

# **Curriculum and Syllabi**

**B. TECH.**

**Information Technology**

(Applicable for 2015-16 batch and onwards)



**Department of Information Technology**

**School of Engineering and Technology,**

**H. N. B. Garhwal University(Chauras Campus)**

**Uttarakhand- 249161**

**Regulations for Bachelor of Technology (B. Tech.) Degree Program**

(For session 2015-16 onwards)

**Preliminary Definitions and Nomenclature:** In these regulations, unless the context otherwise requires

- i. “Program” means 4 year (8 Semester) Bachelor of Technology (B. Tech.) Degree program in:
  - (1)Instrumentation Engineering,
  - (2)Electronics and Communication Engineering,
  - (3)Computer Science and Engineering,
  - (4)Mechanical Engineering,
  - (5)Information Technology,and other B. Tech. degree courses of the university.

That is equivalent to Bachelor of Engineering (B.E).
- ii. “Course” means a theory or practical subject that is normally studied, in a semester, like Mathematics, Physics, Engineering Graphics, Computer Practice, etc.
- iii. “School” means a School of the University, like School of Commerce, School of Science, etc. A Dean heads each School.

**1 Admissions:**

- 1.1 Admissions to the B. Tech. 1st semester will be done on the basis of merit of the specified entrance test decided by the university and through Counseling.
- 1.2 The selection of diploma/B.Sc. candidates for admission in 2nd year/3rd semester will be based on the specified entrance test and subsequent Counseling.
- 1.3 The academic session and the teaching process shall commence as per the University academic calendar. A candidate shall not be admitted to the autumn (First/Third) semester of the first/ second year after the cutoff date as specified by the university from time to time.
- 1.4 Domicile requirements, age limit and medical standards will be same as prescribed by the Government/University.

**2 Eligibility:**

- 2.1 For admission in the **first year of the B. Tech.** course(s):- Passed 10+2 examination with physics and mathematics as compulsory subject along with one of the subject – Chemistry/ Biotechnology / biology obtained at least 45% marks (40% for reserved category candidates) in the above subjects taken together.
- 2.2 For admission in the **second year of the B. Tech.** course (lateral entry):- A candidate should have passed Diploma examination, from organized institution/ university, with at least 45% marks (40% for reserved category candidates) in appropriate branch of engineering/ technology; **OR** should have passed B. Sc. Degree from a recognized university as defined by the UGC, with at least 45% marks (40% for reserved category candidates) and passed 10+2 with mathematics as a subject. Provided that in case of students belonging to B. Sc. stream, shall qualify the subject of Engineering Graphics/ Engineering Drawing and Engineering Mechanics of the first year Engineering program along with the Second year subjects.

**3 Reservation:**

As per the policy of Government of India/University.

**4 Attendance:**

- 4.1 Every candidate is required to have at least 75% attendance, of lectures, tutorials, practicals and other prescribed curricular and co-curricular activities, to appear in the end semester examination.
- 4.2 A further relaxation of attendance up to 15% can be given by Dean/ Head of the Institute for the students, who have been absent with prior permission, for reasons acceptable to the Head of the institute.

**5 Duration:**

- 5.1 Total duration of B. Tech. Course shall be four years, each year comprising two semesters.
- 5.2 Each semester shall normally have teaching for the 90 working days.
- 5.3 Maximum time allowed for a candidate admitted in 1st /3rd semester for completing the B. Tech. course will be 7 (seven) years/5 (five) years, respectively, from the date of admission. Those who are unlikely to satisfy this condition shall not be allowed to continue the studies any further for the program.
- 5.4 All eligible students must register within specified duration for each semester as notified from time to time.

**6 Curriculum:**

- 6.1 The 4 years curriculum will be divided into eight semesters and shall include lectures, tutorials, practicals, seminars and projects, in addition to practical training and educational tours as defined in the scheme of examinations.
- 6.2 It will also include co-curricular and extra-curricular activities as prescribed from time to time by the University.
- 6.3 After Completion of 3<sup>rd</sup> year (6th Semester), students will have to undergo training in industry/laboratory of national importance for a duration of 4-6 weeks, in summer break to get more exposure in the subjects.
- 6.4 The final year project(s) will be carried out by the student, in the University.
- 6.5 This project can be in collaboration with other University/Institute/Organization/Industry subjected to the permission of the Department.

**7 Examination:**

- 7.1 Student’s performance will be evaluated through continuous internal evaluation (CIE) in the form of class tests, assignments, quiz tests, viva-voce/ practicals, etc. There shall be an end semester examination (ESE) at the end of each semester in theory subjects, practical subjects and/or project(s).
- 7.2 The continuous internal evaluation (CIE) will consist of class tests (CT) and internal assessment (IA). The internal assessment can be based on assignment(s), quiz, attendance etc as specified by the subject teacher to the students at the beginning of the course.

- 7.3 The weightage of the class test(s), internal assessment and end semester examination in total marks, to decide the grade for a course, will be as prescribed in the scheme of examination.
- 7.4 The End Semester Examination can be in the form of a theory paper, practical exam, workshop practice, project work, etc., depending on the type/ need of a particular course.
- 7.5 The grade offered to a student for a course shall be on the basis of the performance of the student in the end semester examination and continuous internal evaluation.
- 7.6 Pass/fail in a subject shall be declared on the basis of the grade obtained in that course.
- 7.7 The grade(s) of the previous semester(s) shall not be added in determining the semester grade point.
- 7.8 End Semester Examination for Practical, workshop practice etc. courses shall be evaluated by an evaluation committee, decided by the university.
- 7.9 The project(s) will be evaluated on the basis of the Project Report, Oral Exam in the form of a Presentation or a Viva-Voce by committee consisting external examiner(s) and internal examiner(s) as decided by the university.
- 7.10 If a student fails in a course, she/ he may appear in the subsequent end semester examination of that course in next session by duly applying and depositing the specified fee to the College/ University. Such end semester examination in the context of such student may be called as back paper.
- 7.11 In case of students who have appeared in the end semester examination of eighth semester, End Semester Examination of course(s) with F grade may be conducted immediately after the declaration of results of eighth semester after depositing a specified fee. Such examination may be called as Special Back Paper.
- 7.12 If a student appears in the back paper or special back paper examination for any course, the old grade in that course will be replaced by the new grade obtained in such back paper or special back paper.
- 7.13 Performance of a student will be evaluated on a scale of 10 point grading system, as per the following table-

Marks obtained (in %)	Grade	Grade Points	Performance
90 to 100	O	10	Outstanding
75 to 89	A <sup>+</sup>	09	Excellent
61 to 74	A	08	Very Good
55 to 60	B <sup>+</sup>	07	Good
50 to 54	B	06	Above Average
45 to 49	C	05	Average
40 to 44	P	04	Pass/ Satisfactory
Below 40	F	0	Fail/ Unsatisfactory
Absent	Ab (Absent)	0	Absent

- 7.14 Semester Grade Point Aggregate (SGPA) will be calculated, up to two digits after decimal, by  $SGPA = \frac{\sum GP * C}{\sum C}$ , where GP is grade point obtained in a course and C is the number of credits assigned to that course.

**8 Promotion Rules:**

- 8.1 A candidate satisfying all/ relevant conditions under clause No. 7.1 to 7.14, without any F grade or F grade in not more that 18 credits, shall be promoted to the next semester of the B. Tech. program.
- 8.2 Students who do not get promoted to next semester will have to repeat the semester in the next session opting as either Regular Student or Ex-student.

**9 Result:**

- 9.1 After the successful completion of the program, degree will be awarded according to the requirement of the course. Cumulative grade point aggregate (CGPA) of a program will be calculated, up to two digits after decimal, by  $CGPA = \frac{\sum SGPA * SC}{\sum SC}$ , where SGPA is the semester grade point aggregate of the student in corresponding semester and SC is the number of credits assigned in that semester.
- 9.2 No merit position (e.g. First position, gold medalist, etc.) shall be awarded to any candidate.

**10 Change of Branch:**

- 10.1 A student may be allowed to change branch of his/ her choice, in the Second year. However, this will be allowed up to the limit, if after this change, at least 50% of the sanctioned seats remain filled in the branch where from the student wishes to change. After the declaration of the 1<sup>st</sup> semester result the School will announce for submitting choice of change of branch from the students. The branch change will be allowed to only those students who are passed in all papers (Theory /Practical) of 1<sup>st</sup> semester. The branch change may be allowed as per merit of 1<sup>st</sup> semester result, and in case of tie, on the basis of JEE (main) merit.

**11 Industrial Training, Educational Tour (if any), etc.**

A candidate must secure C grade to pass in Industrial Training, Educational Tour, etc, each.

**12 Grace marks:**

There will be no provision of grace marks/ grade(s) in any paper/ semester exam.

**13 Scrutiny:**

Scrutiny shall be allowed as per rules of the University. Revaluation is not permitted.

**14 Conduct and Discipline:**

As per the rules of the University.

**15 Power to modify:**

Notwithstanding all that has been stated above, the college/University has the right to modify the above regulations from time to time.

**Curriculum****Definitions/ Descriptions:****1. Credit Equivalent**

	No. of Contact Hours per Week	Equivalent Credits
Lecture+ Tutorial	4	3
Practical	2	1

**2. Code for Courses:**

Code for a course consists of two alphabets followed by three digits and an optional alphabet. First three alphabet represent the school name (SET: School of Engineering and Technology) next two alphabets in the code represent the subject area of the course. E.g. (SH: Applied Science and Humanities, EC: Electronics and Communication Engineering, IN: Instrumentation Engineering, EE: Electrical Engineering, ME: Mechanical Engineering, CS: Computer Science and Engineering, IT: Information Technology, AECC: Ability Enhancement Compulsory Courses). Then there will be subject code with 4 letters out of which first will tell the nature of subject (C: Core/E: Elective/S: Skill Enhancement) and next three letters will tell the number according to the semester(for example 801 will tell its 8<sup>th</sup> semester subject). First digit represents the semester. Next two digits represent the sequence number of course in the list of courses of a semester.

**Elective Course:**

Elective courses are provided in VII and VIII semesters to provide student with flexibility to choose courses of their interest from a list of offered electives. These Electives are the courses offered by the same department or 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	Computer Programming	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	C Programming Lab	-	-	1	2	1
10	SET/ME/BT/C110	Engineering Workshop	-	-	2	4	2
<b>Total</b>			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	Fundamentals of Information Technology	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/IT/BT/C209	Information Technology Lab	-	-	1	2	1
10	SET/ME/BT/C210	Engineering Graphics	-	-	2	4	2
<b>Total</b>			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/IT/BT/C302	Computer Based Numerical & Statistical Techniques	3	1	-	4	3
3	SET/IT/BT/C303	Principle of Programming Language	3	1	-	4	3
4	SET/IT/BT/C304	Data Structures Using C	3	1	-	4	3
5	SET/EC/BT/C305	Digital Electronics	3	1	-	4	3
6	SET/IT/BT/C306	Computer Based Numerical & Statistical Techniques Lab	-	-	1	2	1
7	SET/IT/BT/C307	Data Structures Using C Lab	-	-	2	4	2
8	SET/EC/BT/C308	Digital Electronics Lab	-	-	1	2	1
9	SET/IT/BT/S309	Seminar	-	-	1	2	1
<b>Total</b>			15	5	5	30	20

**Semester IV**

S. No.	Code	Course Title	L	T	P	Contact Hrs./Week	Credits
1	SET/IT/BT/C401	Computer Organization	3	1	-	4	3
2	SET/IT/BT/C402	Operating System	3	1	-	4	3
3	SET/IT/BT/C403	Object Oriented Programming using C++	3	1	-	4	3
4	SET/IT/BT/C404	Discrete Structure	3	1	-	4	3
5	SET/IT/BT/C405	Management Information System	3	1	-	4	3
6	SET/IT/BT/C406	Computer Organization Lab	-	-	1	2	1
7	SET/IT/BT/C407	Operating System Lab	-	-	1	2	1
8	SET/IT/BT/C408	Object Oriented Programming using C++ Lab	-	-	1	2	1
9	SET/IT/BT/S409	Mini Project -1	-	-	2	4	2
<b>Total</b>			15	5	5	30	20

**Semester V**

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

**Semester VI**

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

**Semester VII**

S. No.	Code	Course Title	L	T	P	Contact Hrs./Week	Credits
1	SET/IT/BT/C701	Unix and Shell Programming	3	1	-	4	3
2	SET/IT/BT/C702	Artificial Intelligence	3	1	-	4	3
3	SET/IT/BT/C703	Software Project Management	3	1	-	4	3
4		Elective I	3	1	-	4	3
5		Elective II	3	1	-	4	3
6	SET/IT/BT/C706	Unix and Shell Programming Lab	-	-	1	2	1
7	SET/IT/BT/C707	Artificial Intelligence Lab	-	-	1	2	1
8	SET/IT/BT/C708	Project Work – I	-	-	2	4	2
9	SET/IT/BT/S709	Industrial Training Seminar	-	-	1	2	1
<b>Total</b>			15	5	5	30	20

Elective I	S. No.	Code	Course Title
	1	SET/IT/BT/E721	Advanced Information System Engineering
	2	SET/IT/BT/E722	Object Oriented Modeling and Design
	3	SET/IT/BT/E723	Advance Database Management System

Elective II	S. No.	Code	Course Title
	1	SET/IT/BT/E731	Distributed Systems
	2	SET/IT/BT/E732	Neural Networks
	3	SET/IT/BT/E733	Digital Image Processing

**Semester VIII**

S. No.	Code	Course Title	L	T	P	Contact Hrs./Week	Credits
1	SET/IT/BT/C801	ERP Systems	3	1	-	4	3
2	SET/IT/BT/C802	Data Mining and Data Warehousing	3	1	-	4	3
3		Elective III	3	1	-	4	3
4		Elective IV	3	1	-	4	3
5	SET/IT/BT/C806	Project and Dissertation	-	-	6	12	6
<b>Total</b>			12	4	6	28	18

Elective III	S. No.	Code	Course Title
	1	SET/IT/BT/E821	Cloud Computing
	2	SET/IT/BT/E822	Mobile Computing
	3	SET/IT/BT/E823	Bioinformatics
	4	SET/IT/BT/E824	.NET Technology

Elective IV	S. No.	Code	Course Title
	1	SET/IT/BT/E831	Real Time Systems
	2	SET/IT/BT/E832	Natural Language Processing
	3	SET/IT/BT/E833	Pattern Recognition
	4	SET/IT/BT/E834	E-Business

**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. 7<sup>th</sup> and 8<sup>th</sup> 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 7<sup>th</sup> and 8<sup>th</sup> 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 7<sup>th</sup> semester. Project topic /title shall be evaluated by the project evaluation committee of faculty in the department before the end of 7<sup>th</sup> semester. However, Major Project would be evaluated in the end of 8<sup>th</sup> semester.

