Name	Content	No. of Hrs.
Module 1	1. Creation of a Word Document. 2. Creation of a Document in spreadsheet and using Formulae 3. Use of Search Engine and World Wide Web 4. Creation of email id and email 5. Use of FTP service. 6. Creation of Static Web Pages using HTML 7. Creation of Page Using Java Script (Besides these additional experiments can be included to give hands on experience to students. Students can be provided opportunity to work on any Information System to give them better understanding of Information System)	14x2
Total No. of Hours		28

ENGINEERING WORKSHOP (SET/ME/BT/C110)		
Module Name	Content	No. of Hrs.
Module 1	Mechanical Engineering covering, the following trades for experiments (with a minimum of two exercises under each trade) - Carpentry, Fitting, Tin- Smithy and Development of jobs carried out and soldering, Black Smithy, House Wiring, Foundry (Moulding only), Plumbing; (6 Sessions)	3X6
Module 2	Power tools in Construction, Wood working, Electrical and Mechanical Engineering practices; (2 Sessions)	3x4
Total No. of Hours		30

SEMESTER – II

S. No.	Code	Course Title	L	T	P	Contact Hrs./Week	Credits
1	SET/SH/BT/C201	Mathematics II	3	1	-	4	3
2	SET/SH/BT/C202	Physics	3	1	-	4	3
3	SET/EE/BT/C203	Basic Electrical Engineering	3	1	-	4	3
4	SET/EC/BT/C204	Basic Electronics	3	1	-	4	3
5	SET/IT/BT/C205	C-Programming	3	1	-	4	3
6	AECC206	General English*	2	-	-	2	2
7	SET/SH/BT/C207	Physics Lab	-	-	1	2	1
8	SET/EE/BT/C208	Electrical Engineering Lab	-	-	1	2	1
9	SET/CS/BT/C209	C Programming Lab	-	-	1	2	1
Total			17	5	5	32	22

MATHEMATICS- II (SET/SH/BT/C201)		
Module Name	Content	No. of Hrs.
Multiple Integral	Double and triple integrals, change of order of integration. Change of variables, application to area, volume, centre of gravity, moment of inertia and product of inertia. Gamma and Beta functions, Drichlet's integral and its application.	8
Fourier Series	Periodic functions, Fourier series of functions with period $2n$, change of interval, half range sine and cosine series.	6
Integral Transform	Laplace transforms, existence theorem, Laplace transform derivatives, inverse Laplace transform, application to solve linear differential equations, unit step function, Dirac delta function, Laplace transforms of periodic functions. Application of Laplace transforms. Definitions of Fourier and Z-transform and its simple applications.	12
Ordinary Differential Equations	Introduction to order, degree and arbitrary constants, linear differential equations of n^{th} order with constant coefficient, complimentary functions and particular integrals. Homogeneous differential equations, simultaneous linear differential equations. Solutions of second order differential equations by changing dependent and independent variables. Method of variation of parameters, equations of the form $y'' = f(y)$, applications to engineering problems.	12
Solutions of Equations and Curve Fitting	Solutions of cubic and bi-quadric equations. Method of least square and curve fitting.	6
Total No. of Hours		44
Textbooks	1. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers 2. H K Das, "Advanced Engineering Mathematics", S Chand 3. Erwin Kreyszig, "Advanced Engineering Mathematics"	
References	1. J. N. Kapoor, "A Text Book of Differential Equations"	

PHYSICS (SET/SH/BT/C202)		
Module Name	Content	No. of Hrs.
Optics	Interference: Coherent Sources, Conditions of Interference, Fresnel's Biprism Experiment, Interference in Thin Films, Newton's Rings; Single and n-Slit Diffraction, Diffraction Grating, Raleigh's Criterion of Resolution, Resolving Power of Telescope, microscope; Phenomenon of Double Refraction, Ordinary and Extra-ordinary Rays, Nicol Prism, Circularly and Elliptically Polarized Light, Fresnel Theory, Optical Activity, Specific Rotation;	13
Lasers and X-Rays	Laser : Principle of Laser Action, Einstein's Coefficients, Construction and Working of He-Ne and Ruby Laser; Introduction to Maser Diffraction of X-Rays, Bragg's Law, Practical Applications of X-Rays, Compton Effect.	7
Basics Material Science	Introduction to crystal structure of materials, Miller indices for crystallographic planes and directions. X-ray diffraction for determination of crystal structure. Defects in solids: point, line and planar defects and their effect on properties of materials. Band theory of solids, conductors, semi-conductors and insulators, metals. Fermi Level. Magnetism: dipole moments, paramagnetism, Curie's law, magnetization and hysteresis, Ferromagnetism and Anti-Ferromagnetism. Ferroelectricity and Piezoelectricity. Superconductivity in materials.	14
Electromagnetics	Ampere's Law and Displacement Current, Maxwell's Equations in Integral and Differential Forms, Electromagnetic Wave Propagation in Free Space and Conducting Media, Poynting Theorem.	8
Total No. of Hours		42
Textbooks	1. Gaur, Gupta, "Engineering Physics" 2. Callister W.D., "Materials Science and Engineering: An introduction", 6th Edition, John Wiley & Sons Inc., New York 2002	
References	1. J. R. Taylor, C.D. Zafiratos and M. A. Dubson, Modern Physics for Scientists and Engineers, 2nd Pearson 2. Arthur Beiser, Concepts of Modern Physics, 6th Ed., TMH, (2009) 3. D.J. Griffith : Electrodynamics	

BASIC ELECTRICAL ENGINEERING (SET/EE/BT/C203)		
Module Name	Content	No. of Hrs.
DC Networks	Concepts of linear, nonlinear, active, passive, unilateral and bilateral elements; Ideal and practical voltage & current sources – conversion from one to the other; Kirchhoff's laws – statements; Mesh Analysis; Nodal Analysis; Delta-Star & Star-Delta conversion; Superposition principle; Thevenin's theorem – statement, advantages in case of complex networks; explanation & illustration with examples; Norton's theorem, Maximum power transfer theorem, Reciprocity Theorem and its application	10
Single Phase AC Circuits	Generation of single phase a.c. voltage and determination of average (mean) and RMS (effective) values of voltage and current with special reference to sinusoidal waveforms; Form factor and peak factor for various waves; Representation of sinusoidal time varying quantities as phasors; concepts of reactance, impedance and their representation in complex forms using j operator; Steady state analysis of series R-L-C circuit & its phasor diagram; Concept of power & power factor; Concept of admittance, susceptance in parallel circuits; Analysis of series parallel circuits & phasor diagrams; Resonance in series and parallel circuits.	10
Three Phase Circuits	Generation of 3-phase balanced sinusoidal voltage; star & delta connections; line & phase quantities (current & voltage); Solution of 3-phase star/delta circuits with balanced supply voltage and balanced load; phasor diagram; 3-phase, 4-wire circuits; Measurement of three phase power by two wattmeter method; phasor diagram with balanced load and determination of load power factor from wattmeter readings.	6
Transformers and Rotating Machines	Transformers: Constructional features and principle of operation, concept of ideal transformer under no load & loaded conditions and its equivalent circuit; Practical transformer rating & its equivalent circuit; Autotransformer – principle of operation & relative advantages & disadvantages; Rotating Machine: construction features (stator, rotor & air gap), conditions for production of steady electromagnetic torque; Three phase Induction motor: constructional features and operation; DC Machines: construction features, EMF and Torque expression, Classification of d.c. motors and generators; Stepper motor.	12
Measuring Instruments	DC PMMC instruments – constructional feature and principle of operation; Moving iron meters – construction and principle of operation; Dynamometer type wattmeter; Induction type energy meter construction & principle of operation.	6
Total No. of Hours		44
Textbooks	1. I.J. Nagrath, "Basic Electrical Engineering," Tata Mc. Graw Hill.	
References	1. A. E. Fitzgerald, D.E., Higginbotham and A Grabel, "Basic Electrical Engineering", Mc Graw Hill. 2. Rizzoni, Principles and Applications of Electrical Engineering, TMH 3. V. Del Toro. "Principles of electrical Engineering, "Prentice hall 4. W.H. Hayt & J.E. Kemmerly, "Engineering circuit Analysis, "Mc Graw Hill 5. H. Cotton, "Advanced Electrical Technology" Wheeler Publishing	

BASIC ENGINEERING MECHANICS (ME 204)		
Module Name	Content	No. of Hrs.
Force System	Introduction: Force system, dimensions and units in mechanics, laws of mechanics, vector algebra, addition and subtraction of forces, cross and dot products of vectors, moment of a force about a point and axis, couple and couple moment, transfer of a force to a parallel position, resultant of a force system using vector method, Problems involving vector application Equilibrium: Static and dynamic equilibrium, static in determinacy, general equations of equilibrium, Varignon's theorem, Lami's theorem, equilibrium of bodies under a force system, Problems.	10
Trusses	Truss and Frames: Truss, classification of truss, assumptions in truss analysis, perfect truss, analysis of perfect plane truss using method of joints and method of sections, Problems.	10
Centre Of Gravity And Moment Of Interia	Centroid , Centre of mass and Centre of gravity, Determination of centroid, centre of mass and centre of gravity by integration method of regular and composite figures and solid objects, Problems Moment of Inertia: Area moment of inertia, mass moment of inertia, parallel axis and perpendicular axis theorems, radius of gyration, polar moment of inertia, product of inertia, principle axis, problem based on composite figures and solid objects.	13
Kinematics	Kinematics: Concept of rigid body, velocity and acceleration, relative velocity, translation and rotation of rigid bodies, equations of motion for translation and rotation, problems. Particle Dynamics: Energy methods and momentum methods, Newton's laws, work energy equation for a system of particles, linear and angular momentum equations, projectile motion, problem	12
Total No. of Hours		45
Textbooks	3. R S Khurmi, "Engineering Mechanics" 4. P K Nag "Engineering Thermodynamics"	
References	5. Van Wylen G.J. & Sonntag R.E. : Fundamentals of classical thermodynamics, John Wiley & Sons, Inc. NY. 6. Wark Wenneth : Thermodynamics (2nd edition), Mc Graw Hill book Co. NY. 7. Holman, J.P. : Thermodynamics, MC Graw Hill book Co. NY. 8. Yadav R. : Thermodynamics and Heat Engines, Vol I & II (SI Edition) Central Publishing House Allahabad. 9. Yadav R. : Steam & Gas Turbines. 10. Kshitish Chandra Pal : Heat Power, Orient Longman Limited, 17, Chittranjan Avenue, Calcutta. 11. S. Rao, B.B. Parulekar, 'Energy Technology', Khanna Pub., New Delhi. 12. G. H. Ryder : "Strength of Materials". 13. F. L. Singer : "Strength of Materials". 14. Timoshenko : "Strength of Materials". 15. Beer, Johnson, Statics"	

COMPUTER PROGRAMMING (CS 205)		
Module Name	Content	No. of Hrs.
Introduction	C character set, identifiers and keywords, data types, declarations, expressions, statements and symbolic constants.	6
Operators and Expressions	Arithmetic, unary, relational, logical, and assignment operators, conditional operator, library functions.	6
Control Statements	While, do-while, for statements, nested loops, if-else, switch, break, continue and go to statements, comma operator.	5
Functions	Defining and accessing functions, function prototypes, Passing arguments, recursion, and use of library functions.	5
Program Structure	Storage classes, automatic, external, static variables	4
Arrays	Defining and processing, passing to a function, multidimensional arrays, arrays and strings.	4
Pointers	Declarations, passing to a function, operations on pointers, pointers and arrays, dynamic memory allocation, array of pointers.	6
Structures and Unions	Basics of structures, Structures and functions, Arrays of Structures, Pointers to structures, self-referential structures, type definitions, Unions.	4
Data Files	Open, close, create, process, unformatted data files.	4
Total No. of Hours		44
Textbooks	1. E. Balagurusamy, "Programming in ANSI C"	
References	1. Byron S. Gottfried, "Programming With C" 2. Yashwant Kanitker, "LET US C" 3. B. W. Kernighan and D. M. Ritchie, "The C Programming Language" 4. B. W. Kernighan, "The Practice of Programming", Addison-Wesley, 1999. 5. C. L. Tondo and S. E. Gimpel, "The C Answer Book", (2/e), Prentice Hall, 1988.	

