ADMISSION & EXAMINATION

BYE-LAWS

FOR

BACHELOR OF TECHNOLOGY

(COMPUTER SCIENCE & ENGINEERING)

B. TECH (CSE)

Lateral Entry

CHOICE BASED CREDIT SYSTEM (CBCS)
(for students admitted in 2019-20)

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
School of Engineering Sciences and Technology
JAMIA HAMDARD
(DEEMED TO BE UNIVERSITY)
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ADMISSION & EXAMINATION RULES

for

BACHELOR OF TECHNOLOGY
(COMPUTER SCIENCE & ENGINEERING)
B. TECH. (CSE)
Lateral Entry

1. OBJECTIVE

To prepare highly skilled professionals, with a strong conceptual and theoretical background in the fields of information technologies, especially in the emerging areas of software technologies.

2. THE PROGRAMME

Highlights of the course are described in the following table:

a.	Name of the Programme	Bachelor of Technology (Computer Science & Engineering) B. TECH. (CSE) (Lateral Entry)
b.	Nature	Regular and Full Time
c.	Duration	Three Years (6 Semesters)
d.	Total number of credits	150
e.	Medium of Instruction and Examinations	English
f.	Eligibility Criteria	A candidate seeking admission to B.Tech (CSE) lateral entry must have passed Diploma Engineering in Computer Science and Engineering/ Information Technology / Electronics and Communication from a recognized institution /university securing at least 50% marks or equivalent CGPA in aggregate.
g.	Selection procedure	Jamia Hamdard will admit candidates on the basis of merit of qualifying examination.
h.	Total Seats	Maximum of 10% of "Approved Intake", plus the unfilled vacancies of First year.
i.	Period of Completion	Not more than 06 years (12 Semesters)

j.	Commencement of the Programme	July of every academic session

3. PROGRAMME STRUCTURE

Semester-wise course structure, guidelines for teaching, practical and associated assessment of the programme is described in the following tables:

Course Type	**Subject Area**	**Credits**	**Percentage (%)** *(Approx)*
Foundation Core (FC)	Humanities and Social Sciences (HS), including Management	12	23
	Basic Sciences(BS) including Mathematics, Physics, Chemistry, Biology	22	
Professional Core (PC)	Engineering Science (ES) courses including Workshop, Drawing, Basics of Electrical/ Mechanical/ Computer etc	21	57
	Professional core courses	50	
	Project Work, Seminar and/or Internship in Industry or elsewhere.	15	
Departmental Electives (DE)	Departmental Elective (DE) courses relevant to chosen specialization/branch	18	12
Open Electives (OE)	Open subjects – Electives (OE) from other technical and /or emerging subjects	12	8
Mandatory Courses (MC)	Mandatory Courses (MC)	0	Non-Credit
Total		**150**	**100**

Course Codes:

Course code	**Definitions**
BS	Basic Science Courses
ES	Engineering Science Courses
HS	Humanities and Social Sciences including Management courses

PC	Professional core courses
DE	Departmental Elective courses
OE	Open Elective courses
LC	Laboratory course
MC	Mandatory courses
PROJ	Project
DISS	Dissertation

L-T-P stands for number of contact hours as Lecture-Tutorial-Practical in a week.

A. Definition of Credit:

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5 credit
2 Hours Practical(Lab)/week	1 credit

B. Range of credits:

A total credit of 150 is required for a student to be eligible to get Under Graduate degree in Engineering. A student will be eligible to get Under Graduate degree with Honours if he/ she completes an additional 20 credits. These could be acquired through MOOCs.

Note: To compensate for first year credits, the students have to appear for examinations during end semester as per the schedule given below.

Semester – III

Paper Code	Title of the Paper	Course Type	Marks			L-T-P	Credits
			Internal Assessment	Semester Exam	Total		
BTCSE 301	Analog Electronic Circuits	ES	25	75	100	3-0-0	3
BTCSE 302	Chemistry	BS	25	75	100	2-0-0	2
BTCSE 303	Data structure & Algorithms	PC	25	75	100	3-0-0	3