**Detailed Syllabi****SEMESTER – I**

Theory		L	T	P	T.A.	C.T.	TOT	ESE.	SUB. TOTAL	Credit
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/CS/BT/C105	Computer Programming	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	C Programming Lab	-	-	1	30	-	30	70	100	1
SET/ME/BT/C110	Engineering Workshop	-	-	2	30	-	30	70	100	2
Total		17	5	5			300	700	1000	22

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.
<b>Vector Calculus</b>	Interpretation of Vectors & Scalars, Gradient, Divergence and Curl of a Vector and Their Physical Interpretation, Gauss Divergence Theorem and Stoke's Theorem.	8
<b>Matrices</b>	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
<b>Differential Calculus</b>	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
<b>Probability and Statistics</b>	Binomial Distribution, Normal Distribution and Poisson's Distribution. Correlation and Regression.	8
<b>Total No. of Hours</b>		<b>42</b>
<b>Textbooks</b>	1. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers 2. H K Das, "Advanced Engineering Mathematics", S Chand 3. Erwin Kreyszig, "Advanced Engineering Mathematics"	
<b>References</b>	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.
<b>Basic Concept of Thermodynamics</b>	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	10
<b>Introduction to Machine Tools.</b>	Introduction to metal cutting, Specification and operations of Lathe, Shaper, Planer, Drilling, Milling machine.	10
<b>Properties of Steam and Boilers.</b>	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.	12
<b>Shear Force and Bending Moment</b>	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 contraflexure under the load of concentrated load, uniformly distributed load combination of concentrated load, uniformly distributed load. Problems.	12
<b>Stress and Strain Analysis</b>	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.	11
<b>Total No. of Hours</b>		<b>55</b>
<b>Textbooks</b>	1. R S Khurmi, "Engineering Mechanics" 2. P K Nag "Engineering Thermodynamics"	
<b>References</b>	1. Van Wylen G.J., Sonnlög 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, Chittranjan 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".
10.	Timoshenko : "Strength of Materials".
11.	Beer, Johnson, "Statics"

CHEMISTRY (SET/SH/BT/C103)		
Module Name	Content	No. of Hrs.
<b>Thermodynamics</b>	Terminology in Thermodynamics, Zeroth law of Thermodynamics, First law of Thermodynamics, Enthalpy, Reversible isothermal expansion of ideal gas, Adiabatic expansion of ideal gas, Joule-Thomson effect.	4
<b>Lubricants</b>	Theory, classification and mechanism of lubrication.	4
<b>Polymers</b>	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
<b>Complex Compounds</b>	Introduction, Valence bond and crystal field theory for bonding in complexes.	4
<b>Chemical Kinetics &amp; Catalysis</b>	Order and molecularity of 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
<b>Atmospheric Chemistry &amp; Air Pollution</b>	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
<b>Corrosion</b>	Introduction, causes of corrosion, theories of corrosion- direct chemical attack, electrochemical theory of corrosion, factors influencing corrosion, passivity, types of corrosions, protection from corrosion (Cathodic and anodic protection) and protective metallic coatings (Galvanizing and tinning).	5
<b>Water and Waste Water Chemistry</b>	Introduction, Hardness of Water, Characteristics Imparted by Impurities, Determination of hardness by EDTA method, Treatment of Water by Zeolite, L-S Process, Boiler problems caused by use of hard Water, Reverse osmosis process for purification of water. Numerical based on hardness of water, zeolite process and Lime-soda process.	6
<b>Fuels &amp; Combustion</b>	Classification of Fuels, Non-Conventional Energy, Biogas, and Solar Energy, Calorific value – Gross and Net, Characteristics of Good Fuel, Determination of Calorific Value by bomb calorimeter method (theory and numerical), Solid Fuels: Analysis of Coal (Proximate and ultimate analysis of coal theory and numerical), Liquid Fuels: mining and refining of petroleum, cracking (Thermal and catalytic), Knocking, octane and cetane number .	5
<b>Stereochemistry of Organic-Compounds</b>	Mechanism of Chemical Reaction, Beckman, Hoffman, Reimer Tiemann, Cunnizzaro, Diels- Alder and Skraup synthesis.	3
<b>Total No. of Hours</b>		<b>42</b>
<b>Textbooks</b>	1. Jain, Jain, "Engineering Chemistry" 2. Sharma, Kumar, "Engineering Chemistry"	
<b>References</b>	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	



<b>BASIC ENGINEERING MECHANICS(SET/ME/BT/C104)</b>		
Module Name	Content	No. of Hrs.
<b>Force System</b>	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.	<b>10</b>
<b>Trusses And Frames</b>	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.	<b>10</b>
<b>Centre Of Gravity And Moment Of Inertia</b>	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.	<b>13</b>
<b>Kinematics And Dynamics</b>	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	<b>12</b>
<b>Total No. of Hours</b>		<b>45</b>
<b>Textbooks</b>	1. R S Khurmi, "Engineering Mechanics" 2. P K Nag "Engineering Thermodynamics"	
<b>References</b>	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, Chittranjan 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". 10. Timoshenko : "Strength of Materials". 11. Beer, Johnson, Statics"	

<b>COMPUTER PROGRAMMING (SET/CS/BT/C105)</b>		
Module Name	Content	No. of Hrs.
<b>Introduction</b>	C Character Set, Identifiers and Keywords, Data Types, Declarations, Expressions, Statements and Symbolic Constants.	6
<b>Operators and Expressions</b>	Arithmetic, Unary, Relational, Logical, and Assignment Operators, Conditional Operator, Library Functions.	6
<b>Control Statements</b>	While, Do-while, For Statements, Nested Loops, If-Else, Switch, Break, Continue and Go to Statements, Comma Operator.	5
<b>Functions</b>	Defining and Accessing Functions, Function Prototypes, Passing Arguments, Recursion, and Use of Library Functions.	5
<b>Program Structure</b>	Storage classes, Automatic, External, Static Variables	4
<b>Arrays</b>	Defining and Processing, Passing to a Function, Multidimensional Arrays, Arrays and Strings.	4
<b>Pointers</b>	Declarations, Passing to a Function, Operations on Pointers, Pointers and Arrays, Dynamic Memory Allocation, Array of Pointers.	6
<b>Structures and Unions</b>	Basics of Structures, Structures and Functions, Arrays of Structures, Pointers to Structures, Self Referential Structures, type definitions, Unions.	4
<b>Data Files</b>	Open, Close, Create, Process, Unformatted data files.	4
<b>Total No. of Hours</b>		<b>44</b>
<b>Textbooks</b>	1. E. Balagurusamy, "Programming in ANSI C"	
<b>References</b>	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.	

ENVIRONMENTAL SCIENCE(AECC106)		
Module Name	Content	No. of Hrs.
<b>Introduction to Environmental Sciences</b>	Multidisciplinary nature of Environmental Sciences; Scope and importance; Concept of sustainability and sustainable development.	2
<b>Ecosystems</b>	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
<b>Natural Resources: Renewable and Non-renewable Resources</b>	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
<b>Biodiversity and Conservation</b>	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
<b>Environmental Pollution</b>	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
<b>Environmental Policies &amp; Practices</b>	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
<b>Human Communities and the Environment</b>	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
<b>Field work</b>	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
<b>Total No. of Hours</b>		<b>50</b>
<b>Textbooks</b>	<ol style="list-style-type: none"> <li>Carson, R. 2002. “<i>Silent Spring</i>”. Houghton Mifflin Harcourt.</li> <li>Gadgil, M., &amp; Guha, R. 1993. “<i>This Fissured Land: An Ecological History of India</i>”. Univ. of California Press.</li> <li>Gleeson, B. and Low, N. (eds.) 1999. “<i>Global Ethics and Environment</i>”, London, Routledge.</li> <li>Gleick, P. H. 1993. “<i>Water in Crisis</i>”. Pacific Institute for Studies in Dev., Environment &amp; Security. Stockholm Env. Institute, Oxford Univ.</li> </ol>	
<b>References</b>	<ol style="list-style-type: none"> <li>Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. “<i>Principles of Conservation Biology</i>”. Sunderland: Sinauer Associates”, 2006.</li> <li>Grumbine, R. Edward, and Pandit, M.K. 2013. “Threats from India’s Himalaya dams”. <i>Science</i>, 339: 36-37.</li> <li>McCully, P. 1996. “<i>Rivers no more: the environmental effects of dams</i>” (pp. 29-64). Zed Books.</li> <li>McNeill, John R. 2000. “Something New Under the Sun: An Environmental History of the Twentieth Century”.</li> <li>Odum, E.P., Odum, H.T. &amp; Andrews, J. 1971. “<i>Fundamentals of Ecology</i>”. Philadelphia: Saunders.</li> <li>Pepper, I.L., Gerba, C.P. &amp; Brusseau, M.L. 2011. “<i>Environmental and Pollution Science</i>”. Academic Press.</li> <li>Rao, M.N. &amp; Datta, A.K. 1987. “<i>Waste Water Treatment</i>”. Oxford and IBH Publishing Co. Pvt. Ltd.</li> <li>Raven, P.H., Hassenzahl, D.M. &amp; Berg, L.R. 2012. “<i>Environment</i>.” 8th edition. John Wiley &amp; Sons.</li> <li>Rosencranz, A., Divan, S., &amp; Noble, M. L. 2001. “<i>Environmental law and policy in India</i>”. Tripathi 1992.</li> <li>Sengupta, R. 2003. “<i>Ecology and economics: An approach to sustainable development</i>”. OUP.</li> <li>Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. “<i>Ecology, Environmental Science and Conservation</i>.”, S. Chand, Delhi.</li> <li>Sodhi, N.S., Gibson, L. &amp; Raven, P.H. 2013. “<i>Conservation Biology: Voices from the Tropics</i>”. John Wiley &amp; Sons.</li> <li>Thapar, V. 1998. “<i>Land of the Tiger: A Natural History of the Indian Subcontinent</i>.”</li> <li>Warren, C. E. 1971. “<i>Biology and Water Pollution Control</i>”. WB Saunders.</li> <li>Wilson, E. O. 2006. “<i>The Creation: An appeal to save life on earth</i>”. New York: Norton.</li> <li>World Commission on Environment and Development. 1987. “<i>Our Common Future</i>”. Oxford University press</li> </ol>	

<b>Basic Mechanical Engineering Lab (SET/ME/BT/C107)</b>		
Module Name	Content	No. of Hrs.
<b>Module 1</b>	1. Study of boiler models – Babcock Wilcox, Lancashire and Locomotive. 2. Study of Steam Engine and Steam Turbine models. 3. Study of 2-Stroke and 4-Stroke ICE models. 4. Study of vapour compression Refrigeration unit tutor. 5. Study of window type air conditioner. 6. To conduct the tensile test on a UTM and determine ultimate tensile strength, percentage elongation for a steel specimen. 7. To conduct the compression test and determine the ultimate compressive strength for a specimen. 8. To conduct impact test (Izod/Charpy) on the impact testing machine and find the impact strength. To determine the hardness of the given specimen using Brinell/Rockwell/Vicker testing machine.	15x2
<b>Total No. of Hours</b>		<b>30</b>

<b>CHEMISTRY LAB (SET/SH/BT/C107)</b>		
Module Name	Content	No. of Hrs.
<b>Module 1</b>	1. To determine Saponification value of given oil sample. 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 acid value of given oil sample. 5. To determine the total hardness of water sample by EDTA titration. 6. To find chemical oxygen demand of a waste water sample using Potassium Dichromate. 7. Estimation of iron in plain carbon steel by redox titration. 8. Estimation of copper in brass by titration method. 9. Estimation of Zinc in brass by titration method. 10. Analysis of a coal sample by proximate analysis method.	15 x 2
<b>Total No. of Hours</b>		<b>30</b>

<b>C PROGRAMMING LAB (SET/CS/BT/C109)</b>		
Module Name	Content	No. of Hrs.
<b>Module 1</b>	This lab shall have minimum 25 programs in C. There shall be minimum two programs per module as taught in theory. Programming shall follow logic/algorithm and flowchart wherever applicable. Exercises shall also enhance analytical and debugging abilities.	15x2
<b>Total No. of Hours</b>		<b>30</b>

<b>ENGINEERING WORKSHOP (SET/ME/BT/C110)</b>		
Module Name	Content	No. of Hrs.
<b>Module 1</b>	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)	16x2
<b>Module 2</b>	Power tools in Construction, Wood working, Electrical and Mechanical Engineering practices; (2 Sessions)	8x2
<b>Total No. of Hours</b>		<b>48</b>

**SEMESTER – II**

Code	Theory	L	T	P	T.A	C.T.	TOT	ESE.	SUB. TOTAL	Credit
	Course									
SET/SH/BT/C201	Mathematics II	3	1	-	10	20	30	70	100	3
SET/SH/BT/C202	Physics	3	1	-	10	20	30	70	100	3
SET/EE/BT/C203	Basic Electrical Engineering	3	1	-	10	20	30	70	100	3
SET/EC/BT/C204	Basic Electronics	3	1	-	10	20	30	70	100	3
SET/IT/BT/C205	Fundamentals of Information Technology	3	1	-	10	20	30	70	100	3
AECC206	*General English	2	-	-	10	20	30	70	100	2
SET/SH/BT/C207	Physics Lab	-	-	1	30	-	30	70	100	1
SET/EE/BT/C208	Electrical Engineering Lab	-	-	1	30	-	30	70	100	1
SET/IT/BT/C209	Information Technology Lab	-	-	1	30	-	30	70	100	1
SET/ME/BT/C210	Engineering Graphics	-	-	2	30	-	30	70	100	2
Total		17	5	5			300	700	1000	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, Dirichlet's integral and its application.	8
Fourier Series	Periodic functions, Fourier series of functions with period $2\pi$ , 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 $n^{\text{th}}$ 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-quadratic equations. Method of least square and curve fitting.	6
<b>Total No. of Hours</b>		<b>44</b>
Textbooks	<ol style="list-style-type: none"> <li>1. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers</li> <li>2. H K Das, "Advanced Engineering Mathematics", S Chand</li> <li>3. Erwin Kreyszig, "Advanced Engineering Mathematics"</li> </ol>	
References	<ol style="list-style-type: none"> <li>1. J. N. Kapoor, "A Text Book of Differential Equations"</li> </ol>	