BUSINESS COMMUNICATION & PRESENTATION SKILLS (HU 206)		
Module Name	Content	No. of Hrs.
Business communication	Role of communication in information age; concept and meaning of communication; skills necessary for technical communication; Communications in a technical organization; Barriers to the process of communication and	3
Style and organization in technical communication	Listening, speaking, reading and writing as skills; Objectivity, clarity, precision as defining features of technical communication; Various types of business writing: Letters, reports, notes, memos; Language and format of various types of business letters; Language and style of reports; Report writing strategies; Analysis of a sample report;	4
Communication and personality development	Psychological aspects of communication, cognition as a part of communication; Emotional Intelligence; Politeness and Etiquette in communication; Cultural factors that influence communication; Mannerisms to be avoided in communication; Language and persuasion; Language and conflict resolution;	3
Oral Presentation and professional speaking	covering, Basics of English pronunciation; Elements of effective presentation; Body Language and use of voice during presentation; Connecting with the audience during presentation; Projecting a positive image while speaking; Planning and preparing a model presentation; Organizing the presentation to suit the audience and context; Basics of public speaking; Preparing for a speech;	3
Career Oriented Communication	Resume and biodata: Design & style; Applying for a job: Language and format of job application. Job Interviews: purpose and process; How to prepare for interviews; Language and style to be used in interview; Types of interview questions and how to answer them; Group Discussion: structure and dynamics; Techniques of effective participation in group discussion; Preparing for group discussion;	5
Advanced Techniques in Technical Communication	Interview through telephone/video-conferencing; Power-point presentation: structure and format; Using e-mail for business communication; Standard e-mail practices; Language in e-mail; Using internet for collecting information; Referencing while using internet materials for project reports; Writing for the media;	2
Studying General Texts	Prescribed text books for detailed study: "The old Man and the Sea" by Earnest Hemingway.	4
Total No. of Hours		24
Textbooks	<ol style="list-style-type: none"> 1. Malti Agarwal, "Professional Communication" 2. Earnest Hemingway, "The old Man and the Sea." 	
References	<ol style="list-style-type: none"> 1. Fred Luthans, Organizational Behaviour, McGraw Hill 2. Lesikar and petit, Report writing for Business 3. M. Ashraf Rizvi, Effective Technical Communication, McGraw Hill 4. Wallace and masters, Personal Development for Life and Work, Thomson Learning 5. Hartman Lemay, Presentation Success, Thomson Learning 6. Malcolm Goodale, Professional Presentations 7. Farhathullah, T. M. Communication skills for Technical Students 8. Michael Muckian, John Woods, The Business letters Handbook 9. Herta A. Murphy, Effective Business Communication 10. MLA Handbook for Writers of Research Papers 	

PHYSICS LAB (BS 207)		
Module Name	Content	No. of Hrs.
Module 1	<ol style="list-style-type: none"> To determine the wavelength of monochromatic light by Newton's ring method. To determine the wavelength of monochromatic light by Fresnel's biprism. To determine the focal length of two lenses by nodal slide and locate the position of cardinal points. To determine the wavelength of spectral lines using plane transmission grating. 	2x4
Module 2	<ol style="list-style-type: none"> Measurement of Magnetic susceptibility- Quincke's Method / Gouy's balance. Mapping of magnetic field 	2x2
Module 3	<ol style="list-style-type: none"> Measurement of e/m of electron – Thomson's experiment Determination of Planck's constant. 	2x2
Module 4	<ol style="list-style-type: none"> To draw hysteresis curve of a given sample of ferromagnetic material and from this to determine magnetic susceptibility To study the Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material. To determine the energy band gap of a given semiconductor material. 	2x3
Total No. of Hours		22

COMPUTER PROGRAMMING LAB (CS 208)		
Module Name	Content	No. of Hrs.
	This lab shall have minimum 25 programs in C. There shall be minimum two programs per module as taught in theory CS205. Programming shall follow logic/algorithm and flowchart wherever applicable. Exercises shall also enhance analytical and debugging abilities.	2x16
Total No. of Hours		32

SEMESTER III

Theory		L	T	P	T.A	C.T.	TOT	ESE.	SUB. TOTAL	Credit equivalenc e
Code	Course									
SET/AH/BT/C301	Mathematics III	3	1	-	10	20	30	70	100	3
SET/CS/BT/C302	Computer Based Numerical & Statistical Techniques	3	1	-	10	20	30	70	100	3
SET/CS/BT/C303	Data Structures Using C	3	1	-	10	20	30	70	100	3
SET/CS/BT/C304	Computer Organization	3	1	-	10	20	30	70	100	3
SET/CS/BT/C305	Digital Electronics	3	1	-	10	20	30	70	100	3
SET/CS/BT/C306	Computer Based Numerical & Statistical Techniques lab	-	-	1	30		30	70	100	1
SET/CS/BT/C307	Data Structures Using C Lab	-	-	2	30		30	70	100	2
SET/CS/BT/C308	Digital Electronics Lab	-	-	1	30		30	70	100	1
SET/CS/BT/S309	Seminar	-	-	1	30		30	70	100	1
Total		15	5	5			270	630	900	20

MATHEMATICS- III (SET/AH/BT/C301)		
Module Name	Content	No. of Hrs.
Ordinary Differential Equations	ODE of 2nd order with constant coefficients both homogeneous and non-homogeneous types with applications to electrical and mechanical systems. Difference equations and their solutions by Z transform. Series solutions of ODE of 2nd orders with variable coefficients with special emphasis to the differential equations of Legendre, Bessel and Chebyshev. Legendre's polynomials, Chebyshev polynomials and Bessel's functions and their properties.	14
Integral Transforms	Fourier transform and integral Hankel transforms and Hilbert transforms and their properties, some simple applications.	8
Partial Differential Equations	Linear PDE with constant coefficients of 2nd order and their classifications. PDE of parabolic, elliptic and hyperbolic type with illustrative examples. Separation of variables method for solving PDE, such as two dimensional heat equations, wave equations and Laplace equations.	10
Functions of a Complex Variable	Analytic functions, Cauchy Riemann equations, harmonic functions line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula derivatives of analytic function, Liouville's theorem, fundamental theorem of algebraic representation of a function by power series, Taylor's & Laurent series, poles & singularity of zeros. Residue theorem, conformal mapping, linear fractional transformation, special linear transformation.	14
Total No. of Hours		46
Textbooks	1. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers 2. H K Das, "Advanced Engineering Mathematics", S Chand 3. Erwin Kreyszig, "Advanced Engineering Mathematics"	
References	1. Papoulis, "Signal Analysis", TMH	

COMPUTER BASED NUMERICAL & STATISTICAL TECHNIQUES (SET/CS/BT/C302)		
Module Name	Content	No. of Hrs.
Errors in numerical computations	Errors in numerical computations, mathematical preliminaries, errors and their analysis, machine computations, computer software	6
Algebraic & Transcendental Equation	Bisection method, iteration method, method of false position, rate of convergence, method for complex root, Muller's method, quotient difference method, Newton's-Raphson methods.	6
Interpolation	Introduction, errors in polynomial interpolation, finite difference, decision of errors, Newton's formulae for interpolation, Gauss, Stirling, Bessel's, Everett's formulae, interpolation by unevenly spaced points, Lagrange interpolation formula, divided difference, Newton's general interpolation, formula. Curve Fitting.	10
Cubic Spline & Approximation	Introduction, method of least square curve fitting procedures, fitting a straight line, curve fitting by sum of exponentials, data fitting with cubic splines, approximation of functions.	8
Numerical Integration & Differentiation	Introduction, numerical differentiation, numerical integration, trapezoidal rule, Simpson 1/3 rule, Simpson 3/8 rule, Boole's and Weddle's rule, Euler-Maclaurin formula, Gaussian formula, numerical evaluation of singular integrals.	6
Statistical Computation	Frequency chart, regression analysis, least square fit, linear & non linear regression, multiple regression, statistical control methods.	6
Total No. of Hours		42
Textbooks	1. Sashtry : Introductory Method of Numerical Analysis, PHI 2. Balaguruswamy : Numerical Methods, TMH	
References	1. Jain, Iyengar, Jain : Numerical Methods for Scientific & Engg. Computation, New Age 2. Gerald & Wheatley : Applied Numerical Analysis, Addison Wesley	

Data Structures Using C (SET/CS/BT/C303)		
Module Name	Content	No. of Hrs.
Elementary Data Organization	Elementary Data Organization, Structure operations, Algorithm Complexity and Time-Space trade-off.	6
Arrays and Linked list	Representation and Analysis, Single and Multidimensional Arrays, address calculation, application of arrays, String in C, Array as Parameters, Ordered List, Sparse Matrices and Vectors. Representation and Implementation of Singly Linked Lists, Two-way Header List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to/from Linked Lists, Insertion and deletion Algorithms, Doubly linked list, Linked List in Array, Polynomial representation and addition, Generalized linked list, Garbage Collection and Compaction.	12
Stacks and Queues	Array Representation of Stack, Linked Representation of Stack, Operations Associated with Stacks, Application of stack: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack. Array and linked representation and implementation of queues, Create, Add, Delete, Full and Empty, Circular queues, Dqueues and Priority Queues.	8
Trees	Binary Trees, Binary tree representation, algebraic Expressions, Complete Binary Tree, Extended Binary Trees, Array and Linked Representation of Binary trees, Traversing Binary trees, Threaded Binary trees, Traversing, Threaded Binary trees, Huffman algorithm.	8
Searching and Sorting	Sequential search, binary search, comparison and analysis. Insertion Sort, Bubble Sorting, Quick Sort, Two Way Merge Sort, Heap Sort, Sorting on Different Keys. Binary Search Tree, Insertion and Deletion in BST, Complexity of Search Algorithm, AVL Trees, B-trees.	8
Total No. of Hours		42
Textbooks	1. Seymour Lipschutz, "Data Structures", TMH	
References	1. R. Kruse etal, "Data Structures and Program Design in C", Pearson Education Asia, Delhi-2002. 2. A. M. Tenenbaum, "Data Structures using C & C++", Prentice-Hall of India Pvt. Ltd., New Delhi.	

Computer Organization (SET/CS/BT/C304)		
Module Name	Content	No. of Hrs.
Fundamental Concepts	CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU—registers, instruction execution cycle, Performing of arithmetic or logical operations, Fetching a word from memory, storing a word in memory, Bus and Memory Transfers, Bus Architecture, Arithmetic Algorithms (addition, subtraction, Booth Multiplication), IEEE standard for Floating point numbers. General register organization, Register Transfers, Register Transfer Language.	10
Control Design	Execution of a complete instruction, Multiple-Bus organization, Hardwired Control, Micro programmed control, Microinstruction, address sequencing, Microinstruction with Next-address field, Prefetching Microinstruction.	8
Processor Design	Processor Organization: Stack organization, Addressing mode, Instruction format, Data transfer & manipulations, Program Control, Reduced Instruction Set Computer. Assembly levels programs, programming techniques such as looping, counting and indexing addressing modes, data transfer instructions, arithmetic and logic operations.	8
Input-Output Organization	I/O Interface, Modes of transfer, Interrupts & Interrupt handling, Direct Memory access, Input- Output processor, Serial Communication.	6
Memory Organization	Memory Hierarchy, Main Memory (RAM and ROM Chips), Auxiliary memory, Cache memory, Virtual Memory, Memory management hardware.	6
Pipelining and Parallel Processors:	Basic concepts of pipelining, throughput and speedup, pipeline hazards. Introduction to parallel processors, Concurrent access to memory and cache coherency.	4
Total No. of Hours		44

Textbooks	1. Morris Mano, “Digital Design” 2. Computer System Architecture, M. Mano(PHI)
References	1. Computer Organization, Vravice, Zaky & Hamacher (TMH Publication) 2. Structured Computer Organization, Tannenbaum(PHI) 3. Computer Organization, Stallings(PHI).

Digital Electronics (SET/CS/BT/C305)		
Module Name	Content	No. of Hrs.
Introduction	Positional number system; Binary, octal and hexadecimal number systems; Methods of base conversions; Binary, octal and hexadecimal arithmetic; Representation of signed numbers; Fixed and floating point numbers. Definition and specification of combination logic; Truth table; Basic logic operation and logic gates; Binary coded decimal codes; Gray codes.	6
Boolean Algebra and Switching Functions	Basic postulates and fundamental theorems of Boolean algebra; Standard representation of logic functions - SOP and POS forms; Simplification of switching functions - K-map and Quine-McCluskey tabular methods;	4
Logic Families	Diode, BJT and MOSFET as a switch. Introduction to different logic families; Electrical characteristics of logic gates – logic levels and noise margins, fan-out, propagation delay, transition time, power consumption and power-delay product; circuit description and operation; RTL; DTL,HTL,TTL and sub families , Brief idea of ECL, CMOS BI-CMOS.	10
Combinational Logic	Arithmetic modules: adders, subtractors and ALU; Design examples. Decoders, encoders, multiplexers and de-multiplexers; Parity circuits and comparators.	6
Sequential Logic	Basic sequential circuits- latches and flip-flops: SR-latch, D-latch, D flip-flop, JK flip-flop, T flip-flop and their inter-conversions; Timing hazards and races; Meta-stability; Analysis of state machines using D flip-flops and JK flip-flops; Definition of state machines, synchronous sequential logic, shift register, counters-ripple and mod counters.	12
Semiconductor Memories	RAM, ROM, Content Addressable Memory, Charge Coupled Device Memory. PLAs, PALs and their applications; Sequential PLDs and their applications;	4
Total No. of Hours		42

Textbooks	1. Morris Mano, “Digital Design” 2. John F Wakerly, “Digital Design: Principles and Practices”, Prentice Hall
References	1. Thomas L. Floyd, “Digital Fundamentals”, Pearson/ Prentice Hall 2. Ronald J. Tocci, “Digital Systems: Principles and Applications”, Pearson/ Prentice Hall 3. Charles Roth, “Fundamentals of Logic Design”, Jaico Publishing House

COMPUTER BASED NUMERICAL & STATISTICAL TECHNIQUES LAB (SET/CS/BT/C306)		
Module Name	Content	No. of Hrs.
Errors in numerical computations	Write a Program to deduce errors involved in polynomial interpolation.	6
Algebraic & Transcendental Equation	Write a Program for algebraic and transcendental equations using bisection, iterative, method of false position, also give rate of conversions of roots in tabular form for each of these methods.	6
Interpolation	Write a Program to implement Bessel's functions, Newton's, Stirling's, Lagrange's.	6
Cubic Spline & Approximation	Write a Program to implement method of least square curve fitting.	6
Numerical Integration & Differentiation	Write a Program to Implement numerical differential using trapezoidal, Simpson 3/8 rules.	6
Statistical Computation	Write a Program to show frequency chart, regression analysis, linear square fit and polynomial fit.	6
Total No. of Hours		36

DATA STRUCTURES LAB (SET/CS/BT/C307)		
Module Name	Content	No. of Hrs.
Arrays	Array implementation of Stack, Queue, Circular Queue.	9
Linked List	List implementation of Stack, Queue, Circular Queue.	9
Tree	Implementation of Tree, Binary Tree, Tree Traversal, Binary Search Tree, Insertion and Deletion in BST.	9
Searching and Sorting	Implementation of Searching and Sorting Algorithms.	9
Total No. of Hours		36

DIGITAL ELECTRONICS (SET/CS/BT/C308)		
Module Name	Content	No. of Hrs.
Experiments	<ol style="list-style-type: none"> 1. Combinational Logic design using basic gates (Code Converters, Comparators). 2. Combinational Logic design using decoders and MUXs. 3. Arithmetic circuits - Half and full adders and subtractors. 4. Bread Board Implementation of Flip-Flops. 5. Experiments with clocked Flip-Flop. 6. Design of Counters. 7. Bread Board implementation of counters & shift registers. 8. Implementation of Arithmetic algorithms. 9. Bread Board implementation of Adder/Subtractor (Half, Full) 10. Bread Board implementation of Binary Adder. 11. Bread Board implementation of Seven Segment Display. 12. Write assembly levels programs using programming techniques such as looping, counting and indexing addressing modes 	4x10
Total No. of Hours		40

SEMESTER IV

Theory		L	T	P	T.A	C.T.	TOT	ESE.	SUB. TOTAL	Credit equivalence
Code	Course									
SET/CS/BT/C401	Object Oriented Programming using C++	3	1	-	10	20	30	70	100	3
SET/CS/BT/C402	Operating System	3	1	-	10	20	30	70	100	3
SET/CS/BT/C403	Discrete Structure	3	1	-	10	20	30	70	100	3
SET/CS/BT/C404	Data Communication and Computer Networks	3	1	-	10	20	30	70	100	3
SET/CS/BT/C405	Theory of Automata and Formal Languages	3	1	-	10	20	30	70	100	3
SET/CS/BT/C406	Object Oriented Programming using C++ Lab	-	-	1	30	-	30	70	100	1
SET/CS/BT/C407	Operating System Lab	-	-	1	30	-	30	70	50	1
SET/CS/BT/C408	Data Communication and Computer Network Lab	-	-	1	30	-	30	70	50	1
SET/CS/BT/S409	Mini Project -1	-	-	2	30	-	30	70	50	2
Total		15	5	5			270	630	900	20

OBJECT ORIENTED PROGRAMMING USING C++ (SET/CS/BT/C401)		
Module Name	Content	No. of Hrs.
Fundamental Concept	Object Oriented Programming Paradigm, Basic concepts of OOP, Objects, Classes, Data abstraction and Encapsulation, Inheritance, Polymorphism, Dynamic binding, Message passing, Applications of OOP. Introduction to C++, structure of C++ Program. Tokens, Keywords, Identifiers and Constants, Data Types, Declaration and Dynamic Initialization of Variables, Reference Variables, Operators in C++, Expressions and their types, Control Structure, Functions in C++, Function Overloading.	10
Classes, Objects and Constructors	C Structure Revisited, Specifying a class, Defining Member functions, Making an Outside function inline, nesting of member function, Private member function, arrays within class, Memory allocation for objects, static data members and member functions, Arrays of objects, Object as a function arguments, Friend function, Returning objects, pointers to members local classes. Constructors, Parameterized constructors, Multiple constructors in a class, constructors with default arguments, dynamic initialization of objects, copy constructor, dynamic constructors, constructing 2-D arrays, Destructors.	8
Inheritance	Derived class declaration, forms of inheritance, inheritance and member accessibility, constructors and destructors in derived classes, constructors invocation and data members initialization, overloaded member functions, types of inheritance.	8
Polymorphism	Defining operator overloading, Overloading Unary and Binary operators, Operator Overloading using friends, Manipulation of strings using operators, Rules for overloading operators. Need for virtual functions, pointer to derived class objects, array of pointers to base class objects, pure virtual functions, virtual destructor, Concatenation of strings.	6
Streams computation & Exception Handling	Predefined console streams, hierarchy of console stream classes, unformatted and formatted console I/O operations, manipulators, Files: Hierarchy of file stream classes, opening and closing, testing for errors, modes, pointers and their manipulators, sequential access. Exceptions and Exception handling mechanism, throwing and catching mechanism, Re-throwing an exception, list of exceptions, handling uncaught exceptions.	10
Total No. of Hours		42
Textbooks	1. Balagurusamy “Object Oriented Programming with C++ ”, TMH	
References	1. Budd,”Object Oriented Programming “, Addison Wesley. 2. Mastering C++ K.R Venugopal Rajkumar, TMH. 3. C++ Primer , “Lip man and Lajole”, Addison Wesley.	

OPERATING SYSTEMS (SET/CS/BT/C402)		
Module Name	Content	No. of Hrs.
Fundamental Concept	Operating System and Function, Evolution of Operating System, Batch, Interactive, Time Sharing and Real Time System, System Protection. Operating System Structure: System Components, System Structure, Operating System Services.	6
Concurrent Processes	Process Concept, Principle of Concurrency, Producer / Consumer Problem, Critical Section, Problem, Semaphores, Classical Problems in Concurrency, Inter Processes Communication, Process Generation, Process Scheduling. CPU Scheduling: Scheduling Concept, Performance Criteria Scheduling Algorithm, Evolution, Multiprocessor Scheduling.	8
Deadlock	System Model, Deadlock Characterization, Prevention, Avoidance and Detection, Recovery From Deadlock Combined Approach.	6
Memory Management	Basic Machine, Resident Monitor, Multiprogramming with Fixed Partition, Multiprogramming With Variable Partition, Multiple Base Register, Paging, Segmentation, Paged Segmentation, Virtual Memory Concept, Demand Paging, Performance, Paged Replaced Algorithm, Allocation of Frames, Thrashing, Cache Memory Organization, Impact on Performance.	8
I/O Management & Disk Scheduling	I/O Devices and The Organization of I/O Function, I/O Buffering, Disk I/O, Performance criteria in scheduling algorithms, Concept of FCFS scheduling algorithm, Concept of priority scheduling algorithm like SJF, Concept of non-preemptive and preemptive algorithms, Concept of round-robin scheduling algorithm, , Concept of multi-level queues, feedback queues. Operating System Design Issues. File System: Basic File System, Access Control Verification, Logical File System, and Physical File System File-System Interface: File Concept, Access Methods, Directory Structure, Protection, and Consistency Semantics File-System Implementation: File-System Structure, Allocation Methods, Free-Space Management, Directory Implementation, Efficiency and Performance, Recovery. .	10
Unix Operating System	Development Of Unix, Role & Function Of Kernel, System Calls, Elementary unix command & Shell Programming, Directory Structure, System Administration, ,Case study: UNIX Operating System	4
Total No. of Hours		42
Text Books	1. Tannenbaum, "Operating System Design and Implementation", PHI.	
References	1. Milenekovie, "Operating System Concept", McGraw Hill. 2. Petersons, "Operating Systems", Addison Wesley. 3. Dietal, "An Introduction to Operating System", Addison Wesley. 4. Gary Nutt, "Operating System, A Modern Perspective", Addison Wesley.	

DISCRETE STRUCTURE (SET/CS/BT/C403)		
Module Name	Content	No. of Hrs.
Set Theory	Countable and uncountable sets, Venn Diagrams, proofs of some general identities on sets Relation: Definition, types of relation, composition of relations, Pictorial representation of relation, equivalence relation, partial ordering relation, Type of functions, one to one, into and onto function, inverse function, composition of functions, recursively defined functions, mathematical induction (simple and strong), pigeonhole principle, prove by contradiction.	12
Algebraic Structures	Properties, Semi Groups, Monoid, Groups, Abelian group, properties of groups, Subgroup, cyclic groups, Cosets, factor group, Permutation groups, Normal subgroup, Homomorphism and isomorphism of Groups, Rings and Fields.	6
Posets, Hasse Diagram and Lattices	Introduction, ordered set, Hasse diagram of partially, ordered set, isomorphic ordered set, well ordered set, properties of Lattices, bounded and complemented lattices.	6
Propositional Logic	Proposition, First order logic, Basic logical operation, truth tables, tautologies, Contradictions, Algebra of Proposition, logical implications, logical equivalence, predicates, Universal and existential quantifiers.	10
Permutation & Combination	Recurrence Relation, Generating function., Permutation & Combination, Probabilistic Permutation & Combination.	8
Total No. of Hours		42
Textbooks	1. Liptschutz, Seymour, “ Discrete Mathematics”, McGraw Hill. 3rd edition 2. Trembley, J.P & R. Manohar, “Discrete Mathematical Structure with Application to Computer Science”, McGraw Hill, Reprint 2010	
References	1. Discrete Mathematics & its application with combinatory and graph theory, K.H.Rosen, TMH (6th ed). 2. C.L.Liu, ‘Discrete Mathematics’ TMH.	

Data Communication and Computer Networks (SET/CS/BT/C404)		
Module Name	Content	No. of Hrs.
Introduction	Introduction to Computer Networking: Use, advantage, structure of the communications network topologies the telephone network, analog to digital communication. Network classes, Repeaters Hub, Bridges, Switches, Routers, Gateways B-routers.	6
Data Communications	Fundamentals: Layered Network Architecture, Communication Between Analog Computers & Terminals Layered Protocols, Network & The OSI Models, Traffic control and accountability wide area and local area networks, connection oriented and connectionless networks, classification of communication protocols polling/selection systems, design problems, communication between layers, ISO standard. Transmission Media: Guided, Unguided; Transmission Impairments and Channel Capacity; Transmission of Digital Data, Interfaces-DTE-DCE, MODEM, The telephone network system and DSL technology;	8
Data link layer:	Introduction, Framing, and Error – Detection and Correction – Parity – LRC – CRC Hamming code, Flow and Error Control, Noiseless Channels, Noisy Channels, HDLC, Medium Access sub layer: ALOHA, CSMA/CD, IEEE LAN Standards Random access, Controlled access, Channelization. Data Link Protocols: Synchronous, Asynchronous Protocols, Point-to-Point Protocol(PPP) Switching Communication Networks: Circuit switching; Packet switching; Routing in packet switched networks; X.25; Frame Relay, ATM, ISDN.	10
Network Layer	Network Layer Design Issues, Routing Algorithms, Network Layer Protocols IP Addressing, CIDR & NAT, IP layer protocols (ICMP, ARP, RARP, DHCP, and BOOTP) and IPv6, TCP/IP and internetworking, Network Devices.	10
Transport layer and Application layer	Process to Process Delivery, UDP and TCP protocols, Data Traffic, Congestion Control, QoS, Integrated Services, Differentiated Services. Domain name space, DNS in internet, electronic mail, SMTP, FTP, WWW, HTTP, SNMP.	8
Total No. of Hours		42
Text Books	1. Data communication & Networking by Bahrouz Forouzan. 2. Stallings, W. (2010), Data and Computer Communications, Pearson.	
References	1. J. Kurose, K. Ross, Computer Networking: A Top - Down Approach, Pearson 2. Tannanbaum, A.S.: Computer Network, PHI 3. Black : Computer Network; Protocols, Standards and Interface PHI	

Theory of Automata and Formal Languages (SET/CS/BT/C405)		
Module Name	Content	No. of Hrs.
Finite Automata	Introduction to defining language, Kleene closures, Arithmetic expressions, defining grammar, Chomsky hierarchy, Finite Automata (FA), Transition graph, generalized transition graph. Nondeterministic finite Automata (NFA), Deterministic finite Automata (DFA), Construction of DFA from NFA and optimization, FA with output: Moore machine, Mealy machine and Equivalence, Applications and Limitation of FA, Arden Theorem, Pumping Lemma for regular expressions, Myhill - Nerode theorem.	12
Context free grammar	Ambiguity, Simplification of CFGs, Normal forms for CFGs, Pumping lemma for CFLs, Decidability of CFGs, Ambiguous to Unambiguous CFG.	8
Push Down Automata	Description and definition, Working of PDA, Acceptance of a string by PDA, PDA and CFG, Introduction to auxiliary PDA and Two stack PDA.	10
Turing Machines	Basic model, definition and representation, Language acceptance by TM, TM and Type – 0 grammar, Halting problem of TM, Modifications in TM, Universal TM, Properties of recursive and recursively enumerable languages, unsolvable decision problem, undecidability of Post correspondence problem, Church's Thesis, Recursive function theory, Godel Numbering.	10
Total No. of Hours		42
Text Books	1. K.L.P. Mishra and N.Chandrasekaran, "Theory of Computer Science (Automata, Languages and Computation)", PHI	
References	1. Hopcroft, Ullman, "Introduction to Automata Theory, Language and Computation", Nerosa Publishing House 2. Cohen D. I. A., "Introduction to Computer theory", John Wiley & Sons	