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. Ferro electricity 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
<b>Total No. of Hours</b>		<b>42</b>
Textbooks	<ol style="list-style-type: none"> <li>1. Gaur, Gupta, "Engineering Physics"</li> <li>2. Callister W.D., "Materials Science and Engineering: An introduction", 6th Edition, John Wiley &amp; Sons Inc., New York 2002</li> </ol>	
References	<ol style="list-style-type: none"> <li>1. J. R. Taylor, C.D. Zafiratos and M. A. Dubson, "Modern Physics for Scientists and Engineers", Pearson, 2<sup>nd</sup> Ed.</li> <li>2. Arthur Beiser, "Concepts of Modern Physics", TMH, 6th Ed.</li> <li>3. A.K. Ghatak : "Optics"</li> </ol>	

	<ol style="list-style-type: none"> <li>4. Subramanyam, Brijlal : “Optics”</li> <li>5. Wehr Richards &amp; Adiav : “Physics of Atoms”</li> <li>6. O.Svelto : “Lasers”</li> <li>7. D.J. Griffith : “Electrodynamics”</li> <li>8. Robert Eisberg and Robert Resnick, “Quantum Physics of atoms, Molecules, Solids, Nuclei and Particle”, 2nd Ed., John Wiley(2006)</li> <li>9. Raghavan V. “ Materials Science and Engineering – A first course” 5th Edition, Prentice Hall, New Delhi, 1998</li> <li>10. Van Vlack, LH, “ Elements of Materials Science and Engineering” . 6th Edition, Addison – Wesley Singapore, 1989</li> <li>11. B. G. Streetman, “Solid state Devices”, 5th Ed., Pearson (2006)</li> <li>12. Dekker, “Electrical Engineering Materials”, PHI</li> </ol>
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<b>BASIC ELECTRICAL ENGINEERING (SET/EE/BT/C203)</b>		
Module Name	Content	No. of Hrs.
<b>DC Networks</b>	Concepts of linear, nonlinear, active, passive, unilateral and bilateral elements; Ideal and practical voltage & current sources – conversion from one from 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 it’s application	<b>10</b>
<b>Single Phase AC Circuits</b>	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.	<b>10</b>
<b>Three Phase Circuits</b>	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.	<b>6</b>
<b>Transformers and Rotating Machines</b>	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.	<b>12</b>
<b>Measuring Instruments</b>	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.	<b>6</b>
<b>Total No. of Hours</b>		<b>44</b>
<b>Textbooks</b>	1. I.J. Nagrath, “Basic Electrical Engineering,” Tata Mc. Graw Hill.	
<b>References</b>	<ol style="list-style-type: none"> <li>1. A. E. Fitzgerald, D.E., Higginbotham and A Grabel, “Basic Electrical Engineering”, Mc Graw Hill.</li> <li>2. Rizzoni, Principles and Applications of Electrical Engineering, TMH</li> <li>3. V. Del Toro. “ Principles of electrical Engineering, “Prentice hall</li> <li>4. W.H. Hayt &amp; J.E. Kemmerly,” Engineering circuit Analysis, “Mc Graw Hill</li> <li>5. H. Cotton, “Advanced Electrical Technology” Wheeler Publishing</li> </ol>	

<b>BASIC ELECTRONICS(SET/EC/BT/C204)</b>		
Module Name	Content	No. of Hrs.
<b>Semiconductor Diodes</b>	Semiconductor materials- intrinsic and extrinsic types, Ideal Diode as switch, Terminal characteristics of PN diode - p-n junction under open circuit condition, p-n junction under forward bias and reverse bias conditions, p-n junction in breakdown region; Zener diode and applications e.g. voltage regulator; Rectifier Circuits, Clipping and Clamping circuits; LED, Photo Diode.	10
<b>Bipolar Junction Transistors</b>	Physical structure, physical operation and current-voltage characteristics of NPN transistor; Use of Voltage dependent Current source as an Voltage amplifier; Transistor as an amplifier: Characteristics of CE amplifier; Active region operation of transistor; D.C. analysis of Common Emitter Amplifier: load line analysis; Transistor as a switch: cut-off and saturation modes.	10
<b>Field Effect Transistor</b>	Enhancement-type MOSFET: structure and physical operation, current-voltage characteristics; MOSFET as a Switch, MOSFET as a Voltage dependent Current source and Amplifier.	8
<b>Operation Amplifier</b>	Ideal Op-amp; Properties of the ideal Operational Amplifier; op-amp application circuits (assuming ideal op amp): inverting amplifier, non -inverting amplifier, weighted summer, integrator, and differentiator.	6
<b>Digital Logic and Gates</b>	Binary, octal and hexadecimal number systems; Methods of base conversions; Binary, octal and hexadecimal arithmetic; Representation of signed numbers; Basic logic operations and logic gates; MOSFET Switch Implementation of Logic Gates e.g. Inverter, NAND, NOR. Basic postulates and fundamental theorems of Boolean algebra.	8
<b>Total No. of Hours</b>		<b>42</b>
<b>Textbooks</b>	1. Agarwal, Anant; Lang, Jeffrey H, “Foundations of Analog and Digital Electronic Circuits”, Elsevier Science & Technology Books.	

<b>References</b>	<ol style="list-style-type: none"> <li>1. V. Del Toro, Principles of Electrical Engineering, PHI</li> <li>2. Rizzoni, Principles and Applications of Electrical Engineering, TMH</li> <li>3. Malvino, Electronic Principles</li> <li>4. R.L.Boylestad &amp; L.Nashelsky, Electronics Devices &amp; Circuit Theory, PHI</li> </ol>
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<b>Fundamentals of Information Technology(SET/IT/BT/C205)</b>		
<b>Module Name</b>	<b>Content</b>	<b>No. of Hrs.</b>
<b>Introduction</b>	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;	4
<b>Computer Languages</b>	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;	6
<b>OS &amp; Office</b>	Software- System and Application Software; Elementary Concepts in Operating System; Textual Vs GUI Interface, Introduction to DOS, MS Windows	4
<b>Computer Networks</b>	Elements of Communication system; Brief Introduction to Computer Networks- Introduction of LAN and WAN. Network Topologies, Client-server Architecture;	6
<b>Internet</b>	Internet & World Wide Web, Hypertext Markup Language, DHTML, WWW, Gopher, FTP, Telnet, Web Browsers, Net Surfing, Search Engines, Email; Introduction to Web Development, Static and Dynamic Pages.	6
<b>IT Application and Multi media</b>	Basic Awareness of NICNET and ERNET; E Commerce, E governance; Brief Introduction to Different Formats of Image, Audio, Video;	6
<b>Information Concepts &amp; Processing:</b>	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
<b>Total No. of Hours</b>		<b>40</b>
<b>Textbooks</b>	<ol style="list-style-type: none"> <li>1. Sinha, Sinha, "Computer Fundamentals",</li> <li>2. Yadav R. P. , "Information Technology"</li> </ol>	
<b>References</b>	<ol style="list-style-type: none"> <li>1. D S Yadav, "Foundations of IT", New Age, Delhi</li> <li>2. Rajaraman, "Introduction to Computers", PHI</li> <li>3. Peter Nortans "Introduction to Computers", TMH.</li> <li>4. Patterson D.A. &amp; Hennessy J.L., "Computer Organization and Design", Morgan Kaufmann Publishers</li> </ol>	

<b>GENERAL ENGLISH (AECC206)</b>		
<b>Module Name</b>	<b>Content</b>	<b>No. of Hrs.</b>
<b>Introduction</b>	Theory of Communication, Types and modes of Communication	7
<b>Language of Communication</b>	Verbal and Non-verbal (Spoken and Written) Personal, Social and Business Barriers and Strategies Intra-personal, Inter-personal and Group communication	8
<b>Speaking Skills</b>	Monologue Dialogue Group Discussion Effective Communication/ Mis- Communication Interview Public Speech	5
<b>Reading and Understanding</b>	Reading and Understanding Close Reading Comprehension Summary Paraphrasing Analysis and Interpretation Translation(from Indian language to English and vice-versa) Literary/Knowledge Texts	8
<b>Writing Skills</b>	Documenting Report Writing Making notes Letter writing	4
<b>Total No. of Hours</b>		<b>32</b>
<b>Textbooks</b>	<ol style="list-style-type: none"> <li>1. Department of English, Delhi University, "Fluency in English - Part II", Oxford University Press, 2006.</li> <li>2. "Business English", Pearson, 2008.</li> <li>3. "Language, Literature and Creativity", Orient Blackswan, 2013.</li> <li>4. Gauri Mishra, Ranjana Kaul, Brati Biswas, "Language Through Literature"</li> </ol>	

<b>PHYSICS LAB (SET/SH/BT/C207)</b>		
<b>Module Name</b>	<b>Content</b>	<b>No. of Hrs.</b>
<b>Module 1</b>	<ol style="list-style-type: none"> <li>1. To determine the wavelength of monochromatic light by Newton's ring method.</li> <li>2. To determine the wavelength of monochromatic light by Fresnel's biprism.</li> <li>3. To determine the focal length of two lenses by nodal slide and locate the position of cardinal points.</li> <li>4. To determine the wavelength of spectral lines using plane transmission grating.</li> </ol>	6x2
<b>Module 2</b>	<ol style="list-style-type: none"> <li>1. Measurement of Magnetic susceptibility- Quincke's Method / Gouy's balance.</li> <li>2. Mapping of magnetic field</li> </ol>	2x2
<b>Module 3</b>	<ol style="list-style-type: none"> <li>1. Measurement of e/m of electron – Thomson's experiment</li> </ol>	2x2

	2. Determination of Planck's constant.	
<b>Module 4</b>	<ol style="list-style-type: none"> <li>To draw hysteresis curve of a given sample of ferromagnetic material and from this to determine magnetic susceptibility</li> <li>To study the Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material.</li> <li>To determine the energy band gap of a given semiconductor material.</li> </ol>	4x2
<b>Total No. of Hours</b>		<b>28</b>

<b>BASIC ELECTRICAL ENGINEERING LAB (SET/EE/BT/C108)</b>		
Module Name	Content	No. of Hrs.
<b>Module 1</b>	<ol style="list-style-type: none"> <li>Study of analog voltmeter and ammeter</li> <li>Study of digital multimeter</li> <li>Study of CRO</li> </ol>	3x2
<b>Module 2</b>	<ol style="list-style-type: none"> <li>Verification of KCL and KVL.</li> <li>Verification of Thevenin, Norton Network theorems.</li> <li>Verification of Superposition Network theorem.</li> <li>Verification of MPT Network theorem</li> </ol>	3x2
<b>Module 3</b>	<ol style="list-style-type: none"> <li>Measurement of efficiency of a single phase transformer by load test.</li> <li>Determination of parameters and losses in single phase transformer by OC and SC test.</li> <li>Measurement of power in a three phase circuit by two wattmeter method.</li> <li>Verification of Single Phase Energy Meter constant.</li> <li>Study of three phase induction motor.</li> </ol>	5x2
<b>Module 4</b>	<ol style="list-style-type: none"> <li>Verification of junction diode, zener diode characteristics.</li> <li>Verification of Clipping and clamping circuits.</li> <li>Verification of H.W. and F.W. rectifier circuit: with and without filter circuit and to determine the ripple factor.</li> <li>Verification of CE characteristics of BJT.</li> </ol>	4x2
<b>Total No. of Hours</b>		<b>30</b>

<b>Information Technology Lab (SET/IT/C209)</b>		
Module Name	Content	No. of Hrs.
<b>Module 1</b>	<ol style="list-style-type: none"> <li>Creation of a Word Document.</li> <li>Creation of a Document in spreadsheet and using Formulae</li> <li>Use of Search Engine and World Wide Web</li> <li>Creation of email id and email</li> <li>Use of FTP service.</li> <li>Creation of Static Web Pages using HTML</li> <li>Creation of Page Using Java Script</li> </ol> <p>(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)</p>	14x2
<b>Total No. of Hours</b>		<b>28</b>

<b>ENGINEERING GRAPHICS (SET/ME/BT/C210)</b>		
Module Name	Content	No. of Hrs.
<b>Introduction to Engineering Graphics</b>	Drawing instruments and their use – Different types of lines - Lettering & dimensioning – Familiarization with current Indian Standard Code of Practice for Engineering Drawing. Scales, Plain scales, Diagonal scales, Vernier scales. Introduction to orthographic projections- Horizontal, vertical and profile planes – First angle and third angle projections – Projection of points in different coordinates – Projections of lines inclined to one of the reference planes.	12
<b>Projections of lines and planes</b>	Projections of lines inclined to both the planes – True lengths of the lines and their angles of inclination with the reference planes – Traces of lines. Projection of plane lamina of geometric shapes inclined to one of the reference planes – inclined to both the planes, Traces of planes. Projections on auxiliary planes.	12
<b>Projections of polyhedral and solids</b>	Projections of polyhedral and solids of revolution, projection of solids with axis parallel to one of the planes and parallel or perpendicular to the other plane – Projections with the axis inclined to one of the planes. Projections of Solids with axis inclined to both the planes – Projections of spheres and combination of solids.	12
<b>Sections of solids</b>	Sections of solids by planes perpendicular to at least one of the reference planes – True shapes of sections. Developments, development of the lateral surface of regular solids like, prisms, pyramids, cylinders, cones and spheres, development of truncated solids Isometric projection – Isometric scale – Isometric views – Isometric projection of prisms, pyramids, cylinders, cones, spheres and solids made by combination of the above.	12
<b>Total No. of Hours</b>		<b>48</b>
<b>Textbooks</b>	1. Bhatt N. D, <i>Elementary Engineering Drawing</i> , Charotar Publishing House, Anand, 2002	
<b>References</b>	<ol style="list-style-type: none"> <li>Narayana K L &amp; Kannaiah P, <i>Engineering Graphics</i>, Tata McGraw Hill, New Delhi, 1992</li> <li>Luzadder W J, <i>Fundamentals of Engineering Drawing</i>, Prentice Hall of India, New Delhi, 2001</li> <li>Thomas E French &amp; Charkes J V, <i>Engineering Drawing &amp; Graphing Technology</i>, McGraw Hill Book Co, New York, 1993</li> <li>Venugopal K, <i>Engineering Drawing &amp; Graphics</i>, New Age International Pvt. Ltd., New Delhi, 1994</li> </ol>	