OBJECT ORIENTED PROGRAMMING USING C++ LAB (SET/CS/BT/C406)		
Module Name	Content	No. of Hrs.
Experiments / Spice Simulations	1. Implementation of input and output statements. 2. Implementation of control statements. 3. Implementation of functions. 4. Implementation of array 5. Implementation of Classes and Constructor and Destructor. 6. Implementation of files. 7. Implementation of OOP's Concepts (Inheritance, Polymorphism, Encapsulation, Friend and Static Functions)	3x12
Total No. of Hours		36

OPERATING SYSTEMS LAB (SET/CS/BT/C407)		
Module Name	Content	No. of Hrs.
Module 1	1. Demonstrate how to use the following Bourne Shell commands: cat, grep, ls ,more, ps, chmod, finger etc.. 1. Use the following Bourne Shell constructs: test, if then, if then else, if then el if, for, while, until, and case. 2. Learn tracing mechanisms (for debugging), user variables, Bourne Shell variables, read-only variables, positional parameters, reading input to a Bourne Shell script, command substitution, comments, and exporting variables. In addition, test on numeric values, test on file type, and test on character strings are covered.. 3. Copy, move, and delete files and directories. 4. Write moderately complex Shell scripts. 5. Make a Shell script executable 6. Create a ".profile" script to customize the user environment.. 7. Execute programs written in C under UNIX environment	3x12
Total No. of Hours		36

Data Communication and Computer Networks Lab (SET/CS/BT/C408)		
Module Name	Content	No. of Hrs.
Module 1	1. To study about different physical equipment's used for networking. 2. Implementation of CRC algorithm in C. 3. Implementation of a Hamming (7, 4) code to limit the noise. Code the 4 bit data in to 7 bit data by adding 3 parity bits. 4. To study the working of Basic Networking Commands. 5. To assign IP address to the PC connected to the internet. 6. Simulation of a network of 3 nodes and measure the performance on the same network. 7. Creating a Network topology using CISCO packet tracer software.	3x12
Total No. of Hours		36

MINI PROJECT – 1(SET/CS/BT/C409)		
Module Name	Content	No. of Hrs.
Module 1	Mini Project-1 shall be based on C/C++.	3x12
Total No. of Hours		36

SEMESTER V

Theory		L	T	P	T.A	C.T.	TOT	ESE.	SUB. TOTAL	Credit equivalence
Code	Course									
SET/CS/BT/C501	Database Management System	3	1	-	10	20	30	70	100	3
SET/CS/BT/C502	Java Programming	3	1	-	10	20	30	70	100	3
SET/CS/BT/C503	Design and Analysis of Algorithms	3	1	-	10	20	30	70	100	3
SET/CS/BT/C504	Software Engineering	3	1	-	10	20	30	70	100	3
SET/CS/BT/C505	Graph Theory	3	1	-	10	20	30	70	100	3
SET/CS/BT/C506	DBMS Lab		-	1	30	-	30	70	100	1
SET/CS/BT/C507	Java Programming Lab	-	-	1	30	-	30	70	100	1
SET/CS/BT/C508	Design and Analysis of Algorithms Lab	-	-	2	30	-	30	70	100	2
SET/CS/BT/S509	Seminar	-	-	1	30	-	30	70	100	1
Total		15	5	5			270	630	900	20

DATABASE MANAGEMENT SYSTEM (SET/CS/BT/C501)		
Module Name	Content	No. of Hrs.
Fundamental Concepts	Database system Vs file system, Database system concepts and architecture, data models schema and instances, data independence and data base language and interfaces, Data definitions language, DML, Overall Database Structure.	8
Entity Relationship Model	ER model concepts, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationships of higher degree. Relational data Model and Language, integrity constraints, relational algebra, relational calculus, tuple and domain calculus.	6
Data Base Design & Normalization	Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependences, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design. Transaction.	10
Processing Concepts	Transaction system, Testing of serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling. Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple.	12
Introduction to SQL	Characteristics of SQL. Advantage of SQL. SQL data types and literals. Types of SQL commands. SQL operators and their procedure. Tables, views and indexes. Queries and sub queries. Aggregate functions. Insert, update and delete operations. Joins, Unions, Intersection, Minus, Cursors in SQL granularity, Multi version schemes, Recovery with concurrent transaction.	6
Total No. of Hours		42
Text Books	1. Korth, Silbertz, Sudarshan, "Database Concepts", McGraw Hill	
References	2. Elmasri, Navathe, "Fundamentals Of Database Systems", Addison Wesley 3. Date C.J. "An Introduction to Database System". Addison Wesley	

Java Programming (SET/CS/BT/C502)		
Module Name	Content	No. of Hrs.
Java Fundamentals	Features of Java, OOPs concepts, Java virtual machine, Reflection byte codes, Byte code interpretation, Data types, variable, arrays, expressions, operators, and control structures, Objects and classes. Abstract classes, Static classes, Inner classes, Packages, Wrapper classes, Interfaces, This ,Super, Access control	10
Exception handling	Exception as objects ,Exception hierarchy, Try, catch, finally, Throw, throws, IO package, Input streams, Output streams, Object serialization, De-serialization, Sample programs on IO files, Filter and pipe streams, Multi-threading, Thread Life cycle, Multi-threading advantages and issues, Simple thread program, Thread synchronization, GUI, Introduction to AWT programming, Layout and component managers, Event handling, Applet class, Applet life-cycle, Passing parameters embedding in HTML, Swing components – J Applet, J Button, J Frame.	12
Java Beans and Web Servers	Introduction to Java Beans, Advantage, Properties, BDK, Introduction to EJB, Java Beans API Introduction to Servlets, Lifecycle, JSDK, Servlet API, Servlet Packages: HTTP package, Working with Http request and response, Security Issues. JSP: Introduction to JSP, JSP processing, JSP Application Design, Tomcat Server, Implicit JSP objects, Conditional Processing, Declaring variables and methods, Error Handling and Debugging, Sharing data between JSP pages- Sharing Session and Application Data.	10
Database Connectivity	Database Programming using JDBC, Studying Javax.sql. package, accessing a database from a JSP page, Application-specific Database Action, Developing Java Beans in a JSP page, introduction to Struts framework	10
Java Fundamentals	Features of Java ,OOPs concepts ,Java virtual machine, Reflection byte codes, Byte code interpretation ,Data types, variable, arrays, expressions, operators, and control structures, Objects and classes. Abstract classes, Static classes, Inner classes, Packages, Wrapper classes, Interfaces, This ,Super, Access control	10
Total No. of Hours		42
Textbooks	1. Java – Balaguruswamy	
References	2. Java Programming John P. Flynt Thomson 2nd 3. Java Programming Language Ken Arnold Pearson 4. The complete reference JAVA2, Herbert schildt. TMH 5. Big Java, Cay Horstmann 2nd edition, Wiley India Edition	

DESIGN & ANALYSIS OF ALGORITHMS (CS 503)		
Module Name	Content	No. of Hrs.
Fundamental Concepts	Algorithms, analysis of algorithms, Growth of Functions, Master's Theorem, Designing of Algorithms.	10
Sorting and order Statistics	Heap sort, Quick sort, Sorting in Linear time, Medians and Order Statistics. Advanced Data Structure: Red-Black Trees, Augmenting Data Structure. B-Trees, Binomial Heaps, Fibonacci Heaps, Data Structure for Disjoint Sets.	10
Design and Analysis	Dynamic Programming, Greedy Algorithms, Amortized Analysis, Back Tracking.	10
Graph Algorithms	Elementary Graphs Algorithms, Minimum Spanning Trees, Singlesource Shortest Paths, All-Pairs Shortest Paths, Maximum Flow, and Traveling Salesman Problem. Selected Topics: Randomized Algorithms, String Matching, NP Completeness, Approximation Algorithms.	12
Total No. of Hours		42
Textbooks	1. Coreman, Rivest, Lisserson, : "Algorithm", PHI.	
References	2. Basse, "Computer Algorithms: Introduction to Design & Analysis", Addison Wesley. 3. Horowitz & Sahani, "Fundamental of Computer Algorithm", Galgotia.	

SOFTWARE ENGINEERING (SET/CS/BT/C504)		
Module Name	Content	No. of Hrs.
Introduction	Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Quality Assurance, Verification and Validation, SQA Plans, Software Quality Frameworks. Software Development Models, Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.	10
Software Requirement Specifications and Design	Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document. Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures. Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design.	10
Software Measurement and Metrics	Various Size Oriented Measures, Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures, Control Flow Graphs. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO).	8
Software Testing	Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies, Structural Testing, Functional Testing, Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies.	8
Software Maintenance	Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities. Change Control Process, Software Version Control, An Overview of CASE Tools.	6
Total No. of Hours		42
Textbooks	1. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.	
References	1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill. 2. Ian Sommerville, Software Engineering, Addison Wesley.	

GRAPH THEORY (SET/CS/BT/C 505)		
Module Name	Content	No. of Hrs.
Graphs	Sub graphs, some basic properties, various example of graphs & their sub graphs, walks, path & circuits, connected graphs, disconnected graphs and component, euler graphs, various operation on graphs, Hamiltonian paths and circuits, the traveling sales man problem.	10
Trees and fundamental circuits	Distance diameters, radius and pendent vertices, rooted and binary trees, on counting trees, spanning trees, fundamental circuits, finding all spanning trees of a graph and a weighted graph, algorithms of primes, Kruskal and dijkstra Algorithms.	8
Cuts sets and cut vertices	Fundamental circuits and cut sets , connectivity and separability, network flows, planer graphs, combinatorial and geometric dual, Kuratowski to graphs detection of planarity, geometric dual, some more criterion of planarity, thickness and crossings. Vector space of a graph and vectors, basis vector, cut set vector, circuit vector, circuit and cut set verses subspaces, orthogonal vectors and subspaces, incidence matrix of graph, sub matrices of A(G), circuit matrix, cut set matrix, path matrix and relationships among Af, Bf, and Cf, fundamental circuit matrix and rank of B, adjacency matrices, rank- nullity theorem	12
Coloring, Covering and Partitioning	Chromatic number, chromatic partitioning, chromatic polynomials, matching, covering, four color problem, Directed graphs, some type of directed graphs, Directed paths, and connectedness, Euler digraphs, trees with directed edges, fundamental circuits in digraph, matrices A, B and C of digraphs adjacency matrix of a digraph, enumeration, types of enumeration, counting of labeled and unlabeled trees, polya's theorem, graph enumeration with polya's theorem. Graph theoretic algorithm must be provided wherever required to solve the problems.	12
Total No. of Hours		42
Textbooks	1. Deo, N: Graph theory, PHI	
References	1. Harary, F: Graph Theory, Narosa 2. Bondy and Murthy: Graph theory and application. Addison Wesley.	