**SEMESTER III**

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

**MATHEMATICS- III (SET/SH/BT/C301)**

Module Name	Content	No. of Hrs.
<b>Ordinary Differential Equations</b>	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
<b>Integral Transforms</b>	Fourier transform and integral Hankel transforms and Hilbert transforms and their properties, some simple applications.	8
<b>Partial Differential Equations</b>	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
<b>Functions of a Complex Variable</b>	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 fractional transformations.	14
<b>Total No. of Hours</b>		<b>46</b>
<b>Textbooks</b>	<ol style="list-style-type: none"> <li>1. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers</li> <li>2. H K Das, "Advanced Engineering Mathematics", S Chand</li> <li>3. Erwin Kreyszig, "Advanced Engineering Mathematics"</li> </ol>	
<b>References</b>	<ol style="list-style-type: none"> <li>1. Paopoulis, "Signal Analysis", TMH</li> </ol>	

**COMPUTER BASED NUMERICAL & STATISTICAL TECHNIQUES (SET/IT/BT/C302)**

Module Name	Content	No. of Hrs.
<b>Errors in numerical computations</b>	Errors in numerical computations, mathematical preliminaries, errors and their analysis, machine computations, computer software	6
<b>Algebraic &amp; Transcendental Equation</b>	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
<b>Interpolation</b>	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
<b>Cubic Spline &amp; Approximation</b>	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
<b>Numerical Integration &amp; Differentiation</b>	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
<b>Statistical Computation</b>	Frequency chart, regression analysis, least square fit, linear & non linear regression, multiple regression, statistical control methods.	6
<b>Total No. of Hours</b>		<b>42</b>
<b>Textbooks</b>	<ol style="list-style-type: none"> <li>1. Sashtry : Introductory Method of Numerical Analysis, PHI</li> <li>2. Balaguruswamy : Numerical Methods, TMH</li> </ol>	
<b>References</b>	<ol style="list-style-type: none"> <li>1. Jain, Iyengar, Jain : Numerical Methods for Scientific &amp; Engg. Computation, New Age</li> <li>2. Gerald &amp; Wheatley : Applied Numerical Analysis, Addison Wesley</li> </ol>	



PRINCIPLES OF PROGRAMMING LANGUAGES (SET/IT/BT/C303)		
Module Name	Content	No. of Hrs.
<b>Introduction</b>	Characteristics of programming Languages, Factors influencing the evolution of programming language, developments in programming methodologies, desirable features and design issues.	6
<b>Programming Language Processors</b>	Structure and operations of translators, software simulated computer, syntax, semantics, structure, virtual computers, binding and binding time.	8
<b>Data Types</b>	Data object variables, constants, data types, elementary data types, declaration, assignment and initialization, enumeration, characters, strings. Structured data type and objects: Specification of data structured types, vectors and arrays, records, variable size data structure, pointers and programmer constructed data structure, Sets files. Abstractions, encapsulations, information hiding, sub programmes, abstract data types	12
<b>Sequence Control</b>	Implicit and Explicit sequence control, sequence control with within expression and statements, recursive sub programmes, exception handling, coroutines, Scheduled sub programmes, concurrent execution. Data control referencing environments, static and dynamic scope, local data local data referencing environment,	8
<b>Storage Management</b>	Major run time requirements, storage management phases, static storage management, stack based, heap based storage management.	8
<b>Total No. of Hours</b>		<b>42</b>
<b>Textbooks</b>	1. Terrance W Pratt, "Programming Languages: Design and Implementation" PHI 2. E Horowitz, "Programming Languages", 2nd Edition, Addison Wesley	
<b>References</b>	1. Sebesta, "Concept of Programming Language", Addison Wesley 2. Fundamentals of Programming Languages, Galgotia.	

DATA STRUCTURES USING C (SET/IT/BT/C304)		
Module Name	Content	No. of Hrs.
<b>Elementary Data Organization</b>	Elementary Data Organization, Structure operations, Algorithm Complexity and Time-Space trade-off.	6
<b>Arrays and Linked list</b>	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
<b>Stacks and Queues</b>	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
<b>Trees</b>	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
<b>Searching and Sorting</b>	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
<b>Total No. of Hours</b>		<b>42</b>
<b>Textbooks</b>	1. Seymour Lipschutz, "Data Structures", TMH	
<b>References</b>	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.	

DIGITAL ELECTRONICS (SET/EC/BT/C305)		
Module Name	Content	No. of Hrs.
<b>Introduction</b>	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
<b>Boolean Algebra and Switching Functions</b>	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
<b>Logic Families</b>	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

<b>Combinational Logic</b>	Arithmetic modules: adders, subtractors and ALU; Design examples. Decoders, encoders, multiplexers and demultiplexers; Parity circuits and comparators.	6
<b>Sequential Logic</b>	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
<b>Semiconductor Memories</b>	RAM, ROM, Content Addressable Memory, Charge Coupled Device Memory. PLAs, PALs and their applications; Sequential PLDs and their applications;	4
<b>Total No. of Hours</b>		<b>42</b>
<b>Textbooks</b>	1. Morris Mano, "Digital Design"	
<b>References</b>	1. Taub, Schilieng, "Digital Integrated Electronics" 2. Anad Kumar, "Digital principles and application" 3. John F Wakerly, "Digital Design: Principles and Practices", Prentice Hall 4. Thomas L. Floyd, "Digital Fundamentals", Pearson/ Prentice Hall 5. Ronald J. Tocci, "Digital Systems: Principles and Applications", Pearson/ Prentice Hall 6. Charles Roth, "Fundamentals of Logic Design", Jaico Publishing House	

<b>COMPUTER BASED NUMERICAL &amp; STATISTICAL TECHNIQUES LAB (SET/IT/BT/C306)</b>		
Module Name	Content	No. of Hrs.
<b>Errors in numerical computations</b>	Write a Program to deduce errors involved in polynomial interpolation.	6
<b>Algebraic &amp; Transcendental Equation</b>	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
<b>Interpolation</b>	Write a Program to implement Bessel's functions, Newton's, Stirling's, Lagrange's.	6
<b>Cubic Spline &amp; Approximation</b>	Write a Program to implement method of least square curve fitting.	6
<b>Numerical Integration &amp; Differentiation</b>	Write a Program to Implement numerical differential using trapezoidal, Simpson 3/8 rules.	6
<b>Statistical Computation</b>	Write a Program to show frequency chart, regression analysis, linear square fit and polynomial fit.	6
<b>Total No. of Hours</b>		<b>36</b>

<b>DATA STRUCTURES USING C LAB (SET/IT/BT/C307)</b>		
Module Name	Content	No. of Hrs.
<b>Arrays</b>	Array implementation of Stack, Queue, Circular Queue.	4X2
<b>Linked List</b>	Linked List implementation of Stack, Queue, Circular Queue.	4X4
<b>Tree</b>	Implementation of Tree, Binary Tree, Tree Traversal, Binary Search Tree, Insertion and Deletion in BST.	4X4
<b>Searching and Sorting</b>	Implementation of Searching and Sorting Algorithms.	4X2
<b>Total No. of Hours</b>		<b>48</b>

<b>DIGITAL ELECTRONICS LAB (SET/EC/BT/C308)</b>		
Module Name	Content	No. of Hrs.
<b>Experiments</b>	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. Arithmetic circuits – design using adder ICs, BCD adder. 5. Flip flop circuit (RS latch, JK & master slave) using basic gates. 6. Asynchronous Counters 7. Synchronous counters, Johnson & Ring counters. 8. Sequential Circuit designs (sequence detector circuit). 9. Transfer Characteristics, Measurement of Sinking and Sourcing currents etc. of TTL gates	8x2
<b>Model Sim Simulations</b>	Writing and simulating VHDL programs for adder, decoder, multiplexer, de-multiplexer, up/down counter, universal shift register, Sequence Detector etc.	8x2
<b>Total No. of Hours</b>		<b>32</b>

<b>SEMINAR (SET/IT/BT/S309)</b>		
Module Name	Content	No. of Hrs.
<b>Module 1</b>	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 Information Technology. Students should search for the related literature and prepare a presentation. Evaluation shall be based on content, presentation and active participation.	12x2
<b>Total No. of Hours</b>		<b>24</b>
<b>References</b>	1. Internet and Journals/Magazines	

## SEMESTER IV

Theory		L	T	P	T.A	C.T.	TOT	ESE.	SUB. TOTAL	Credit
Code	Course									
SET/IT/BT/C401	Computer Organization	3	1	-	10	20	30	70	100	3
SET/IT/BT/C402	Operating System	3	1	-	10	20	30	70	100	3
SET/IT/BT/C403	Object Oriented Programming using C++	3	1	-	10	20	30	70	100	3
SET/IT/BT/C404	Discrete Structure	3	1	-	10	20	30	70	100	3
SET/IT/BT/C405	Management Information System	3	1	-	10	20	30	70	100	3
SET/IT/BT/C406	Computer Organization Lab	-	-	1	30	-	30	70	100	2
SET/IT/BT/C407	Operating System Lab	-	-	1	30	-	30	70	100	1
SET/IT/BT/C408	Object Oriented Programming using C++ Lab	-	-	1	30	-	30	70	100	1
SET/IT/BT/S409	Mini Project -1	-	-	2	30	-	30	70	100	1
Total		15	5	5			270	630	900	20

COMPUTER ORGANIZATION (SET/IT/BT/C401)		
Module Name	Content	No. of Hrs.
<b>Fundamental Concepts</b>	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), General register organization, Register Transfers, Register Transfer Language.	10
<b>Control Design</b>	Execution of a complete instruction, Multiple-Bus organization, Hardwired Control, Micro programmed control, Microinstruction, address sequencing, Microinstruction with Next-address field, Prefetching Microinstruction.	8
<b>Processor Design</b>	Processor Organization: Stack organization, Addressing mode, Instruction format, Data transfer & manipulations, Program Control, Reduced Instruction Set Computer. Assembly level programs,	8
<b>Input-Output Organization</b>	I/O Interface, Modes of transfer, Interrupts & Interrupt handling, Direct Memory access, Input- Output processor, Serial Communication.	8
<b>Memory Organization</b>	Memory Hierarchy, Main Memory (RAM and ROM Chips), Auxiliary memory, Cache memory, Virtual Memory, Memory management hardware.	8
<b>Total No. of Hours</b>		<b>42</b>
<b>Text Books</b>	1. Computer System Architecture, M. Mano(PHI)	
<b>References</b>	1. Computer Organization, Vravice, Zaky & Hamacher (TMH Publication) 2. Structured Computer Organization, Tannenbaum(PHI) 3. Computer Organization, Stallings(PHI)	

OPERATING SYSTEMS (SET/IT/BT/C402)		
Module Name	Content	No. of Hrs.
<b>Fundamental Concepts</b>	Operating System and its Functions, <u>Evolution of Operating Systems</u> : Batch, Interactive, Time Sharing and Real Time System, <u>Computer System Structure</u> : System Operations, I/O Structure, Storage Structure, Storage Hierarchy, System Protection. <u>Operating System Structure</u> : System Components, Operating System Services, System Calls, System Programs, System Structure.	10
<b>Process and CPU Scheduling</b>	Process Concept, Process Scheduling, Operations on Processes, Cooperating Processes, <u>Communication Between Processes</u> : Producer Consumer Problem, Shared Memory, Inter Processes Communication, <u>CPU Scheduling</u> : Scheduling Concept, Performance Criteria Scheduling Algorithms, Multiprocessor Scheduling, Algorithm Evaluation.	10
<b>Process Synchronization and Deadlock</b>	Critical Section Problem, Semaphores, Classical Problems in Concurrency, <u>Deadlocks</u> : System Model, Deadlock Characterization, Methods for Handling Deadlocks: Prevention, Avoidance and Detection and Recovery.	8
<b>Memory Management</b>	Basic Concepts, Swapping, Contiguous Memory Allocation, Non-contiguous Memory Allocation, Paging, Segmentation, Segmentation with Paging, <u>Virtual Memory</u> : Basic Concept, Demand Paging, Performance of Demand Paging, Paged Replacement Algorithms, Allocation of Frames, Thrashing.	8
<b>File System and Mass Storage Structure</b>	<u>File System</u> : File Concept, Access Methods, File Organization, Directory Structure, File System Mounting, File Sharing, Protection, <u>Implementation Issues</u> : Directory Implementation, Allocation Methods, Free Space Management. <u>Mass Storage Structure</u> : Disk Structure, Disk Scheduling, Disk Management.	8

	<b>Total No. of Hours</b>	<b>44</b>
<b>Text Books</b>	1. Galvin, Silberschatz, Gagne “Operating System Concepts”, Wiley	
<b>References</b>	1. Tannenbaum, "Operating System Design and Implementation", PHI. 2. 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.	

<b>OBJECT ORIENTED PROGRAMMING USING C++ (SET/IT/BT/C403)</b>		
Module Name	Content	No. of Hrs.
<b>Fundamental Concept</b>	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
<b>Classes, Objects and Constructors</b>	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
<b>Inheritance</b>	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
<b>Polymorphism</b>	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
<b>Streams Computation &amp; Exception Handling</b>	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
<b>Total No. of Hours</b>		<b>42</b>
<b>Textbooks</b>	1. Balagurusamy “Object Oriented Programming with C++ ”, TMH	
<b>References</b>	1. Budd, "Object Oriented Programming ", Addison Wesley. 2. Mastering C++ K.R Venugopal Rajkumar, TMH. 3. C++ Primer , “Lip man and Lajole”, Addison Wesley.	

<b>DISCRETE STRUCTURE (SET/IT/BT/C404)</b>		
Module Name	Content	No. of Hrs.
<b>Set Theory</b>	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
<b>Algebraic Structures</b>	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
<b>Posets, Hasse Diagram and Lattices</b>	Introduction, ordered set, Hasse diagram of partially, ordered set, isomorphic ordered set, well ordered set, properties of Lattices, bounded and complemented lattices.	6
<b>Propositional Logic</b>	Proposition, First order logic, Basic logical operation, truth tables, tautologies, Contradictions, Algebra of Proposition, logical implications, logical equivalence, predicates, Universal and existential quantifiers.	10
<b>Permutation &amp; Combination</b>	Recurrence Relation, Generating function., Permutation & Combination, Probabilistic Permutation & Combination.	8
<b>Total No. of Hours</b>		<b>42</b>
<b>Text Books</b>	1. Lipschutz, 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	
<b>References</b>	1. K.H.Rosen, “Discrete Mathematics & Its Application with Combinatory and Graph Theory”, TMH (6th ed). 2. C.L.Liu, “Discrete Mathematics”, TMH.	

MANAGEMENT INFORMATION SYSTEM (SET/IT/BT/C405)		
Module Name	Content	No. of Hrs.
<b>Information Systems</b>	Information system in business, fundamentals of information systems, Solving business problems with information systems, Types of information systems, effectiveness and efficiency criteria in information system.	12
<b>Management Information System</b>	Decision Support Systems, Information Resources Management, End user computing , Concept of an MIS, Structure of a Management Information Systems. Concepts of Planning and Control: Concept of organizational planning. The Planning Process, Computational support for planning, control process.	12
<b>Information Technology</b>	Internet & electronic commerce, Internet, Extranet & Enterprises Solutions, Information System for Business Operations, Information System for Managerial Decision Support, Information System for Strategic Advantage.	10
<b>Enterprise of MIS</b>	Enterprise & Global management, Security & Ethical challenges, Planning & Implementing changes. Enterprise Resource planning. Supply chain Management, Customer Relationship Management, and Procurement Management.	8
<b>Total No. of Hours</b>		<b>42</b>
<b>Text Books</b>	O. Brian, "Management Information System" TMH	
<b>References</b>	1. Gordon B. Davis & Margrethe H. Oison, "Management Information System" TMH 2. O Brian, "Introduction to Information Systems" McGraw Hill 3. Murdic, "Information System for Modern Management" PHI	

COMPUTER ORGNIZATION LAB (SET/IT/BT/C406)		
Module Name	Content	No. of Hrs.
<b>Experiments / Spice Simulations</b>	1. Bread Board Implementation of Flip-Flops. 2. Experiments with clocked Flip-Flop. 3. Design of Counters. 4. Bread Board implementation of counters & shift registers. 5. Implementation of Arithmetic algorithms. 6. Bread Board implementation of Adder/Subtractor (Half, Full) 7. Bread Board implementation of Binary Adder. 8. Bread Board implementation of Seven Segment Display. 9. Programming in Assembly Language.	12x2
<b>Total No. of Hours</b>		<b>24</b>

OPERATING SYSTEMS LAB (SET/IT/BT/C407)		
Module Name	Content	No. of Hrs.
<b>Module 1</b>	1. Simulation of the CPU Scheduling algorithms a) Round Robin b) SJF c) FCFS d) Priority 2. Simulation of MUTEX and SEMAPHORES. 3. Simulation of Bankers Deadlock Avoidance and Prevention algorithms. 4. Implementation of Process Synchronization (Reader-Writer and Dining Philosopher's Problem) 5. Simulation of Page Replacement Algorithms a) FIFO b) LRU c) LFU 6. Simulation of Paging Techniques of memory management. 7. Simulation of File allocation Strategies a) Sequential b) Indexed c) Linked 8. Simulation of File organization techniques a) Single Level Directory b) Two Level c) Hierarchical d) DAG	12x2
<b>Total No. of Hours</b>		<b>24</b>

OBJECT ORIENTED PROGRAMMING USING C++ LAB (SET/IT/BT/C408)		
Module Name	Content	No. of Hrs.
<b>Module 1</b>	1. Implementation of input and output statements. 2. Implementation of Control statements. 3. Implementation of Functions. 4. Implementation of Arrays 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)	12x2
<b>Total No. of Hours</b>		<b>24</b>

MINI PROJECT – 1(SET/IT/BT/S409)		
Module Name	Content	No. of Hrs.
Module 1	Mini Project-1 shall be based on C/C++.	24x2
<b>Total No. of Hours</b>		<b>48</b>

## SEMESTER V

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

DATABASE MANAGEMENT SYSTEM (SET/IT/BT/C501)		
Module Name	Content	No. of Hrs.
Module 1	<u>Fundamental Concepts:</u> Database System Vs File System, Database System Concepts and Architecture, Data Models, Schema and Instances, Data Independence and Database language and Interfaces, Data Definition Language, Data Manipulation Language, Overall Database Structure.	8
Module 2	<u>Relationship Models:</u> ER Model Concepts, Concepts of Super Key, Candidate Key, Primary Key, Notation for ER Diagram, Specialization, Generalization, Aggregation, Reduction of ER Diagrams to Tables, Extended ER model, Relationships of Higher Degree. Relational Data Model and Language, Integrity Constraints, Relational Algebra, Tuple Relational Calculus and Domain Relational Calculus.	6
Module 3	<u>Introduction to SQL:</u> 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, Assertions, Triggers, Introduction to PL/SQL, Cursors .	8
Module 4	<u>Database Design &amp; Normalization:</u> Functional Dependencies, Normal Forms: First, Second, Third Normal Forms, BCNF, Inclusion Dependencies, Lossless Join Decompositions, Normalization using FD, MVD, and JDs, Alternative Approaches to Database Design.	10
Module 5	<u>Transaction Processing Concepts:</u> Transaction System, Testing of Serializability, Serializability of Schedules, Conflict & View Serializable Schedule, Recoverability, Recovery from Transaction Failures, <u>Concurrency Control Techniques:</u> Concurrency Control, Locking Techniques for Concurrency Control, Time-Stamp Based Protocols for Concurrency Control, Validation Based Protocol,	12
<b>Total No. of Hours</b>		<b>44</b>
<b>Text Books</b>	1. Korth, Silbertz, Sudarshan, “Database Concepts”, McGraw Hill	
<b>References</b>	1. Elmasri, Navathe, “Fundamentals Of Database Systems”, Addison Wesley	

COMPUTER NETWORKS (SET/IT/BT/C502)		
Module Name	Content	No. of Hrs.
<b>Network Structure and Architecture</b>	Goals and Applications of Networks, The OSI reference model, services, Network Topology Design – Delay Analysis, Back Bone Design, Local Access Network Design. Physical Layer Transmission Media, Switching methods, ISDN, Terminal Handling.	<b>10</b>
<b>Medium Access Sub layer</b>	Medium Access sub layer - Channel Allocations, LAN protocols - ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer - Elementary Data Link Protocols, Sliding Window protocols, Error Handling.	<b>8</b>
<b>Network Layer</b>	Network Layer - Point - to Pont Networks, routing, Congestion control. Internetworking -TCP / IP - IP packet, IP address, IPv6.	<b>6</b>
<b>Transport Layer</b>	Transport Layer - Design issues, connection management, session Layer- Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques, cryptography - TCP - Window Management.	<b>10</b>
<b>Application Layer</b>	File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application, Example Networks - Internet and Public Networks.	<b>10</b>

	<b>Total No. of Hours</b>	<b>44</b>
<b>Textbooks</b>	iv. Forouzen, "Data Communication and Networking", TMH	
<b>References</b>	1. A.S. Tanenbaum, "Computer Networks", 3rd Edition, Prentice Hall India, 1997. 2. S. Keshav, "An Engineering Approach on Computer Networking", Addison Wesley, 1997. 3. W. Stallings, "Data and Computer Communication", Macmillan Press, 1989.	

<b>DESIGN &amp; ANALYSIS OF ALGORITHMS (SET/IT/BT/C503)</b>		
Module Name	Content	No. of Hrs.
<b>Fundamental Concepts</b>	Algorithms, Analysis of algorithms, Growth of Functions, Master's Theorem, Designing of Algorithms.	10
<b>Sorting and order Statistics</b>	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
<b>Design and Analysis</b>	Dynamic Programming, Greedy Algorithms, Amortized Analysis, Back Tracking.	10
<b>Graph Algorithms</b>	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
<b>Total No. of Hours</b>		<b>42</b>
<b>Textbooks</b>	1. Coreman, Rivest, Lisserson, "Algorithm", PHI.	
<b>References</b>	1. Basse, "Computer Algorithms: Introduction to Design & Analysis", Addison Wesley. 2. Horowitz & Sahani, "Fundamental of Computer Algorithm", Galgotia.	

<b>THEORY OF AUTOMATA &amp; FORMAL LANGUAGES (SET/IT/BT/C504)</b>		
Module Name	Content	No. of Hrs.
<b>Finite Automata</b>	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
<b>Context Free Grammar</b>	Ambiguity, Simplification of CFGs, Normal forms for CFGs, Pumping lemma for CFLs, Decidability of CFGs, Ambiguous to Unambiguous CFG.	10
<b>Push Down Automata</b>	Description and definition, Working of PDA, Acceptance of a string by PDA, PDA and CFG, Introduction to auxiliary PDA and Two stack PDA.	10
<b>Turing Machines</b>	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.	12
<b>Total No. of Hours</b>		<b>44</b>
<b>Textbooks</b>	1. K.L.P. Mishra and N.Chandrasekaran, "Theory of Computer Science (Automata, Languages and Computation)", PHI	
<b>References</b>	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	

<b>SOFTWARE ENGINEERING (SET/IT/BT/C505)</b>		
Module Name	Content	No. of Hrs.
<b>Introduction</b>	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
<b>Software Requirement Specifications and Design</b>	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
<b>Software Measurement and Metrics</b>	Various Size Oriented Measures, Halstead'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
<b>Software Testing</b>	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

<b>Software Maintenance</b>	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
<b>Total No. of Hours</b>		<b>42</b>
<b>Textbooks</b>	<b>1.</b> K. K. Aggarwal and Yogesh Singh, “Software Engineering”, New Age International Publishers.	
<b>References</b>	1. R. S. Pressman, “Software Engineering: A Practitioners Approach”, McGraw Hill. 2. Ian Sommerville, “Software Engineering”, Addison Wesley.	

<b>DBMS LAB (SET/IT/BT/C506)</b>		
Module Name	Content	No. of Hrs.
<b>Module 1</b>	<ol style="list-style-type: none"> <li>1. Creating ER diagrams and Schema Diagrams of real world problems.</li> <li>2. Creating tables and data population.</li> <li>3. Writing SQL queries using following operators:                             <ol style="list-style-type: none"> <li>(a) Logical operators (=,&lt;,&gt;,etc.).</li> <li>(b) SQL operators (Between.... AND, IN(List), Like, ISNULL and also with negating expressions ).</li> <li>(c) Set Operators(UNION, INTERSECT, and MINUS, etc.).</li> </ol> </li> <li>4. Writing SQL queries using Character, Number, Date and Group functions.</li> <li>5. Writing SQL queries for extracting data from more than one table (Equi-Join, Non-Equi-Join , Outer Join)</li> <li>6. Creating VIEWS using SQL and performing operation on it.</li> <li>7. Writing ASSERTIONS using SQL</li> <li>8. Writing programs using PL/SQL.</li> <li>9. Use Concepts for ROLL BACK, COMMIT &amp; CHECK POINTS.</li> <li>10. Write queries using CURSORS,</li> <li>11. Write TRIGGRS using PL/SQL</li> <li>12. Create FORMS and REPORTS.</li> </ol>	12x2
<b>Total No. of Hours</b>		<b>24</b>

<b>DESIGN AND ANALYSIS OF ALGORITHMS LAB (SET/IT/C507)</b>		
Module Name	Content	No. of Hrs.
<b>Module 1</b>	<ol style="list-style-type: none"> <li>1. Divide and conquer method (quick sort, merge sort, Strassen’s matrix multiplication),</li> <li>2. Greedy method (knapsack problem, job sequencing, optimal merge patterns, minimal spanning trees).</li> <li>3. Dynamic programming (multistage graphs, OBST, 0/1 knapsack, traveling salesperson problem).</li> <li>4. Back tracking (n-queens problem, graph coloring problem, Hamiltonian cycles).</li> <li>5. Sorting : Insertion sort, Heap sort, Bubble sort</li> <li>6. Searching : Sequential and Binary Search</li> <li>7. Selection : Minimum/ Maximum, Kth smallest element</li> </ol>	24x2
<b>Total No. of Hours</b>		<b>48</b>

<b>COMPUTER NETWORKS LAB (SET/IT/C508)</b>		
Module Name	Content	No. of Hrs.
<b>Module 1</b>	<ol style="list-style-type: none"> <li>1. Implementation of the Data Link Layer framing method such as character stuffing and bit stuffing in C.</li> <li>2. Implementation of CRC algorithm in C.</li> <li>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.Implementation will be in C.</li> <li>4. Implementation of LZW compression algorithm in C.</li> <li>5. Write a socket program in C to implement a listener and a talker.</li> <li>6. Write a program in C to encrypt 64-bit text using DES algorithm.</li> </ol>	12x2
<b>Total No. of Hours</b>		<b>24</b>



SEMINAR (SET/IT/BT/S509)		
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 Information Technology. Students should search for the related literature and prepare a presentation. Evaluation shall be based on content, presentation and active participation.	12x2
<b>Total No. of Hours</b>		<b>24</b>
<b>References</b>	1. Internet and Journals/Magazines	

**SEMESTER VI**

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

COMPILER CONSTRUCTION (SET/IT/BT/C601)		
Module Name	Content	No. of Hrs.
<b>Fundamental Concept</b>	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
<b>Syntactic specification of programming languages</b>	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
<b>Syntax-directed Translation</b>	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
<b>Symbol Tables</b>	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
<b>Total No. of Hours</b>		<b>42</b>
<b>Textbooks</b>	1. Aho, Sethi & Ullman, "Compiler Design", Addison Wesley.	