DBMS LAB (SET/CS/BT/C 506)		
Module Name	Content	No. of Hrs.
Module 1	<ol style="list-style-type: none"> 1. Write the queries for Data Definition and Data Manipulation language. 2. Write SQL queries using Logical operators (=,<,>,etc.). 3. Write SQL queries using SQL operators (Between.... AND, IN(List), Like, ISNULL and also with negating expressions). 4. Write SQL query using character, number, date and group functions. 5. Write SQL queries for Relational Algebra (UNION, INTERSECT, and MINUS, etc.). 6. Write SQL queries for extracting data from more than one table (Equi-Join, Non-Equi-Join , Outer Join) 7. Write SQL queries for sub queries, nested queries. 8. Write programs by the use of PL/SQL. 9. Concepts for ROLL BACK, COMMIT & CHECK POINTS. 10. Create VIEWS, CURSORS, and TRIGGRS & write ASSERTIONS, Create FORMS and REPORTS. 	3x12
Total No. of Hours		36

JAVA PROGRAMMING LAB ((SET/CS/BT/C 507)		
Module Name	Content	No. of Hrs.
Module1	1. Creation of classes and use of different types of functions 2. Programs using constructor and destructor 3. Programs on interfaces 4. Programs on packages 5. Programs using function overloading 6. Programs using inheritance 7. Programs using IO streams 8. Programs using files 9. Write a program using exception handling mechanism 10. Programs using AWT 11. Programs on swing 12. Programs using JDBC	3x12
Total No. of Hours		36

DESIGN AND ANALYSIS OF ALGORITHMS LAB ((SET/CS/BT/C 508)		
Module Name	Content	No. of Hrs.
Module 1	1. Divide and conquer method (quick sort, merge sort, Strassen's matrix multiplication), 2. Greedy method (knapsack problem, job sequencing, optimal merge patterns, minimal spanning trees). 3. Dynamic programming (multistage graphs, OBST, 0/1 knapsack, traveling salesperson problem). 4. Back tracking (n-queens problem, graph coloring problem, Hamiltonian cycles). 5. Sorting : Insertion sort, Heap sort, Bubble sort 6. Searching : Sequential and Binary Search 7. Selection : Minimum/ Maximum, Kth smallest element	3x12
Total No. of Hours		36

SEMINAR ((SET/CS/BT/C 509)		
Module Name	Content	No. of Hrs.
Module 1	Every Student shall deliver a seminar for 30 minutes. Topic for the seminar shall be decided in consultation with faculty. Topic can be related to an application or a technology which makes use of Computer Science and Engineering. Students should search for the related literature and prepare a presentation. Evaluation shall be based on content, presentation and active participation.	-
Total No. of Hours		-
References	1. Internet and Journals/Magazines	

SEMESTER VI

Theory		L	T	P	T.A	C.T.	TOT	ESE.	SUB. TOTAL	Credit equivalence
Code	Course									
SET/CS/BT/C601	Compiler Designing	3	1	-	10	20	30	70	100	3
SET/CS/BT/C602	Computer Graphics	3	1	-	10	20	30	70	100	3
SET/CS/BT/C603	Cryptography and Network Security	3	1	-	10	20	30	70	100	3
SET/CS/BT/C604	Data Mining	3	1	-	10	20	30	70	100	3
SET/CS/BT/C605	E-Commerce	3	1	-	10	20	30	70	100	3
SET/CS/BT/C606	Compiler Designing Lab	-	-	1	30	-	30	70	100	1
SET/CS/BT/C607	Computer Graphics Lab	-	-	1	30	-	30	70	100	1
SET/CS/BT/C608	Python Lab	-	-	1	30	-	30	70	100	1
SET/CS/BT/S609	Mini Project – 2	-	-	2	30	-	30	70	100	2
Total		15	5	5			270	630	900	20

COMPILER CONSTRUCTION (SET/CS/BT/C 601)		
Module Name	Content	No. of Hrs.
Fundamental Concept	Introduction to Compiler, Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Implementation of lexical analyzers, lexical-analyzer generator, LEX-compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC.	10
Syntactic specification of programming languages	Context free grammars, derivation and parse trees, capabilities of CFG. Basic Parsing Techniques, Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables, constructing LALR sets of items.	12
Syntax-directed Translation	Syntax-directed Translation schemes, Implementation of Syntax- directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declarations, case statements.	10
Symbol Tables	Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors. Introduction to code optimization: Loop optimization, the DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.	10
Total No. of Hours		42
Textbooks	1. Aho, Sethi & Ullman, "Compiler Design", Addison Wesley.	
References		

COMPUTER GRAPHICS (SET/CS/BT/C602)		
Module Name	Content	No. of Hrs.
Graphics Primitives	Display devices, Primitive devices, Display File Structure, Display control text.	4
Line generation, Polygon, Segments	Points lines, Planes, Pixels and Frame buffers, vector and character generation. Polygon Representation, Entering polygons, Filling polygons. Segments table, creating deleting and renaming segments, visibility, image transformations.	12
Transformations, Windowing and Clipping	Matrices transformation, transformation routines, displays procedure. Viewing transformation and clipping, generalize clipping, multiple windowing. Three Dimension: 3-D geometry primitives, transformations, projection clipping.	12
Interaction	Hardware input devices handling algorithms, Event handling echoing, Interactive techniques.	6
Hidden Line and Surface	Back face removal algorithms, hidden line methods.	4
Rendering and Illumination	Introduction to curve generation, Bezier, Hermite and Bspline algorithms and their comparisons.	4
Total No. of Hours		42
Textbooks	1. Rogers, "Procedural Elements of Computer Graphics", McGraw Hill 2. Asthana, Sinha, "Computer Graphics", Addison Wesley Newman and Sproul, "Principle of Interactive Computer Graphics", McGraw Hill.	
References	3. Steven Harrington, "Computer Graphics", A Programming Approach, 2nd Edition 4. Rogar and Adams, "Mathematical Elements of Computer Graphics", McGraw Hill.	

CRYPTOGRAPHY AND NETWORK SECURITY (SET/CS/BT/C 603)		
Module Name	Content	No. of Hrs.
Module 1	Security attacks, Services and Mechanism, Conventional encryption model, classical encryption techniques substitution ciphers and transposition ciphers, cryptanalysis, stereography, stream and block ciphers. Modern Block Ciphers: Block ciphers principals, Shannon's theory of confusion and diffusion, fiestal structure, data encryption standard (DES), strength of DES, differential and linear crypt analysis of DES, block cipher modes of operations, triple DES, IDEA encryption and decryption, strength of IDEA, confidentiality using conventional encryption, traffic confidentiality, key distribution, random number generation.	10
Module 2	Introduction to graph, ring and field, prime and relative prime numbers, modular arithmetic, Fermat's and Euler's theorem, primality testing, Euclid's Algorithm, Chinese Remainder theorem, discrete logarithms. Principals of public key crypto systems, RSA algorithm, security of RSA, key management, Diffle-Hellman key exchange algorithm, introductory idea of Elliptic curve cryptography, Elganel encryption.	8
Module 3	Message Authentication and Hash Function: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions and MACS, MD5 message digest algorithm, Secure hash algorithm(SHA). Digital Signatures: Digital Signatures, authentication protocols, digital signature standards (DSS),proof of digital signature algorithm.	8
Module 4	Authentication Applications: Kerberos and X.509, directory authentication service, electronic mail security-pretty good privacy (PGP), S/MIME.	8
Module 5	IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Web Security: Secure socket layer and transport layer security, secure electronic transaction (SET). System Security: Intruders, Viruses and related threads, firewall design principals, trusted systems.	8
Total No. of Hours		42
Textbooks	1. William Stallings, "Cryptography and Network Security: Principals and Practice", Prentice Hall, New Jersey.	
References	1. Johannes A. Buchmann, "Introduction to Cryptography", Springer-Verlag. 2. B. Forouzan, "Cryptography and Network Security, TMH	

DATA MINING (SET/CS/BT/C 604)		
Module Name	Content	No. of Hrs.
Fundamental of Data Mining, and Data Warehouses	Introduction, Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Implementation - Data Warehousing to Data Mining –Data warehousing components-building a data warehouse – mapping the data warehouse to an architecture - data extraction - cleanup- transformation tools- metadata – OLAP - Patterns and models - Data visualization principles.	8
DataPreprocessing, Language, Architectures, Concept Description	Preprocessing, Cleaning, Integration, Transformation, Reduction, Discretization, Concept Hierarchy Generation, Data Mining Primitives, Query Language, Graphical User Interfaces, Architectures, Concept Description, Data Generalization, Characterizations, Class Comparisons, Descriptive Statistical Measures	8
Association Rule	Association Rule Mining, Single-Dimensional Boolean Association Rules from Transactional Databases, Multi-Level Association Rules from Transaction Databases-mining multidimensional Association rules –association mining to correlation analysis-constraint based association mining.	8
Classification and Prediction	Classification and Prediction, Issues, Decision Tree Induction, Bayesian Classification, Association Rule Based, Other Classification Methods, Prediction, Classifier Accuracy..	8
Cluster Analysis	Cluster Analysis, Types of data, Categorization of methods, Partitioning methods, hierarchical methods, density based methods, grid based methods - Outlier Analysis. Recent trends - Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Databases, Multimedia Databases, Time Series and Sequence Data, Text Databases, World Wide Web, Applications and Trends in Data Mining	10
Total No. of Hours		42
Textbooks	1. Alex Berson and Stephen J. Smith, "Data Warehousing, Data mining and OLAP", Tata McGraw-Hill, 2004. (UNIT V)	
References	1. Margaret H. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education, 2004. 2. Sam Anahory and Dennis Murry, "Data Warehousing in the Real World", Pearson Education, 2003. 3. J. Han and M. Kamber, "Data Mining: Concepts and Techniques",Harcourt India /Morgan Kauffman, 2001.	

E-COMMERCE (SET/CS/BT/C 605)		
Module Name	Content	No. of Hrs.
Technology and Prospects	Economic potential of electronic commerce, Incentives for engaging in electronic commerce, forces behind E-Commerce, Advantages and Disadvantages, Architectural framework, Impact of E-Commerce on business.	8
Network Infrastructure of E-Commerce	Internet and Intranet based E-Commerce Issues, problems and prospects, Network Infrastructure, Network Access Equipments, Broadband telecommunication (ATM, ISDN, and FRAME RELAY). Mobile Commerce: Introduction, Wireless Application Protocol, WAP Technology, Mobile Information device, Mobile Computing Applications.	10
Web Security	Security Issues on web, Importance of Firewall, components of Firewall, Transaction security, Emerging client server, Security Threats, Network Security, Factors to consider in Firewall design, Limitation of Firewalls.	8
Encryption	Encryption techniques, Symmetric Encryption-Keys and data encryption standard, Triple encryption. Asymmetric encryption-Secret key encryption, public and private pair key encryption, Digital Signature, Virtual Private Network.	8
Electronic Payments	Overview, The SET protocol, payment Gateway, certificate, digital Tokens, Smart card, credit card, magnetic strip card, E-Checks, Credit/Debit card based EPS, online Banking EDI Application in business	8
Total No. of Hours		42
Textbooks	1. E-Commerce, Ritendra Goel, New Age International Publishers	
References	1. Ravi Kalakota, Andrew Winston, "Frontiers of Electronic Commerce" Addison Wesley. 2. Bajaj and Nag. "E-Commerce the cutting edge of Business". TMH. 3. P. Loshin, John Vacca, "Electronic Commerce" Firewall Media, N.Delhi. 4. E Business & Commerce: Brahm Cazner, Wiley dreamtech.	

COMPILER CONSTRUCTION LAB (SET/CS/BT/C607)		
Module Name	Content	No. of Hrs.
Syntactic specification of programming languages	1. Program to check a string under a given grammar. 2. Program to check for keywords in a given string. 3. Program to check for identification for a given string. 4. Program to check for constant in a given string. 5. Program to check for relation all operators in a given string. 6. Program for lexical analyzer. 7. Implementation of stack using C.	3x12
Syntax-directed Translation	1. Implementation of shift – reduce parsing using C. 2. Implementation of three address code using quadruples.	
Total No. of Hours		36

COMPUTER GRAPHICS LAB (SET/CS/BT/C 608)		
Module Name	Content	No. of Hrs.
Drawing Algorithm	1. Implementation of line generation using slope's method, DDA and Bresenham algorithms. 2. Implementation of circle generation using Mid-point method and Bresenham algorithm 3. Implementation of ellipse generation using Mid-point method.	3x12
Polygon Filling	Implementation of polygon filling using Flood-fill, Boundary-fill and Scan-line algorithms.	
2D and 3D transformation	1. Translation, Scaling, Rotation, Mirror Reflection and Shearing. 2. 3D Translation, Scaling and rotation.	
Windowing and Clipping	1. Implementation of Line Clipping using Cohen-Sutherland algorithm and Bisection Method. 2. Implementation of Polygon Clipping using Sutherland-Hodgman algorithm.	
Rendering and Illumination	Implementation of Curve generation using Interpolation methods, B-spline and Bezier curves.	
Hidden Line and Surface	Implementation of any one of Back face removal algorithms such as Depth-Buffer algorithm, Painter's algorithm, Warnock's algorithm, Scan-line algorithm.	
Total No. of Hours		36

Data Mining (SET/CS/BT/C609)		
Module Name	Content	No. of Hrs.
Module 1	Related Experiments on Python	3x12
Total No. of Hours		36

MINI PROJECT – 2(SET/CS/BT/S 609)		
Module Name	Content	No. of Hrs.
Module 1	Mini Project-2 shall be based on Database/Computer Networking.	3x12
Total No. of Hours		36

SEMESTER VII

Theory		L	T	P	T.A	C.T.	TOT	ESE.	SUB. TOTAL	Credit equivalence
Code	Course									
SET/CS/BT/C701	Artificial Intelligence	3	1	0	10	20	30	70	100	3
SET/CS/BT/C702	Embedded System	3	1	0	10	20	30	70	100	3
SET/CS/BT/C703	Wireless and Mobile Computing	3	1	-	10	20	30	70	100	3
	Elective I	3	1	-	10	20	30	70	100	3
	Elective II	3	1		10	20	30	70	100	3
SET/CS/BT/C706	Artificial Intelligence Lab	-	-	1	30	-	30	70	100	1
SET/CS/BT/C707	Embedded System Lab	-	-	1	30	-	30	70	100	1
SET/CS/BT/S708	Project Work – I	-	-	2	30	-	30	70	100	2
SET/CS/BT/S709	Industrial Training Seminar	-	-	1	30	-	30	70	100	1
Total		15	5	5			270	630	900	20

Elective I	S. No.	Code	Course Title
	1	SET/CS/BT/E721	Security Architecture & Operating System Security
	2	SET/CS/BT/E722	Neural Network
	3	SET/CS/BT/E723	Real Time System

Elective II	S. No.	Code	Course Title
	1	SET/CS/BT/E731	Cloud Computing
	2	SET/CS/BT/E732	Distributed Computing
	3	SET/CS/BT/E733	Digital Image Processing

ARTIFICIAL INTELLIGENCE (SET/CS/BT/C 701)		
Module Name	Content	No. of Hrs.
Problem Solving Methods	Production systems ,State space search , Control strategies , Heuristic search, Forward and backward reasoning, Hill Climbing techniques, Breadth first search, Depth first search, Best search , Staged search., Predicate logic, Resolution question answering, Nonmonotonic reasoning, Stastical and probalistic reasoning,	12
Knowledge Representation	Predicate logic, Resolution question answering, Nonmonotonic reasoning , Stastical and probalistic reasoning, Fuzzy logic, Semantic Nets, Conceptual dependency, Frames, Scripts.	10
AI Application	Neural Networks, Natural language understanding, speech recognition and understanding, Learning, perception, AI robotics, satellite imaging and medical diagnosis.	10
Expert Systems	Structure of an expert system, interaction with an expert, Design of an expert system.	10
Total No. of Hours		42
Textbooks	1. E. Rich & K. Knight : Artificial Intelligence.	
References	1. N. J. Nilsson : Principles of Artificial Intelligence 2. A. Barr, E. A. Fergenbaumand & P. R. Cohen : Artificial Intelligence. 3. 4. D. A. Waterman : A guide to Expert System.	