COMPUTER GRAPHICS (SET/IT/BT/C602)		
Module Name	Content	No. of Hrs.
<b>Graphics Primitives</b>	Display devices, Primitive devices, Display File Structure, Display control text.	4
<b>Line generation, Polygon, Segments</b>	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
<b>Transformations, Windowing and Clipping</b>	Matrices transformation, transformation routines, displays procedure. Viewing transformation and clipping, generalize clipping, multiple windowing. Three Dimension: 3-D geometry primitives, transformations, projection clipping.	12
<b>Interaction</b>	Hardware input devices handling algorithms, Event handling echoing, Interactive techniques.	6

<b>Hidden Line and Surface</b>	Back face removal algorithms, hidden line methods.	4
<b>Rendering and Illumination</b>	Introduction to curve generation, Bezier, Hermite and B-spline algorithms and their comparisons.	4
<b>Total No. of Hours</b>		<b>42</b>
<b>Textbooks</b>	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.	
<b>References</b>	3. Steven Harrington, "Computer Graphics", A Programming Approach, 2nd Edition 4. Rogar and Adams, "Mathematical Elements of Computer Graphics", McGraw Hill.	

<b>CRYPTOGRAPHY AND NETWORK SECURITY (SET/IT/BT/C603)</b>		
Module Name	Content	No. of Hrs.
<b>Module 1</b>	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, feistel 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
<b>Module 2</b>	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, Diffie-Hellman key exchange algorithm, introductory idea of Elliptic curve cryptography, Elganel encryption.	8
<b>Module 3</b>	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
<b>Module 4</b>	Authentication Applications: Kerberos and X.509, directory authentication service, electronic mail security-pretty good privacy (PGP), S/MIME.	8
<b>Module 5</b>	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
<b>Total No. of Hours</b>		<b>42</b>
<b>Textbooks</b>	1. William Stallings, "Cryptography and Network Security: Principals and Practice", Prentice Hall, New Jersey.	
<b>References</b>	1. Johannes A. Buchmann, "Introduction to Cryptography", Springer-Verlag. 2. B. Forouzan, "Cryptography and Network Security, TMH	

<b>GRAPH THEORY (SET/IT/BT/C604)</b>		
Module Name	Content	No. of Hrs.
<b>Module 1</b>	Graphs: Sub Graphs, Basic Properties, Example of Graphs & Their Sub Graphs, Walks, Path & Circuits, Connected Graphs, Disconnected Graphs and Components, Euler Graphs, Various Operation on Graphs, Hamiltonian Paths and Circuits, The Traveling Salesman problem, <u>Trees and Fundamental Circuits</u> : Basic Properties of Tree, Distance and Centers, Radius and Diameters, Pendent Vertices, Rooted and Binary Trees, On Counting Trees, Spanning Trees, Fundamental Circuits, Finding Spanning Trees of a Graph and a Weighted Graph: Prim's Algorithm, Kruskal's Algorithm.	12
<b>Module 2</b>	<u>Cuts-sets and Cut Vertices</u> : Cut-sets, Properties of Cut-sets, Fundamental Circuits and Cut-sets, Connectivity and Separability, Network Flows, <u>Planer and Dual Graphs</u> : Combinatorial and Geometric Dual, Kuratowski to graphs detection of planarity, geometric dual, some more criterion of planarity, thickness and crossings.	10
<b>Module 3</b>	<u>Vector Space of a Graph and Vectors</u> : Basis Vector, Cut-set Vector, Circuit Vector, Circuit and Cut-set verses Subspaces, Orthogonal Vectors and Subspaces, <u>Matrix Representation of Graphs</u> : 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	8
<b>Module 4</b>	<u>Coloring, Covering and Partitioning</u> : 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,	8
<b>Module 5</b>	<u>Enumeration</u> : Types of Enumeration, Counting of Labeled and Unlabeled Trees, Polya's Counting Theorem, Graph	6

	Enumeration with Polyá’s Theorem. Graph Theoretic Algorithms	
<b>Total No. of Hours</b>		<b>44</b>
<b>Textbooks</b>	1. Deo, N, “Graph Theory”, PHI	
<b>References</b>	1. Harary, F, “Graph Theory”, Narosa 2. Bondy and Murthy, “Graph Theory and Application”, Addison Wesley.	

<b>E-COMMERCE (SET/IT/BT/C605)</b>		
Module Name	Content	No. of Hrs.
<b>Technology and Prospects</b>	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
<b>Network Infrastructure of E-Commerce</b>	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
<b>Web Security</b>	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
<b>Encryption</b>	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
<b>Electronic Payments</b>	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
<b>Total No. of Hours</b>		<b>42</b>
<b>Textbooks</b>	1. Ritendra Goel, “E-Commerce”, New Age International Publishers	
<b>References</b>	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. Brahm Cazner, “E Business & Commerce”, Wiley dreamtech.	

<b>COMPILER CONSTRUCTION LAB (SET/IT/BT/C606)</b>		
Module Name	Content	No. of Hrs.
<b>Syntactic specification of programming languages</b>	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.	6x2
<b>Syntax-directed Translation</b>	1. Implementation of shift – reduce parsing using C. 2. Implementation of three address code using quadruples.	6x2
<b>Total No. of Hours</b>		<b>24</b>

<b>COMPUTER GRAPHICS LAB (SET/IT/BT/C607)</b>		
Module Name	Content	No. of Hrs.
<b>Drawing Algorithm</b>	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.	12x2
<b>Polygon Filling</b>	4. Implementation of polygon filling using Flood-fill, Boundary-fill and Scan-line algorithms.	
<b>2D and 3D transformation</b>	5. Translation, Scaling, Rotation, Mirror Reflection and Shearing. 6. 3D Translation, Scaling and rotation.	
<b>Windowing and Clipping</b>	7. Implementation of Line Clipping using Cohen-Sutherland algorithm and Bisection Method. 8. Implementation of Polygon Clipping using Sutherland-Hodgman algorithm.	
<b>Rendering and Illumination</b>	9. Implementation of Curve generation using Interpolation methods, B-spline and Bezier curves.	
<b>Hidden Line and Surface</b>	10. Implementation of any one of Back face removal algorithms such as Depth-Buffer algorithm, Painter’s algorithm, Warnock’s algorithm, Scan-line algorithm.	
<b>Total No. of Hours</b>		<b>24</b>

CRYPTOGRAPHY AND NETWORK SECURITY LAB (SET/IT/C608)		
Module Name	Content	No. of Hrs.
Module 1	1. Conventional encryption. 2. Classical encryption techniques. 3. Graph, ring and field, prime and relative prime numbers 4. Fermat's and Euler's theorem. 5. Euclid's Algorithm. 6. Chinese Remainder theorem . 7. RSA algorithm 8. Diffie-Hellman key exchange algorithm. 9. Hash Function . 10. MD5 message digest algorithm . 11. Secure hash algorithm (SHA). 12. Digital signature standards (DSS)	12x2
<b>Total No. of Hours</b>		<b>24</b>

MINI PROJECT – 2(SET/IT/BT/S609)		
Module Name	Content	No. of Hrs.
Module 1	Mini Project-2 shall be based on Database/Computer Networking.	24x2
<b>Total No. of Hours</b>		<b>48</b>

## SEMESTER VII

Theory		L	T	P	T.A	C.T.	TOT	ESE.	SUB. TOTAL	Credit
Code	Course									
SET/IT/BT/C701	Unix and Shell Programming	3	1	-	10	20	30	70	100	3
SET/IT/BT/C702	Artificial Intelligence	3	1	-	10	20	30	70	100	3
SET/IT/BT/C703	Software Project Management	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	2
SET/IT/BT/C706	Unix and Shell Programming Lab	-	-	1	30	-	30	70	100	1
SET/IT/BT/C707	Artificial Intelligence Lab	-	-	1	30	-	30	70	100	1
SET/IT/BT/C708	Project Work – I	-	-	2	30	-	30	70	100	2
SET/IT/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/IT/BT/E721	Advanced Information System Engineering
	2	SET/IT/BT/E722	Object Oriented Modeling and Design
	3	SET/IT/BT/E723	Advance Database Management System

Elective II	S. No.	Code	Course Title
	1	SET/IT/BT/E731	Distributed Systems
	2	SET/IT/BT/E732	Neural Networks
	3	SET/IT/BT/E733	Digital Image Processing

UNIX AND SHELL PROGRAMMING (SET/IT/BT/C701)		
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

<b>Processes</b>	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
<b>Total No. of Hours</b>		<b>42</b>
<b>Text Books</b>	1. Sumitabha Das, “Your Unix – The Ultimate Guide”, TMH, 2000.	
<b>References</b>	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.	

<b>ARTIFICIAL INTELLIGENCE (SET/IT/BT/C702)</b>		
<b>Module Name</b>	<b>Content</b>	<b>No. of Hrs.</b>
<b>Problem Solving Methods</b>	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
<b>Knowledge Representation</b>	Predicate logic, Resolution question answering, Nonmonotonic reasoning , Stastical and probalistic reasoning, Fuzzy logic, Semantic Nets, Conceptual dependency, Frames, Scripts.	10
<b>AI Application</b>	Neural Networks, Natural language understanding, speech recognition and understanding, Learning, perception, AI robotics, satellite imaging and medical diagnosis.	10
<b>Expert Systems</b>	Structure of an expert system, interaction with an expert, Design of an expert system.	10
<b>Total No. of Hours</b>		<b>42</b>
<b>Textbooks</b>	1. E. Rich & K. Knight, “Artificial Intelligence”	
<b>References</b>	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”	

<b>SOFTWARE PROJECT MANAGEMENT (SET/IT/BT/C703)</b>		
<b>Module Name</b>	<b>Content</b>	<b>No. of Hrs.</b>
<b>Software Project Planning</b>	Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.	10
<b>Project Organization</b>	Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques. Network Diagrams, PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.	8
<b>Project Monitoring and Control</b>	Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled, Cost Variance, Schedule Variance, Cost Performance Index, Schedule Performance Index, Interpretation of Earned Value Indicators, Error Tracking, Software Reviews.	8
<b>Software Quality Assurance and Testing</b>	Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model CMM), SQA Activities, Statistical quality assurance, Clean room process.	8
<b>Software Configuration Management</b>	Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management, Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis.	8
<b>Total No. of Hours</b>		<b>42</b>
<b>Text books</b>	1. M. Cotterell, “Software Project Management”, TMH	
<b>References</b>	1. S. A. Kelkar, “Software Project Management”, PHI 2. Royce, “Software Project Management”, Pearson Education 3. Kieron Conway, “Software Project Management”, Dreamtech Press	

**DETAILED SYLLABI FOR ELECTIVES**

<b>ADVANCED INFORMATION SYSTEM ENGINEERING (SET/IT/BT/E721)</b>		
<b>Module Name</b>	<b>Content</b>	<b>No. of Hrs.</b>
<b>Module 1</b>	Modeling of Secure Information System, Tropos Methodology, Development Process, Introduction to Internet Based Information System (IBIS), Semantic data integration, Framework for data integration, Query processing, Architecture of IBIS, Data extraction, Interaction with the user Situation Method Engineering (SME) Generic process model for SME, Assembly based method engineering, paradigm-based method engineering.	14
<b>Module 2</b>	Advanced design of Information System, Web based federated Information system Designing, Hera Methodology, Role	14

	of RDF, RDFS, RQL in Hera, Hera front-end Embedding metrics into IS development Meta modeling technique and MEL, method assembly for measurable methods, defining metrics with MEL Methodologies for IS development Method components, application of the method component, introduction to change centric method engineering, typology of method engineering approaches, Generic operations for method engineering, introduction to two-Hemisphere model driven approach, software development driven by particular model.	
<b>Module 3</b>	Requirements on Modelling technique Communication driven knowledge transformation, Conceptual framework, Guidelines for the usage of modeling techniques, concern oriented RE model, COM for RE, Realization of the model. Enterprise Modelling Business Process Modelling Process model frameworks, validity of process models, supply chain operations reference model (SCOR) Dataware House Methodology Approaches to DW development methods, IPD approach, organizational process modeling.	14
<b>Total No. of Hours</b>		<b>42</b>
<b>Textbooks</b>	1. Oscar Pastor, Joao Falcao Cunha, “Advanced Information System Engineering”, Springer	
<b>References</b>	1. Ivar Jacobson, Martin Griss, Patrik Jonsson, “Software Reuse”, Pearson Education.	