EMBEDDED SYSTEM (SET/CS/BT/C 702)		
Module Name	Content	No. of Hrs.
Introduction to Embedded System:	Components of Embedded System – Classification -Characteristic of embedded system- Microprocessors & Micro controllers- Introduction to embedded processors - Embedded software architectures: Simple control loop – Interrupt controlled system - Cooperative multitasking - Preemptive multitasking or multi-threading – Micro kernels and exokernels - Monolithic kernels - Exotic custom operating systems	10
Embedded Hardware Architecture – 32 Bit Microcontrollers:	ARM 2 TDMI core based 32 Bit microcontrollers and family of processors, Register, Memory and Data transfer, Arithmetic and Logic instructions, Assembly Language, I/O operations interrupt structure, ARM cache. ARM Bus, Embedded systems with ARM. Networks for Embedded systems: Serial bus protocols: The CAN bus, and the USB bus, Parallel bus protocols: The PCI Bus and GPIB bus.	8
Software Development	Embedded Programming in C and C++ - Source Code Engineering Tools for Embedded C/C++ - Program Modeling Concepts in Single and Multiprocessor Systems - Software Development Process - Software Engineering Practices in the Embedded Software Development – Hardware / Software Co-design in an Embedded System	8
Real Time Operating Systems:	Tasking Models, Task States, Services and Transitions - Real-Time Scheduling Algorithms: Round-Robin, FIFO, Priority-Based Preemptive Scheduling - Rate-Monotonic Scheduling - Priority Inversion and Priority Ceiling - Deadlocks – Process Synchronization – IPC - Shared Memory, Memory Locking, Memory Allocation - Signals – Semaphore Flag or mutex as Resource key – Message Queues – Mailboxes – Pipes – Virtual Sockets.	10
Study of Micro C/OS-II or Vx Works:	RTOS System Level Functions – Task Service Functions – Time Delay Functions – Memory Allocation Related Functions – Semaphore Related Functions – Mailbox Related Functions – Queue Related Functions – Case Studies of Programming with RTOS.	6
Total No. of Hours		42
Text Books	1. Rajkamal, "Embedded System: Architecture, Programming and Design" Tata McGraw-Hill, 2003. (UNITs I, III, IV & V) 2. Wayne Wolf, "Computers as Components – Principles of Embedded Computing System Design", Harcourt India Pvt. Ltd., Morgan Kaufmann Publishers,	
References	1. Sriram Iyer and Pankaj Gupta, "Embedded Real Time Systems Programming", Tata McGraw-Hill, 2004.. 2. Steve Heath, "Embedded Systems Design", Newnes, Second edition, 2003.	

Wireless Network and Mobile Computing (SET/CS/BT/C703)		
Module Name	Content	No. of Hrs.
Introduction to Cellular Communications	Protocol Architecture, Physical Layer, Channel Access Control Sub-layer, MAC Sub-layer, Information Bases and Networking WLAN: Infrared vs. Radio Transmission, Infrastructure and Ad Hoc Networks, IEEE 802.11. Bluetooth.: User Scenarios, Physical Layer, MAC layer, Networking, Security, Link Management.	8
GSM	Mobile Services, System Architecture, Radio Interface, Protocols, Localization and calling, Handover, Security, and New Data Services. Mobile Computing (MC): Introduction to MC, Novel Applications, Limitations, and Architecture	8
Mobile IP	IP and Mobile IP Network Layers, Packet Delivery and Handover Management, Location Management, Registration, Tunnelling and Encapsulation, Route Optimization, DHCP. Mobile Transport Layer: Conventional TCP/IP Protocols, Indirect TCP, Snooping TCP, Mobile TCP, Other Transport Layer Protocols for Mobile Networks.	8
Overview of Ad Hoc Networks:	Ad Hoc Networks, Challenges, and benefits of Mobile Computing, breakthrough Technology, Wireless Computing, Nomadic Computing, Mobile Computing, Ubiquitous Computing, Pervasive Computing, Invisible Computing, applications of mobile computing, Wireless and Mobile Computing Models, LAN Protocols: IEEE 802.11/a/g/n & Bluetooth, Data Management Issues. Sensor Networks- Challenges, Architecture, and Applications.	8
Mobile Ad hoc Networks (MANETs)	Taxonomy, Applications, Challenges in Mobile Environments, Hidden and exposed terminal problems, Routing Protocols- Proactive, Reactive, and Hybrid protocols, Dynamic State Routing (DSR), Ad hoc On-Demand Distance Vector (AODV), Destination Sequenced Distance – Vector Routing (DSDV), and Cluster Based Routing Protocol (CBRP), and Temporally Ordered Routing algorithm (TORA).	10
Total No. of Hours		42
Textbooks	1. Jochen Schiller, “Mobile Communications”, Addison-Wesley, Second Edition, 2004 2. Charles E. Perkins, Ad hoc Networks, Addison Wesley, 2008.	
References	1. KazemSohraby, Daniel Minoli, TaiebZnati, Wireless Sensor Networks: Technology, Protocols, and Applications, Wiley, 2007. 2. Raj Kamal, “Mobile Computing”, Oxford University Press, 2007,	

SECURITY ARCHITECTURE & OPERATING SYSTEM SECURITY (SET/CS/BT/E721)		
Module Name	Content	No. of Hrs.
Introduction	Introduction-Information Systems- Database Management Systems-Information Security Architecture- Database Security–Asset Types and value-Security Methods Introduction-Operating System Overview-Security Environment – Components- Authentication Methods-User Administration-Password Policies-Vulnerabilities-E-mail Security	8
Administration of Users and Profiles, Password Policies, Privileges and Roles	Introduction-Authentication-Creating Users, SQL Server User-Removing, Modifying Users-Default, Remote Users-Database Links-Linked Servers-Remote Servers-Practices for Administrators and Managers-Best Practices Introduction-Defining and Using Profiles-Designing and Implementing Password Policies-Granting and Revoking User Privileges-Creating, Assigning and Revoking User Roles-Best Practices	10
Database Application Security Models and Virtual Private Databases	Introduction-Types of Users-Security Models- Application Types-Application Security Models-Data Encryption Introduction-Overview of VPD-Implementation of VPD using Views, Application Context in Oracle-Implementing Oracle VPD-Viewing VPD Policies and Application contexts using Data Dictionary, Policy Manager Implementing Row and Column level Security with SQL Server	8
Auditing Database Activities:	Using Oracle Database Activities-Creating DLL Triggers with Oracle-Auditing Database Activities with Oracle-Auditing Server Activity with SQL Server 2000-Security and Auditing Project Case Study	8
Privacy Preserving Data Mining Techniques	Introduction- Privacy Preserving Data Mining Algorithms-General Survey-Randomization Methods-Group Based Anonymization -Distributed Privacy Preserving Data Mining-Curse of Dimensionality-Application of Privacy Preserving Data Mining	6
Total No. of Hours		42
Textbooks	1. Hassan A. Afyouni, “Database Security and Auditing”, Third Edition, CengageLearning, 2009. 2. Charu C. Aggarwal, Philip S Yu, “Privacy Preserving Data Mining”: Models and Algorithms, Kluwer Academic Publishers, 2008	
References	1. Ron Ben Natan, ”Implementing Database Security and Auditing”, Elsevier Digital Press, 2005	

NEURAL NETWORK (SET/CS/BT/E722)		
Module Name	Content	No. of Hrs.
Neurocomputing and Neuroscience	Historical notes, human Brain, neuron Model, Knowledge representation, AI and NN.Learning process: Supervised and unsupervised learning, Error correction learning,competitive learning, adaptation, statistical nature of the learning process	8
Data processing	Scaling, normalization, Transformation (FT/FFT), principal component analysis, regression, co-variance matrix, eigen values & eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perceptron, least mean square algorithm, gradient descent rule, nonlinearly separable problems and benchmark problems in NN.	10
Multilayer Preceptons And RBF networks	Multilayered network architecture, back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptron.	8
Recurrent network	Recurrent network and temporal feed-forward network, implementation with BP, self-organizing map andSOM algorithm, properties of feature map and computer simulation. Principal component andIndependent component analysis, application to image and signal processing.	8
Complexity of neural network	Complex valued NN and complex valued BP, analyticity of activation function, application in 2Dinformation processing. Complexity analysis of network models. Soft computing. Neuro-Fuzzy-genetic algorithm Integration.	8
Total No. of Hours		42
References	3. G. J. Klir & T. A. Folger : Fuzzy sets, Uncertainty and Information. 4. Simon Haykin : Neural Networks. 5. B. Kosco : Neural Networks and Fuzzy systems: A Dynamical approach to Machine Intelligence. 6. J. Hertz & Korgh : Introduction to the Theory of Neural Computation	

REAL TIME SYSTEM (SET/CS/BT/E723)		
Module Name	Content	No. of Hrs.
Introduction	Characteristics – Types of Real-Time tasks – Timing constraints –Real-Time Scheduling - Basic concepts and classification of Algorithms – Clock-Driven Scheduling – Event-Driven Scheduling – Hybrid schedulers – EDF Scheduling – RM Scheduling and its Issues.	8
Resource Sharing and Dependencies among Real-Time Tasks	Resource sharing in Real Time tasks, Priority Inversion, Priority Inheritance Protocol, Highest Locker Protocol, Priority Ceiling Protocol, Handling Task dependencies – Scheduling Real-Time Tasks in Multiprocessor and Distributed Systems – Resource Reclaiming in Multiprocessor Real-Time Systems – Fault- Tolerant Task Scheduling in Multiprocessor Real-Time Systems.	10
Real-Time Operating System (RTOS)	Features of RTOS, Commercial Real-Time Operating Systems, Real-Time Databases - Applications, Design issues, Characteristics of Temporal Data, Concurrency control, Commercial Real-Time Databases	8
Real-Time Communication in Wide Area Networks	Introduction, Service and Traffic Models and Performance Requirements, Resource Management, Switching Subsystem, Route Selection in Real-Time Wide Area Networks - Basic Routing Algorithms, Routing during Real-Time Channel Establishment, Route Selection Approaches, Dependable Real-Time Channels	8
Real-Time Communication in a LAN:	Soft Real-Time Communication in a LAN – Hard Real- Time Communication in a LAN – Bounded Access Protocols for LANs – Real-Time Communications over Packet Switched Networks – QoS requirements – Routing and Multicasting	8
Total No. of Hours		42
Textbooks	1. C. Siva Ram Murthy and G. Manimaran, “Resource Management in Real-Time Systems 2. Jane W.S. Liu, “Real-Time Systems”, Prentice Hall,	
References	1. Rajib Mall, “Real-Time Systems Theory and Practice”, Pearson Education 2. C.M. Krishna and Kang G. Shin, “Real-Time Systems”, McGraw-Hill International	