<b>OBJECT ORIENTED MODELLING AND DESIGN (SET/IT/BT/E722)</b>		
<b>Module Name</b>	<b>Content</b>	<b>No. of Hrs.</b>
<b>Object Oriented Methodologies</b>	The Rumbaugh OMT, The booch methodology, Jacobson’s OOSE methodologies, Unified process, Introduction to UML, Important views and diagram to be modelled for system by UML.	5
<b>Functional view</b>	Use case diagram, Requirement capture with use case, Building blocks of use case diagram actors, use case guidelines for use case models, Relationships between use cases extend, include, generalize. Activity diagram, Elements of activity diagram action state, activity state, object node, control and overflow, transition, Guidelines for creating activity diagrams, Activity diagram – action decomposition, Partition – swim lane.	15
<b>Structural View</b>	Classes, values and attributes, operations and methods, responsibilities for classes, abstract classes, access specification (visibility of attributes and operations) Relational among classes: Associations, Dependencies, Inheritance, Generalizations, aggregation Adornments on association: association names, association classes, qualified association, n-ary associations, ternary and reflexive association Dependency relationships among classes, notations Notes in class diagram, extension mechanisms, metadata, refinements, derived, data, constraint, stereotypes, package & interface notation. Object diagram notations and modelling, relations among objects (links).	10
<b>Dynamic view</b>	State diagram, State diagram notations, events (signal events, change events, time events), State diagram states (composite states, parallel states, history states) transition and condition, state diagram behaviour(activity effect, do-activity, entry and exit activity), completion transition, sending signals Interaction diagrams Sequence diagram – Sequence diagram notations and examples, iterations, conditional messaging, branching, object creation and destruction, time constraints, origin of links, activations in sequence diagram. Collaboration diagram – Collaboration diagram notations and examples, iterations, conditional messaging, branching, object creation and destruction, time constraints, origin of links, activations in collaboration diagram.	12
<b>Total No. of Hours</b>		<b>42</b>
<b>Textbooks</b>	1. James Rumbaugh, “Object Oriented Modeling and Design”,	
<b>References</b>	1. Object oriented analysis and design, Satzinger, Jackson, Burd, Thomson 2. Object oriented modeling and design with UML – James Rumbaugh, Michael Blaha (2nd edition) 3. The unified modeling language user guide – Grady Booch, James Rumbaugh, Ivar Jacobson 4. Teach yourself UML in 24 hours – Joseph Rumbaugh 5. Object oriented analysis and design: using UML Mike O’Docherty Wiley publication 6. Designing flexible object oriented systems with UML – Charles Ritcher	

<b>ADVANCED DATABASE MANAGEMENT SYSTEM (SET/IT/BT/E723)</b>		
<b>Module Name</b>	<b>Content</b>	<b>No. of Hrs.</b>
<b>Module 1</b>	Review of DBMS concepts; Relational Database Systems, Applications of DBMS. Transactions & Serializability: Concurrent Executions, Serializability View and Conflict Serializability, Recoverability,	10
<b>Module 2</b>	Concurrency Control: Lock based protocols, timestamp based protocols, validation based protocols, deadlock handling, insert and delete operations	6
<b>Module 3</b>	Recovery System: Failure classification, recovery and atomicity, log based recovery, shadow paging, buffer management, remote backup systems	6
<b>Module 4</b>	Distributed Databases: Homogeneous and heterogeneous databases, distributed transactions, commit protocols, concurrency control in distributed databases	8
<b>Module 5</b>	Advanced Data Types: Time in databases, spatial and geographic databases, multimedia databases, Advanced applications : Knowledge discovery and data mining, data mining functionalities, classification of data mining systems, data warehousing concepts, slicing, dicing, schemas, data warehouse architecture, introduction to Data Mining Query Language (DMQL)	12
<b>Total No. of Hours</b>		<b>42</b>
<b>Textbooks</b>	1. Silberchatz, A., Korth, H. F. and Sudarshan, S., “Database System Concepts”, 6th Ed., Tata-McGraw Hill. 2. Han, J. and Kamber, M., “Data Mining: Concepts and Techniques”, 2nd Ed., Morgan Kaufmann. 3. Ray Chhanda, “Distributed Database Systems”, Pearson.	
<b>References</b>	1. Date, C. J, “An Introduction to Database Systems”, 8th Ed., Pearson.	

DISTRIBUTED SYSTEMS (SET/IT/BT/E731)		
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.	10
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.	8
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.	10
Distributed Algorithms	Communication protocols, Balanced sliding window protocol, Routing algorithms, Destination based routing, Deadlock free Packet switching, Wave & traversal algorithms, Election algorithm.	6
<b>Total No. of Hours</b>		<b>42</b>
Text Books	1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill.	
References	1. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Ed. 2. Gerald Tel, "Distributed Algorithms", Cambridge University Press.	

NEURAL NETWORKS (SET/IT/BT/E732)		
Module Name	Content	No. of Hrs.
Module 1	Introduction to Neural Networks, Working of a Biological and an Artificial Neuron, Neural Network Architectures, Single and Multi-layer Neural Networks, Perceptron, Linear Separability, Perceptron Training Algorithm, Backpropagation Algorithm.	10
Module 2	Adalines, Madalines, Adaptive Multi-layer Networks, Prediction Networks, Radial Basis Functions, Polynomial Networks and Regularization.	8
Module 3	Difference Between Supervised and Unsupervised Learning, Winner Takes all Networks, Counter- Propagation Networks, Adoptive Resonance Theory, Neocognitron, Hopfield Networks, Boltzmann's Training.	8
Module 4	Various Types of Optimization Methods like Gradient Descent, Simulated Annealing etc, Bi-directional Associative Memory Networks.	8
Module 5	Introduction to Fuzzy Logic, Neuro-Fuzzy Systems, Applications of Neural Networks.	8
<b>Total No. of Hours</b>		<b>42</b>
Text Books	1. Kishan Mehrotra, Chilukuri K. Mohan and Sanjay Ranka, "Elements of Artificial Neural Networks"	
References	1. Bart Kosko, "Neural Networks and Fuzzy Systems", Prentice Hall of India. 2. Mohammad H. Hassoun, "Fundamentals of Artificial Neural Networks", Prentice Hall of India.	

DIGITAL IMAGE PROCESSING (SET/IT/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,	10
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	Noise, Mean filter, Median, Min, Max, Midpoint, Adaptive filters, Frequency Domain, etc...	4
Color Image Processing	Color Fundamentals, Color Models, Converting Colors to Different Models, Color Transformation, Smoothing and Sharpening, Color Segmentation.	4
Applications of Wavelets	Multi Resolution Expansions, Wavelet Transform in One Dimension, The Fast Wavelet Transform, Wavelet Transform in Two Dimensions	4
Morphological Image Processing	Erosion and Dilation, Opening and Closing, The Hit or Miss Transformations, Some Basic Morphological algorithms	4
Image Compression	Need for Data Compression, Huffman Coding, Golomb coding, Arithmetic coding, LZW coding, Run Length coding, Bit plane coding and Wavelet coding	4
Image Segmentation	Edge Detection, Thresholding, Region based Segmentation, Segmentation using Morphological Watersheds and the use of motion in Segmentation.	4

		Total No of Hours	42
<b>Text Books</b>	1. Rafael C. Gonzalvez and Richard E. Woods, "Digital Image Processing", 2 <sup>nd</sup> Edition, Pearson Education.		
<b>References</b>	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.		

UNIX AND SHELL PROGRAMMING (SET/IT/BT/C706)		
Module Name	Content	No. of Hrs.
	<b>Related Experiments.</b>	12x2
<b>Total No. of Hours</b>		<b>24</b>

ARTIFICIAL INTELLIGENCE LAB (SET/IT/BT/C707)		
Module Name	Content	No. of Hrs.
	<b>Related Experiments.</b>	12x2
<b>Total No. of Hours</b>		<b>24</b>

PROJECT WORK - I (SET/IT/BT/C708)		
Module Name	Content	No. of Hrs.
<b>Module 1</b>	It includes following assignments. <ul style="list-style-type: none"> <li>Survey and study of published literature on the assigned topic.</li> <li>Working out a preliminary approach to the Problem relating to the assigned topic.</li> <li>Conducting Preliminary Analysis/ Modeling/ Experiment/ Simulation/ Experiment/ Design/ Feasibility.</li> <li>Preparing a Written Report on the Study conducted for presentation to the Department.</li> <li>Final Seminar, as oral Presentation before a Departmental Committee.</li> </ul>	12x2
<b>Total No. of Hours</b>		<b>24</b>

INDUSTRIAL TRAINING SEMINAR (SET/IT/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.	12x2
<b>Total No. of Hours</b>		<b>24</b>

**SEMESTER VIII**

Course		L	T	P	T.A	C.T.	CIE.	ESE	SUB. TOTAL	Credit
Code	Course									
SET/IT/BT/C801	ERP Systems	3	1	0	10	20	30	70	100	3
SET/IT/BT/C802	Data Mining Data Warehousing	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/IT/BT/C806	Project and Dissertation	-	-	6	30	-	30	70	100	
<b>Total</b>		12	4	6			150	350	500	18

	S. No.	Code	Course Title
<b>Elective III</b>	1	SET/IT/BT/E821	Cloud Computing
	2	SET/IT/BT/E822	Mobile Computing
	3	SET/IT/BT/E823	Bioinformatics
	4	SET/IT/BT/E824	.NET Technology

	S. No.	Code	Course Title
<b>Elective IV</b>	1	SET/IT/BT/E831	Real Time Systems
	2	SET/IT/BT/E832	Natural Language Processing
	3	SET/IT/BT/E833	Pattern Recognition
	4	SET/IT/BT/E834	E-Business



ERP SYSTEM (SET/IT/BT/C801)		
Module Name	Content	No. of Hrs.
Module 1	ERP Introduction, Benefits, Origin, Evolution and Structure: Conceptual Model of ERP, The Evolution of ERP, The Structure of ERP.	6
Module 2	Business Process Reengineering, Data ware Housing, Data Mining, Online Analytic Processing(OLAP), Product Life Cycle Management(PLM),LAP, Supply Chain Management.	8
Module 3	ERP Marketplace and Marketplace Dynamics: Market Overview, Marketplace Dynamics, The Changing ERP Market. ERP- Functional Modules: Introduction, Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications.	10
Module 4	ERP Implementation Basics, ERP Implementation Life Cycle, Role of SDLC/SSAD, Object Oriented Architecture, Consultants, Vendors and Employees.	8
Module 5	ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical Success and Failure factors, Integrating ERP into Organizational Culture. Using ERP Tool: Either SAP or ORACLE format to case study	8
<b>Total No. of Hours</b>		<b>42</b>
<b>Text Book</b>	1. Alexis Leon, “ERP Demystified”, Tata McGraw Hill	
<b>References</b>	1. Rahul V. Altekar “Enterprisewide Resource Planning”, Tata McGraw Hill, 2. Vinod Kumar Garg and Venkitakrishnan N K, “Enterprise Resource Planning – Concepts and Practice”, PHI 3. Joseph A Brady, Ellen F Monk, Bret Wagner, “Concepts in Enterprise Resource Planning”, Thompson Course Technology 4. Mary Summer, “Enterprise Resource Planning”- Pearson Education 4. Thomas F. Wallace, Michael H. Kremzar, “ERP: Making It Happen: The Implementers' Guide to Success with Enterprise” ,NetLibrary, Inc 5. Erin Callaway, “Enterprise Resource Planning: Integrating Applications and Business”,	

DATA MINING AND DATA WAREHOUSING (SET/IT/BT/C802)		
Module Name	Content	No. of Hrs.
Module 1	Introduction to Data Mining:- Kinds of Data, Relational Databases, Traditional Databases, Advanced Database Systems. Data Mining Functionalities and Patterns Generated. Data Warehouse and Operational Databases, Multidimensional Data Model. Data Warehouse Architecture:- Process Flow, Extract & Load Process, Clean & Transform Data. Backup and Archive Process Load and Warehouse Manager	8
Module 2	Data Warehouse Design:- Identifying Facts & Dimensions. Designing:- Fact Tables, Dimension Tables, Star Flake Schema Query Redirection. Multidimensional Schemes:- Partitioning Strategy, Aggregation, Data Marting, Metadata. Capacity Planning, Tuning the Data Warehouse. Testing the Data Warehouse: Developing Test Plan, Testing Operational Environment, Database, Application.	8
Module 3	Data Preprocessing, Data Cleaning, Data Integration & Transformation, Data Reduction. Data Mining Primitives, Languages & Systems, Architecture of Data Mining Systems.	8
Module 4	Concept Description, Characterization & Comparison. Mining and Association Rules in Large Databases, Mining Single Dimension and Multilevel Association Rules for Transactional Databases, Relational Databases and Data Warehouses.	10
Module 5	Issues Regarding Classification & Prediction, Methods of Classification & Prediction. Cluster Analysis:- Types of Data in Cluster Analysis, Clustering Methods. Multidimensional Analysis & Descriptive Mining of Complex Objects. Mining Spatial Databases, Multidimensional Databases, Text Databases and World Wide Web.	8
<b>Total No. of Hours</b>		<b>42</b>
<b>Text Book</b>	1. Jiawei Han and Micheline Kamber, "Data Mining Concepts and technique " , Elsevier 2. Sam Anahory and Dennis Murray, "Data Warehousing in the Real World " , Pearson Education	
<b>References</b>	1. M. H. Dunham, “Data Mining: Introductory and Advanced Topics”, Pearson Education 2. Mallach, “Data Warehousing System”, McGraw –Hill	

#### DETAILED SYLLABI FOR ELECTIVES

CLOUD COMPUTING (SET/IT/BT/E821)		
Module Name	Content	No. of Hrs.
Module 1	Introduction: Distributed Computing and Enabling Technologies, Cloud Fundamentals: Cloud Definition, Evolution, Architecture, Applications, deployment models, and service models. Virtualization: Issues with virtualization, virtualization technologies and architectures, Internals of virtual machine monitors/hypervisors, virtualization of data centers, and Issues with Multi-tenancy.	8
Module 2	Implementation: Study of Cloud Computing Systems like Amazon EC2 and S3, Google App Engine, and Microsoft Azure, Build Private/Hybrid Cloud using open source tools, Deployment of Web Services from Inside and Outside a Cloud Architecture. MapReduce and its extensions to Cloud Computing, HDFS, and GFS. Interoperability and Service Monitoring: Issues with interoperability, Vendor lock-in, Interoperability approaches. SLA Management, Metering Issues, and Report generation.	12
Module 3	Resource Management and Load Balancing: Distributed Management of Virtual Infrastructures, Server consolidation, Dynamic provisioning and resource management, Resource Optimization, Resource dynamic reconfiguration, Scheduling Techniques for Advance Reservation, Capacity Management to meet SLA Requirements, and Load Balancing, various load balancing techniques.	8
Module 4	Migration and Fault Tolerance: Broad Aspects of Migration into Cloud, Migration of virtual Machines and techniques. Fault Tolerance Mechanisms.	4