CLOUD COMPUTING (SET/CS/BT/E731)		
Module Name	Content	No. of Hrs.
Introduction	Evolution of Cloud Computing –System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture -IaaS – On-demand Provisioning – Elasticity in Cloud – E.g.of IaaS Providers - PaaS – E.g. of PaaS Providers - SaaS – E.g. of SaaS Providers – Public ,Private and Hybrid Clouds..	8
Virtualization Technology	Definition, Understanding and Benefits ofVirtualization. Implementation Level of Virtualization, Virtualization Structure/Tools and Mechanisms, Hypervisor, VMware, KVM, Xen. Virtualization of CPU, Memory, I/O Devices, Virtual Cluster and Resources Management, Virtualization of Server, Desktop, Network, and Virtualization of data-center.	10
Networking Support for Cloud Computing	Ubiquitous Cloud and the Internet of Things. Cloud Computing Architecture: Cloud Reference Model, Layer and Types of Clouds, Services models, Data center Design and interconnection Network, Architectural design of Computer and Storage Clouds.	8
Security in the Cloud	Security Overview – Cloud Security Challenges – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security	8
Web-Based Cloud Application	Web-Based Application, Pros and Cons of Cloud Service Development, Types of Cloud Service Development, Software as a Service, Platform as a Service, Web Services, On-Demand Computing, Discovering Cloud Services, Development Services and Tools, Amazon Ec2, GoogleApp Engine, IBM Clouds	8
Total No. of Hours		42
Textbooks	1. Raj Kumar Buyya, “Cloud Computing: Principles and Paradigms, wiley 2. Barrie Sosinsky, “Cloud Computing Bible”, Wiley Publishers	
References	1. John W.Rittinghouse and James F.Ransome, “Cloud Computing: Implementation, 2. Michael Miller, “Cloud Computing : Web-based Applications That Change The Way You Work and Collaborate Online”, Pearson Education	

DISTRIBUTED COMPUTING (SET/CS/BT/E732)		
Module Name	Content	No. of Hrs.
System Models	Architectural Models, Fundamental Models, Theoretical Foundation for Distributed System, Limitation of Distributed system, Absence of global clock, Shared memory, Logical clocks, Lamport’s & vectors logical clocks, Causal ordering of messages, Global state, Termination detection. Resource sharing and the Web Challenges. Distributed Objects and Remote Invocation, Communication between distributed objects, Remote procedure call. Distributed File Systems, architecture, Sun Network File System, The Andrew File System.	8
Distributed Mutual Exclusion and Deadlock	Classification of distributed mutual exclusion, Requirement of mutual exclusion theorem, Token based and non-token based algorithms, Performance metric for distributed mutual exclusion algorithms Resource vs. Communication deadlocks, Deadlock prevention, Avoidance, detection & resolution, Centralized dead lock detection, Distributed dead lock detection, Path pushing algorithms, edge chasing algorithms.	10
Agreement Protocols	Classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem	8
Distributed Transactions	Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control, Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication, Fault - tolerant services, highly available services, Transactions with replicated data.	8
Distributed Algorithms	Communication protocols, Balanced sliding window protocol, Routing algorithms, Destination based routing, Deadlock free Packet switching, Wave & traversal algorithms, Election algorithm.	8
Total No. of Hours		42
Textbooks	1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill.	
References	1. Gerald Tel, "Distributed Algorithms", Cambridge University Press., 2. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Ed.	

DIGITAL IMAGE PROCESSING (SET/CS/BT/E733)		
Module Name	Content	No. of Hrs.
Introduction and Fundamentals	Introduction to Image Processing, Digital Images- The Eye, Brightness, Image Sampling, Neighbors of Pixels Distance. Multiview Geometry- Stereo Vision, The correspondence problem; Algorithms for Stereo Matching,	8
Image Enhancement	Spatial Image Enhancements- Transformations: Negative, Log, Power, Histogram, Subtraction, Averaging, Smoothing, Laplacian. Frequency Domain Image Enhancements 1D FT(Fourier Transform), Inverse, 2D FT, Filtering, Lowpass, Highpass, Unsharp, High-Boost, Use of FT, Fast FT	8
Image Restoration Color Image Processing	Noise, Mean filter, Median, Min, Max, Midpoint, Adaptive filters, Frequency Domain, etc... Color Fundamentals, Color Models, Converting Colors to Different Models, Color Transformation, Smoothing and Sharpening, Color Segmentation.	8
Applications of Wavelets Morphological Image Processing	Multi Resolution Expansions, Wavelet Transform in One Dimension, The Fast Wavelet Transform, Wavelet Transform in Two Dimensions Erosion and Dilation, Opening and Closing, The Hit or Miss Transformations, Some Basic Morphological algorithms	8
Image Compression And Segmentation	Need for Data Compression, Huffman Coding, Golomb coding, Arithmetic coding, LZW coding, Run Length coding, Bit plane coding and Wavelet coding Edge Detection, Thresholding, Region based Segmentation, Segmentation using Morphological Watersheds and the use of motion in Segmentation.algorithm.	10
Total No. of Hours		42
Textbooks	1. Rafael C. Gonzalvez and Richard E. Woods, "Digital Image Processing", 2nd Edition, Pearson Education.	
References	1. R.J. Schalkoff. "Digital Image Processing and Computer Vision", Wiley 2. A.K. Jain, "Fundamentals of Digital Image Processing", Prentice Hall 3. D. A. Forsyth , J. Ponce, "Computer Vision: A Modern Approach", Prentice Hall.	

ARTIFICIAL INTELLIGENCE LAB (SET/CS/BT/C706)		
Module Name	Content	No. of Hrs.
	Related Experiments	
Total No. of Hours		36

EMBEDDED SYSTEM LAB (SET/CS/BT/C707)		
Module Name	Content	No. of Hrs.
	1.Study of ARM evaluation system 2. Interfacing ADC and DAC. 3. Interfacing LED and PWM. 4. Interfacing real time clock and serial port. 5. Interfacing keyboard and LCD. 6. Interfacing EPROM and interrupt. 7. Mailbox. 8. Interrupt performance characteristics of ARM and FPGA. 9. Flashing of LEDS. 10. Interfacing stepper motor and temperature sensor. 11. Implementing zigbee protocol with ARM.	12x3
Total No. of Hours		36

PROJECT - I (SET/CS/BT/S708)		
Module Name	Content	No. of Hrs.
	Project – I includes following assignments. <ul style="list-style-type: none"> • Survey and study of published literature on the assigned topic. • Select and define an appropriate problem . • Working out a preliminary approach to the Problem relating to the assigned topic. • Conducting Preliminary Analysis/ Modeling/ Experiment/ Simulation/ Experiment/ Design/ Feasibility. • Preparing a Written Report on the Study conducted for presentation to the Department. • Final Seminar, as oral Presentation before a Departmental Committee. 	3x16
Total No. of Hours		48

INDUSTRIAL TRAINING SEMINAR (SET/CS/BT/S709)		
Module Name	Content	No. of Hrs.
	Student shall prepare a detailed report on her/his industrial training and deliver a seminar of 30 minutes.	-
Total No. of Hours		-

SEMESTER VIII

Course		L	T	P	T.A	C.T	TOT.	ESE.	SUB. TOTAL	Credit equivalence
Code	Course									
SET/CS/BT/C801	Unix Shell Programming	3	1	0	10	20	30	70	100	3
SET/CS/BT/C802	Cyber Security and Ethical Hacking	3	1	0	10	20	30	70	100	3
	Elective III	3	1	0	10	20	30	70	100	3
	Elective IV	3	1	0	10	20	30	70	100	3
SET/CS/BT/C805	Unix shell programming lab	-	-	1	30	-	30	70	100	1
SET/CS/BT/C806	Cyber Security and Ethical Hacking lab	-	-	1	30	-	30	70	100	1
SET/CS/BT/C807	Project and Dissertation	-	-	6	-	-	30	70	100	6
Total		12	4	8			210	490	700	20

List of Electives

Elective III	S. No.	Code	Course Title
	1	SET/CS/BT/E821	Mobile Application Development
	2	SET/CS/BT/E822	Platform Technology
	3	SET/CS/BT/E823	Bioinformatics
	4	SET/CS/BT/E824	Natural Language Processing

Elective IV	S. No.	Code	Course Title
	1	SET/CS/BT/E831	Multimedia Technology
	2	SET/CS/BT/E832	Machine Learning
	3	SET/CS/BT/E833	Optical Network
	4	SET/CS/BT/E834	Big Data Analytics

UNIX AND SHELL PROGRAMMING (SET/CSE//BT/C801)		
Module Name	Content	No. of Hrs.
Unix	User accounts, Unix – starting and shutting processes, Logging in and Logging out, Command line, simple commands.	8
Shell Programming	Unix file system, Unix files, inodes and structure and file system related commands, Shell as command processor, shell variables, creating command substitution, scripts, functions, conditionals, loops, customizing environment.	8
Regular Expressions and Filters	Introducing regular expressions patterns, syntax, character classes, quantifiers, introduction to egrep, sed, programming with awk and perl.	10
The C Environment	The C compiler, vi editor, compiler options, managing projects, memory management, use of makefiles, dependency calculations, memory management, dynamic and static memory, building and using static and dynamic libraries, using ldd, soname, dynamic loader, debugging with gdb.	10
Processes	Processes, starting and stopping processes, initialization processes, rc and init files, job control – at, batch, cron, time, network files, security, privileges, authentication, password administration, archiving, Signals and signal handlers.	6
Total No. of Hours		42
Text Books	1. Sumitabha Das, “Your Unix – The Ultimate Guide”, TMH, 2000.	
References	1. John Goerzen, “Linux Programming Bible”, IDG Books, New Delhi, 2000. 2. Mathew, “Professional Linux Programming”, Vol.1 & 2, Wrox-Shroff, 2001. 3. Welsh & Kaufmann “Running Linux”, O’Reiley & Associates, 2000.	

CYBER SECURITY AND ETHICAL HACKING (SET/CS/BT/C802)		
Module Name	Content	No. of Hrs.
BASICS OF HACKING	Introduction to Hacking, Types of Hacking, Hacking Process, Security – Basics of Security- Elements of Security, Penetration Testing, Scanning, Exploitation Web Based Exploitation.	6
ETHICAL HACKING TECHNIQUES	Building the foundation for Ethical Hacking, Hacking Methodology, Social Engineering, Physical Security, Hacking Windows, Password Hacking, Privacy Attacks, Hacking the Network, Hacking Operating Systems- Windows & Linux, Application Hacking, Foot printing, Scanning, Enumeration.	9
WEB APPLICATIONS SECURITY	Evolution of Web applications, Web application security, Core Defense Mechanisms, Managing the Application, Web Application Technologies- Web Hacking, Web functionality, How to block content on the Internet, Web pages through Email, Web Messengers, Unblocking applications, Injecting Code Injecting into SQL, Attacking Application Logic.	9
HACKING TECHNIQUES IN WIRELESS NETWORKS	Introduction to Wireless LAN Overview, Wireless Network Sniffing, Wireless Spoofing, Port Scanning, Wireless Network Probing, AP Weakness, Denial of Service (DOS), Man-in-the-Middle Attacks, War Driving, Wireless Security Best Practices, Software Tools, Cracking WEP, Cracking WPA & WPA-II.	9
HACKING TECHNIQUES APPLICATIONS	Safer tools and services, Firewalls, Filtering services, Firewall engineering, Secure communications over insecure networks, Case Study: Mobile HackingBluetooth-3G network weaknesses, Case study: DNS Poisoning, Hacking Laws	9
Total No. of Hours		42
Textbooks	1. Kevin Beaver, “Hacking for Dummies” Second Edition, Wiley Publishing, 2. Stuart McClure, Joel Scambray, George Kurtz, “Hacking Exposed 6: Network Security Secrets & Solutions”, Seventh edition, McGraw-Hill Publisher	
References	1. Ankit Fadia, “An Unofficial Guide to Ethical Hacking” Second Edition, Macmillan publishers India Ltd, 2006 2. Ankit Fadia, “How to Unblock Everything on the Internet” Vikas Publishing House Pvt Ltd, 2012	

MOBILE APPLICATION DEVELOPMENT (SET/CS/BT/E821)		
Module Name	Content	No. of Hrs.
JAVA TECHNOLOGY FOR RICH CLIENT APPLICATIONS	Introduction to mobile application development, trends, introduction to various platforms, introduction to smart phones. Android platform features and architecture, versions, comparison added features in each version. ART (Android Runtime), ADB (Android Debug Bridge). Android studio and its working environment, gradle build system, emulator setup. Application framework basics: resources layout, values, asset XML representation and generated R.Javafile, Android manifest file. Creating a simple application	10
ANDROID User Interface Design	GUI for Android: Introduction to activities, activities life-cycle, and Android v7 support library form API21 for lower version support. Intent object, intent filters, adding categories, linking activities, user interface design components Views and View Groups: Basic views, picker views, adapter views, Menu, App Bar etc., basics of screen design; different layouts. App widgets. Lollipop Material design: new themes, new widgets, Card layouts. Recycler View, Fragments: Introduction to activities, activities life-cycle.	12
DATA PERSISTENCE	Different Data persistence schemes: Shared preferences, File Handling, Managing data using SQLite database Content providers: user content provider, Android in build content providers.	8
BACK GROUND RUNNING PROCESS, NETWORKING AND TELEPHONY SERVICES	Services: introduction to services – local service, remote service and binding the service, the communication between service and activity, Intent Service Multithreading: Handlers ,Async Task, Android network programming :Http Url Connection, Connecting to REST based and SOAP based Web services Broad cast receivers: Local Broadcast Manager, Dynamic broadcast receiver, System Broadcast. Pending Intent, Notifications, Telephony Manager: Sending SMS and making calls.	12
Total No. of Hours		42
Textbooks	1. Lee,” Beginning android 4 application development “ISBN 9788126535576 Wiley India 2. Greg Milete, Adam Stroud, “PROFESSIONAL Android™ Sensor Programming”, John Wiley	
Reference Books	1. Paul Deital, Harvey Deital, Alexander Wald, “Android 6 for Programmers ,App Driven approach”, 2015, Prentice Hall 2. Dutson “Android Development Patterns: Best Practices for Professional Developers” Pearson	

PLATFORM TECHNOLOGY (SET/CS/BT/E822)		
Module Name	Content	No. of Hrs.
Introduction	NET Framework - Common Language Runtime (CLR) - .NET Framework Class Library - .NET Windows Forms – Uses of Web Forms & Web Services - Common Language Runtime (CLR) – Common Type System - Microsoft Intermediate Language (MSIL) - Components of the CLR - Distinguish Between the .NET Compilers – Organising and Executing Managed Code. NET Framework Class Library – Namespace – Input and Output - Serialisation – Working with XML – Remoting – Enterprise Services – Interoperability – GUIs.	8
.NET Languages:	C# Language Fundamentals – Classes and Objects – Methods – Fields and Properties - Inheritance and Polymorphism – Operator Overloading – Struts - Interfaces – Arrays – Indexers and Collections – Strings and Regular Expressions – Handling Exceptions – Delegates and Events.	10
VB .NET:	Language Fundamentals – Classes and Objects – Methods – Fields and Properties - Inheritance and Polymorphism – Operator Overloading – Interfaces – Arrays – Indexers and Collections – Strings and Regular Expressions. Handling Exceptions – Delegates and Events - Accessing Data – ADO.NET Object Model- .NET Data Providers – Direct Access to Data – Accessing Data with Datasets	10
C# and ASP.NET	C# Tools, Operands, Data types, Classes, Inheritance, Event and Delegates, ultithreading, Collections, Generics, Reflection, Remoting. ActiveX Data Object: ADO.NET Architecture, Connected Architecture, Disconnected Architecture, Dataset, Data Provider, Data Reader. Server Control, State Management, Master Page, Skin and Theme, Caching, Security, Globalization	10
J2EE	Enterprise Edition Overview - Multi-Tier Architecture - Best Practices-Comparison between J2EE and .NET.	4
Total No. of Hours		42
Text books	1. Herbert Schildt, “C# 3.0 The Complete Reference”, McGraw-Hill Professional, Third Edition 2. .NET 4.0 Programming 6-in-1 Black Book, Kogent Learning Solutions	
References	1. Keogh, “J2EE The Complete Reference”, Tata McGraw-Hill 2. Harvey M. Deitel, Paul J. Deitel, Tem R. Nieto, Contributor Paul J. Deitel, and Tem R. Nieto, “Visual Basic .NET – How to Program”, Prentice Hall	

BIOINFORMATICS (SET/CS/BT/E823)		
Module Name	Content	No. of Hrs.
Introductory Concepts:	The Central Dogma – The Killer Application – Parallel Universes – Watson’s Definition – Top Down Versus Bottom up – Information Flow – Convergence – Databases – Data Management – Data Life Cycle – Database Technology – Interfaces – Implementation – Networks – Geographical Scope – Communication Models – Transmissions Technology – Protocols – Bandwidth – Topology – Hardware – Contents – Security – Ownership – Implementation – Management.	8
Search Engines and Data Visualization	The search process – Search Engine Technology – Searching and Information Theory – Computational methods – Search Engines and Knowledge Management – Data Visualization – sequence visualization – structure visualization – user Interface – Animation Versus simulation – General Purpose Technologies	8
Statistics and Data Mining:	Statistical concepts – Microarrays – Imperfect Data – Randomness – Variability – Approximation – Interface Noise – Assumptions – Sampling and Distributions – Hypothesis Testing – Quantifying Randomness – Data Analysis – Tool selection statistics of Alignment – Clustering and Classification – Data Mining – Methods – Selection and Sampling – Preprocessing and Cleaning – Transformation and Reduction – Data Mining Methods – Evaluation – Visualization – Designing new queries – Pattern Recognition and Discovery – Machine Learning – Text Mining – Tools.	10
Pattern Matching	Pairwise sequence alignment – Local versus global alignment – Multiple sequence alignment – Computational methods – Dot Matrix analysis – Substitution matrices – Dynamic Programming – Word methods – Bayesian methods – Multiple sequence alignment – Dynamic Programming – Progressive strategies – Iterative strategies – Tools – Nucleotide Pattern Matching – Polypeptide pattern matching – Utilities – Sequence Databases	8
Modeling and Simulation:	Drug Discovery – Components – Process – Perspectives – Numeric considerations – Algorithms – Hardware – Issues – Protein structure – AbInitio Methods – Heuristic methods – Systems Biology – Tools – Collaboration and Communications – Standards - Issues – Security – Intellectual property	8
Total No. of Hours		42
Text books	1. D E Krane & M L Raymer, “Fundamental concepts of Bioinformatics”, Perason Education. 2. Bryan Bergeron, “Bio Informatics Computing”, Pearson Education	
References	1. Baxevanis, A. D. and Ouellette, B. F. F., “Bioinformatics: A Practical Guide to Analysis of Genes and Proteins”, 2nd Ed., Wiley 2. Shubha Gopal et.al. “ Bioinformatics: with fundamentals of genomics and proteomics”, Mc Graw Hill.	

NATURAL LANGUAGE PROCESSING (SET/CS/BT/E824)		
Module Name	Content	No. of Hrs.
Introduction to Natural Language Understanding	The study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English syntax	8
Introduction to semantics	Introduction to semantics and knowledge representation, Some applications like machine translation, database interface.	8
Grammars and Parsing	Grammars and sentence Structure, Top-Down and Bottom-Up Parsers, Transition Network Grammars, Top- Down Chart Parsing. Feature Systems and Augmented Grammars: Basic Feature system for English, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks	10
Grammars for Natural Language	Auxiliary Verbs and Verb Phrases, Movement Phenomenon in Language, Grammars. Human preferences in Parsing, Encoding uncertainty, Deterministic Parser.	8
Ambiguity Resolution	Statistical Methods, Probabilistic Language Processing, Estimating Probabilities, Part-of- Speech tagging, Obtaining Lexical Probabilities, Probabilistic Context-Free Grammars, Best First Parsing. Semantics and Logical Form, Word senses and Ambiguity, Encoding Ambiguity in Logical Form	8
Total No of Hours		42
Text Books	1. Akshar Bharti, Vineet Chaitanya and Rajeev Sangal, "NLP: A Paninian Perspective", Prentice Hall	
References	1. James Allen, "Natural Language Understanding", Pearson Education 2. D. Jurafsky, J. H. Martin, "Speech and Language Processing", Pearson Education	

MULTIMEDIA TECHNOLOGY (SET/CS/BT/E831)		
Module Name	Content	No. of Hrs.
Introduction to Multimedia	Introduction to Multimedia, Multimedia Objects, Multimedia in business and work. Multimedia hardware, Memory & Storage devices, Communication devices, Multimedia software's, presentation tools, tools for object generations, video, sound, image capturing, authoring tools, card and page based authoring tools.	12
Compression Techniques	Text, Sound MIDI, Digital Audio, audio file formats, MIDI under windows environment Audio & Video Capture. Huffman Coding, Shannon Fano Algorithm, Huffman Algorithms, Adaptive Coding, Arithmetic Coding Higher Order Modeling. Finite Context Modeling, Dictionary based Compression, Sliding Window Compression, LZ77, LZW compression, Compression, Compression ratio loss less & lossy compression. Digital Audio concepts, Sampling Variables, Loss less compression of sound, loss compression & silence compression.	12
Audio and Video	Multiple monitors, bitmaps, Vector drawing, lossy graphic compression, image file formatic animations Images standards, JPEG Compression, Zig Zag Coding. Video representation, Colors, Video Compression, MPEG standards, MHEG Standard recent development in Multimedia.	12
Total No. of Hours		36
Text books	1. Tay Vaughan "Multimedia, Making IT Work" Osborne McGraw Hill.	
References	1. Buford "Multimedia Systems" Addison Wesley. 2. Agrawal & Tiwari "Multimedia Systems" Excel. 3. Mark Nelson "Data Compression Book" BPB.	

MACHINE LEARNING (SET/CS/BT/E832)		
Module Name	Content	No. of Hrs.
Introduction	Definition of learning systems, Goals and applications of machine learning. Aspects of developing a learning system: training data, concept representation, function approximation. Definition of learning systems, Goals and applications of machine learning. Aspects of developing a learning system: training data, concept representation, function approximation. linear discriminative, non-linear discriminative, decision trees, probabilistic (conditional and generative), nearest neighbor	10
Logistic regression	Logistic regression, Perceptron, Exponential family, Generative learning algorithms, Gaussian discriminant analysis, Naive Bayes, Support vector machines: Optimal hyper plane, Kernels. Model selection and feature selection. Combining classifiers: Bagging, boosting (The Ada boost algorithm), Evaluating and debugging learning algorithms, Classification errors	12
Unsupervised learning:	Clustering. K-means. EM Algorithm. Mixture of Gaussians. Factor analysis. PCA (Principal components analysis), ICA (Independent components analysis), latent semantic indexing. Spectral clustering, Markov models Hidden Markov models (HMMs).	10
Reinforcement Learning and Control	MDPs. Bellman equations, Value iteration and policy iteration, Linear quadratic regulation (LQR). LQG. Q-learning. Value function approximation, Policy search. Reinforce. POMDPs	10
Total No. of Hours		42
Tex books	<ol style="list-style-type: none"> 1. Tom M Mitchell, Machine Learning, McGraw Hill Education. 2. Duda, Richard, Pattern Classification. 2nd, Wiley India 	
References	<ol style="list-style-type: none"> 1. Tom M. Mitchell, Machine Learning . McGraw-Hill Series,. 2. Introduction to Machine Learning - Ethem Alpaydin, MIT Press, Prentice hall of India. 	

OPTICAL NETWORK (SET/CS/BT/E833)		
Module Name	Content	No. of Hrs.
Introduction	Optical networks – Principles of optical transmission – Evolution of optical networks – Components and enabling technologies – Wavelength division multiplexing (WDM) – WDM network architectures, broadcast-and-select networks, linear light wave networks, and wavelength routed networks – Issues in broadcast-and-select networks	8
Virtual topology	Static traffic routing in wavelength routed networks – Virtual topology design – problem formulation and algorithms - design of multi-fiber networks – Virtual topology reconfiguration – problem formulation - reconfiguration due to traffic changes - reconfiguration for fault restoration – Network provisioning	10
Wavelength routed networks	Dynamic traffic routing in wavelength routed networks – Routing and wavelength assignment algorithms – Centralized and distributed control – Introduction to Wavelength convertible networks – Wavelength rerouting.	8
Control and Management	Functions – Framework – Information Model – Protocols – Optical layer Services and Interfacing – Network Survivability – Protection in SONET / SDH – Protection in IP Networks – Optical Layer Protection – Schemes.	8
Next generation optical Internets	burst switching – packet switching (IP-over-WDM) – Multicast traffic routing – source rooted trees - Access Networks – PON, FTTC, FTTH – Traffic Grooming – Optical Burst Switching.	8
Total No. of Hours		42
Textbooks	<ol style="list-style-type: none"> 1. C. Siva Ram Murthy and Mohan Gurusamy, “WDM Optical Networks: Concepts, Design, and Algorithms”, Prentice-Hall of India, 2. Greg Bemstein, Bala Rajagopalan and Debanjan Saha, “Optical Network Control – Architecture, Protocols and Standards”, Pearson Education 	
References	<ol style="list-style-type: none"> 3. Uless Black, “Optical Networks - Third Generation Transport Systems”, Pearson Education, 2002. 	

BIG DATA ANALYTICS (SET/CS/BT/E834)		
Module Name	Content	No. of Hrs.
INTRODUCTION TO BIG DATA AND HADOOP	Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Infosphere BigInsights and Big Sheets	8
HDFS(Hadoop Distributed File System)	The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures	10
Map Reduce	Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features	8
Hadoop Eco System	Pig : Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators. Hive : Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions. Hbase : HBasics, Concepts, Clients, Example, Hbase Versus RDBMS. Big SQL : Introduction	8
Data Analytics with R	Machine Learning : Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with Big R.	8
Total No. of Hours		42
Textbooks	1. Big data,Black Book:Covers Hadoop 2,map reduce,Hive,YARN,PIG,R and data Visualization, Dreamtech, Wiley India 2. Seema Acharya, "Big Data Analytics" Wiley 2015.	
References	3. Tom Plunkett, Mark Hornick, "Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop", McGraw-Hill/Osborne Media (2013), Oracle press.	

Unix Shell Programming lab (SET/CS/BT/C 805)		
Module Name	Content	No. of Hrs.
Module 1	Related Experiments.	3x12
Total No. of Hours		36

Cyber Security and Ethical Hacking lab (SET/CS/BT/C 806)		
Module Name	Content	No. of Hrs.
Module 1	Related Experiments.	3x12
Total No. of Hours		36