<b>Module 5</b>	Security: Vulnerability Issues and Security Threats, Application-level Security, Data level Security, and Virtual Machine level Security, Infrastructure Security, and Multi-tenancy Issues. IDS: host-based and network-based, Security-as-a-Service. Trust Management, Identity Management, and Access Controls Techniques Advances: Grid of Clouds, Green Cloud, Mobile Cloud Computing	10
<b>Total No. of Hours</b>		<b>42</b>
<b>Text Book</b>	1. Rajkumar Buyya, James Broberg, Andrzej Goscinski, "Cloud Computing Principles and Paradigms", Wiley Publishers	
<b>References</b>	<ol style="list-style-type: none"> <li>1. Barrie Sosinsky, "Cloud Computing Bible", Wiley Publishers</li> <li>2. Michael Miller, "Cloud Computing : Web-based Applications That Change The Way You Work and Collaborate Online", Pearson Education</li> <li>3. Rajkumar Buyya, Christian Vacchiola, S Thamarai Selvi, "Mastering Cloud Computing", McGraw Hill</li> <li>4. David S. Linthicum, "Cloud Computing and SOA Convergence in Your Enterprise: A Step-by-Step Guide",</li> <li>5. Tim Mather, Subra Kumaraswamy, Shahed Latif, "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance", O'Reilly</li> <li>6. Toby Velte, Antohy T Velte, Robert Elsenpeter, "Cloud Computing : A Practical Approach", McGraw Hill</li> </ol>	

<b>MOBILE COMPUTING (SET/IT/BT/E822)</b>		
<b>Module Name</b>	<b>Content</b>	<b>No. of Hrs.</b>
<b>Cellular Architecture</b>	Introduction, Issues in mobile computing, overview of wireless telephony: cellular concept, GSM, air-interface, channel structure, location management, HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, CDMA, GPRS.	8
<b>Wireless LAN</b>	Wireless Networking, MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting,	8
<b>Mobile IP</b>	WAP, Architecture, protocol stack, application environment, applications. Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system, Disconnected operations. Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.	10
<b>Mobile Ad Hoc networks</b>	Localization, MAC issues, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, applications.	16
<b>Total No. of Hours</b>		<b>42</b>
<b>Text Books</b>	<ol style="list-style-type: none"> <li>1. J. Schiller, "Mobile Communications", Addison Wesley.</li> <li>2. Charles Perkins, "Mobile IP", Addison Wesley.</li> <li>3. Charles Perkins, "Ad hoc Networks", Addison Wesley.</li> </ol>	
<b>References</b>	<ol style="list-style-type: none"> <li>1. A. Mehrotra, "GSM System Engineering".</li> <li>2. M. V. D. Heijden, M. Taylor, "Understanding WAP", Artech House.</li> <li>3. Upadhyaya, "Mobile Computing", Springer</li> </ol>	

<b>BIOINFORMATICS (SET/IT/BT/E823)</b>		
<b>Module Name</b>	<b>Content</b>	<b>No. of Hrs.</b>
<b>Module 1</b>	<b>Sequence Comparison and Alignment Methods:</b> Dynamic programming; Global, semi global and local alignment algorithms; Gap model; Database searching tools; Multiple sequence alignment.	6
<b>Module 2</b>	<b>Suffix tree:</b> Implicit suffix tree; Explicit suffix tree; Suffix link; Ukkonen's algorithm; Applications of Suffix tree. <b>Phylogenetic Tree:</b> Rooted and unrooted tree, Newick format, scaled and unscaled tree, character and distance based methods, distance matrix, UPGMA, WPGMA, additive tree, neighbor joining method, parsimony, maximum likelihood approach, phylogenetic comparison, agreement tree.	12
<b>Module 3</b>	<b>Gene Network Analysis:</b> Bayesian network, Gene network, clustering, classification, DNA array; Gene network reconstruction methods: Boolean, linear, non-linear and machine learning.	8
<b>Module 4</b>	<b>Sequencing Techniques by Hybridization:</b> Microarray, Hamiltonian path, Euler path.	6
<b>Module 5</b>	<b>RNA Structure Prediction:</b> RNA secondary structure, pseudoknot, loops, RNA secondary structure prediction algorithm, RNA structure comparison, inferring RNA structure. Computational aspects of drug designing.	10
<b>Total No. of Hours</b>		<b>42</b>
<b>Text Books</b>	1. D E Krane & M L Raymer, "Fundamental concepts of Bioinformatics", Pearson Education.	
<b>References</b>	<ol style="list-style-type: none"> <li>1. Rastogi, Mendiratta, Rastogi, "Bioinformatics Methods &amp; applications, Genomics, Proteomics &amp; Drug Discovery", PHI</li> <li>2. Baxevanis, A. D. and Ouellette, B. F. F., "Bioinformatics: A Practical Guide to Analysis of Genes and Proteins", 2nd Ed., Wiley.</li> <li>3. Shubha Gopal et.al. " Bioinformatics: with fundamentals of genomics and proteomics", Mc Graw Hill.</li> <li>4. O'Reilly, " Developing Bioinformatics Computer Skills", CBS</li> <li>5. Forsdyke, "Evolutionary Bioinformatics", Springer</li> </ol>	

<b>.NET TECHNOLOGY (SET/IT/BT/E824)</b>		
<b>Module Name</b>	<b>Content</b>	<b>No. of Hrs.</b>

<b>Visual Studio Environment</b>	Writing Window Applications, Windows Graphical User Interface, Programming Languages – Procedural, Event Driven, and Object Oriented, The Object Model, Microsoft’s Visual Studio.NET, Writing Visual Basic Projects, Three-Step Process, Visual Basic Application Files. IDE Start Page, New Project Dialog, IDE Main Window, Toolbars, Document Window, Form Designer, Solution Explorer Window, Properties Window, Toolbox, Design Time, Run Time, and Break Time.	8
<b>Visual Basic</b>	Workspace Setup, Plan the Project, Define the User Interface, Set Properties, Coding, Testing, Maintenance, Printing, Finding and Fixing Errors: Syntax Errors, Run-Time Errors, Logic Errors, Project Debugging, Naming Rules and Conventions for Objects. Variables, Constants and calculations, formatting data, Handling Exceptions, Displaying Messages in Message Boxes, Counting and Accumulating sums, Decisions and Conditions, Menus, Sub Procedures, and Functions, Lists, Loops, and Printing, Graphics, Animation.	8
<b>.NET Framework</b>	.NET Framework Terminology, CLR, Managed Code, MSIL, JIT, CTS, Assembly, Framework, Class Library, Garbage Collection, Manifest, GAC, Boxing, Unboxing	10
<b>C#</b>	C# Tools, Operands, Datatypes, Classes, Inheritance, Event and Delegates, Multithreading, Collections, Generics, Reflection, Remoting. ActiveX Data Object: ADO.NET Architecture, Connected Architecture, Disconnected Architecture, Dataset, Data Provider, Data Reader.	12
<b>ASP.NET</b>	Server Control, State Management, Master Page, Skin and Theme, Caching, Security, Globalization.	6
<b>Total No. of Hours</b>		<b>44</b>
<b>Text Books</b>	1. .NET 4.0 Programming 6-in-1 Black Book, Kogent Learning Solutions 2. Bradley J. C., “Programming in Visual Basic”, McGrawHill, 2010 Ed.	
<b>References</b>	1. Faraz Rasheed, “Programmers Heaven C# School”, E Book , Synchron Data	

<b>REAL TIME SYSTEMS (SET/IT/BT/E831)</b>		
Module Name	Content	No. of Hrs.
<b>Module 1</b>	<b>Introduction:</b> Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.	10
<b>Module 2</b>	<b>Real Time Scheduling:</b> Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.	8
<b>Module 3</b>	<b>Resources Sharing:</b> Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based PriorityCeiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.	8
<b>Module 4</b>	<b>Real Time Communication:</b> Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols	8
<b>Module 5</b>	<b>Real Time Operating Systems and Databases:</b> Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Characteristic of Temporal data, Temporal Consistency, Concurrency Control, Overview of Commercial Real Time databases	8
<b>Total No. of Hours</b>		<b>42</b>
<b>Text Books</b>	1. Jane W. S. Liu, “Real Time Systems”, Pearson Education Publication.	
<b>References</b>	1. Mall Rajib, “Real Time Systems”, Pearson Education 2. Albert M. K. Cheng , “Real-Time Systems: Scheduling, Analysis, and Verification”, Wiley 3. Krishna, C.M. and Shin, K.G., “Real Time Systems”, Tata McGraw Hill,	

<b>NATURAL LANGUAGE PROCESSING (SET/IT/BT/E832)</b>		
Module Name	Content	No. of Hrs.
<b>Module 1</b>	<b>Introduction to Natural Language Understanding:</b> 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.	10
<b>Module 2</b>	Introduction to semantics and knowledge representation, Some applications like machine translation, database interface.	8
<b>Module 3</b>	<b>Grammars and Parsing:</b> 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.	8
<b>Module 4</b>	<b>Grammars for Natural Language:</b> Auxiliary Verbs and Verb Phrases, Movement Phenomenon in Language, Handling questions in Context-Free Grammars. Human preferences in Parsing, Encoding uncertainty, Deterministic Parser.	8
<b>Module 5</b>	<b>Ambiguity Resolution:</b> 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
<b>Total No. of Hours</b>		<b>42</b>
<b>Text Books</b>	1. Akshar Bharti, Vineet Chaitanya and Rajeev Sangal, “NLP: A Paninian Perspective”, Prentice Hall	
<b>References</b>	1. James Allen, “Natural Language Understanding”, Pearson Education 2. D. Jurafsky, J. H. Martin, “Speech and Language Processing”, Pearson Education	

	<ol style="list-style-type: none"> <li>3. L.M. Ivansca, S. C. Shapiro, “Natural Language Processing and Language Representation”</li> <li>4. T. Winograd, “Language as a Cognitive Process”, Addison-Wesley</li> </ol>
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<b>PATTERN RECOGNITION (SET/IT/BT/E833)</b>		
Module Name	Content	No. of Hrs.
<b>Module 1</b>	Introduction to pattern recognition, types of images, regular pattern, irregular pattern, Approaches to pattern recognition , parametric, non parametric approaches ,Feature selection, Search methods , Pattern recognition applications.	10
<b>Module 2</b>	Classification Naïve Bayes ,Random tree , Random forest, Classifier Ensembles, Classifier combination techniques ,Bagging , boosting, stacking , linear regression , Multiple Polynomial regression, classification using SVM.	8
<b>Module 3</b>	Types of Clustering, K-Mean Clustering, Iso-data Clustering, Clustering Metrics, Clustering applications, Fuzzy K-Mean, Clustering tendency, Semi Supervised learning.	8
<b>Module 4</b>	Explanation of how fuzzy approach can be applied to pattern recognition, Classificatory Analysis Preprocessing, Feature Detection and Primitive Extraction, Adaptive Classification of fuzzy grammar. Fuzzy variants of Classification and Clustering Algorithm.	8
<b>Module 5</b>	Neural networks fundamentals, Genetic Algorithms, Neural and Genetic based approaches for Pattern. Self organizing maps, Advantages/Disadvantages of Neural based approaches for Pattern Recognition.	8
<b>Total No. of Hours</b>		<b>42</b>
<b>Text Books</b>	1. Earl Gose, “Pattern Recognition and Image Analysis”, Prentice Hall	
<b>References</b>	<ol style="list-style-type: none"> <li>1. David G. Stork, Peter E. Hart, and Richard O. Duda , “Pattern Classification”, John Wiley and Sons</li> <li>2. S Theodoridis and K Koutroumbas, “Pattern Recognition”, Academic Press</li> <li>3. C Bishop, “Pattern Recognition and Machine Learning”, Springer</li> </ol>	

<b>E-BUSINESS (SET/IT/BT/E834)</b>		
Module Name	Content	No. of Hrs.
<b>Module 1</b>	<u>Introduction to E-business</u> : High technology, semiconductors, the internet, history development, characteristics, features, definition of EDI, e-commerce, e-business types, Web services, Web based market, Understanding and measuring the Digital Economy.	8
<b>Module 2</b>	<u>E-business Architecture</u> : E-business Architecture, framework, characteristics, models, standardization, security issues- vulnerability management, threat management, Infrastructure Security.	8
<b>Module 3</b>	<u>E-business plan and Strategies</u> : Fundamentals of e- business plans, types, features, importance, business logic, procedures, process, data integration, customer information, security, routing, approvals and reports. Introduction to e-business procurement, e-sourcing, e-marketplace, e-payment schemes.	8
<b>Module 4</b>	<u>E-business Application and Application Development</u> : CRM, SCM, ERP, sales CM, Financial Value Chain Management system, BPR its definition, characteristics, Tools of e-business application, search engines, portals, online shopping, ORM solutions, Web technologies: XML, plug-ins, JavaScript, Open source, Oracle e-business suite, IBM e-business suite, Micro Strategy, Silver line solutions etc.	10
<b>Module 5</b>	<u>E-Business Marketing Strategies and Knowledge Management</u> : Internet marketing technologies, Web designs, content management Promotion mix, Virtual societies, localization, one to one marketing, Introduction to knowledge management and internet data using extended enterprise.	8
<b>Total No. of Hours</b>		<b>42</b>
<b>Text Books</b>	1. Daniel Amor, "E-Business (R) Evolution", Prentice Hall	
<b>References</b>	<ol style="list-style-type: none"> <li>1. Robert W. Price , "E-Business 01/02 ", McGraw-Hill</li> <li>2. Ravi Kalakota, Marcia Robinson, Don Tapscott, "E-Business: Roadmap for Success", Addison-Wesley</li> </ol>	

<b>PROJECT AND DISSERTATION (SET/IT/BT/C806)</b>		
Module Name	Content	No. of Hrs.
<b>Module 1</b>	The Major Project(s) will be evaluated on the basis of the weightage of 20% of Report writing, 50% of the Project work and 30% for Presentation and Viva. There shall be two presentations for each Project evaluation and at least one outside expert will be the member of the evaluation committee for final evaluation.	<b>72x2</b>
<b>Total No. of Hours</b>		<b>144</b>

The Syllabi has been framed in accordance to the UGC guidelines/ norms, as desired by the university letter number.: ACADMIC/976, dated 20-04-2015.

(Prof. S. C. Bhatt)  
Expert

(Prof. D. S. Negi)  
Expert

(Prof. M. M. S. Rauthan)  
Chairman

(Mr. Vinay Prasad Tamta)  
Member