BTCSE 304	Digital Electronics	ES	25	75	100	3-0-0	3
BTCSE 305	IT Workshop (Scilab/ MATLAB)	PC	25	75	100	1-0-0	1
BTCSE 306	Humanities-I (Effective Technical Communication)	HS	25	75	100	3-0-0	3
BTCSE 307	Analog Electronic Circuits Lab	ES	50	50	100	0-0-4	2
BTCSE 308	Data structure & Algorithms Lab	PC	50	50	100	0-0-4	2
BTCSE 309	Digital Electronics Lab	ES	50	50	100	0-0-4	2
BTCSE 310	IT Workshop (SciLab/ MATLAB) Lab	PC	50	50	100	0-0-4	2
BTCSE 101	Applied Physics – I	BS	25	75	100	3-1-0	4
BTCSE 102	Mathematics – I	BS	25	75	100	3-0-0	3
BTCSE 105	Applied Physics - 1 Lab	BS	50	50	100	0-0-4	2
					Total	**21-1-20**	**32**

Semester – IV

Paper Code	**Title of the Paper**	**Course Type**	**Marks**			**L-T-P**	**Credits**
			Internal Assessment	**Semester Exam**	**Total**		
BTCSE 401	Discrete Mathematics	PC	25	75	100	3-1-0	4
BTCSE 402	Computer Organization and Architecture	PC	25	75	100	3-0-0	3

BTCSE 403	Operating Systems	PC	25	75	100	3-0-0	3
BTCSE 404	Design and Analysis of Algorithms	PC	25	75	100	3-0-0	3
BTCSE 405	Organizational Behaviour	HS	25	75	100	3-0-0	3
BTCSE 406	Computer Organization and Architecture Lab	PC	50	50	100	0-0-4	2
BTCSE 407	Operating Systems Lab	PC	50	50	100	0-0-4	2
BTCSE 408	Design and Analysis of Algorithms Lab	PC	50	50	100	0-0-4	2
BTCSE 202	Mathematics – II	BS	25	75	100	2-1-0	3
BTCSE 203	Programming for Problem Solving	ES	25	75	100	3-0-0	3
BTCSE 207	Programming for Problem Solving Lab	ES	50	50	100	0-0-4	2
					Total	**20-2-16**	**30**

Semester – V

Paper Code	**Title of the Paper**	**Course type**	**Marks**			**L-T-P**	**Credits**
			Internal Assessment	**Semester Exam**	**Total**		
BTCSE 501	Signals & Systems	ES	25	75	100	3-0-0	3
BTCSE 502	Database Management Systems	PC	25	75	100	3-0-0	3

BTCSE 503	Formal Language & Automata Theory	PC	25	75	100	3-0-0	3
BTCSE 504	Object Oriented Programming	PC	25	75	100	3-0-0	3
BTCSE 505	Humanities II (Professional Practice, Law & Ethics)	HS	25	75	100	3-0-0	3
	Departmental Elective –I	DE	25	75	100	3-0-0	3
BTCSE 507	Database Management Systems Lab	PC	50	50	100	0-0-4	2
BTCSE 508	Object Oriented Programming Lab	PC	50	50	100	0-0-4	2
BTCSE 509	Constitution of India	MC	25	75	100	2-0-0	0
BTCSE 104	Engineering Graphics & Design	ES	25	75	100	1-0-0	1
BTCSE 107	Engineering Graphics & Design Lab	ES	50	50	100	0-0-4	2
					Total	**21-0-12**	**25**

Semester – VI

Paper Code	**Title of the Paper**	**Course type**	**Marks**			**L-T-P**	**Credits**
			Internal Assessment	**Semester Exam**	**Total**		
BTCSE 601	Project – I	PROJ	25	75	100	0-0-6	3
BTCSE 602	Compiler Design	PC	25	75	100	3-0-0	3
BTCSE 603	Computer Networks	PC	25	75	100	3-0-0	3

BTCSE 604	Compiler Design Lab	PC	50	50	100	0-0-4	2
BTCSE 605	Computer Networks Lab	PC	50	50	100	0-0-4	2
	Departmental Elective - II	DE	25	75	100	3-0-0	3
	Departmental Elective -III	DE	25	75	100	3-0-0	3
	Open Elective - I (Humanities)	OE	25	75	100	3-0-0	3
BTCSE 205	English Language	HS	25	75	100	2-0-0	2
BTCSE 201	Applied Physics II	BS	25	75	100	3-1-0	4
BTCSE 206	Applied Physics II Lab	BS	50	50	100	0-0-2	1
BTCSE 209	English Language Lab	HS	50	50	100	0-0-2	1
					Total	**20-1-18**	**30**

Semester – VII

Paper Code	**Title of the Paper**	**Course Type**	**Marks**			**L-T-P**	**Credits**
			Internal Assessment	**Semester Exam**	**Total**		
BTCSE 701	Project-II	PROJ	200	100	300	0-0-12	6
BTCSE 702	Biology	BS	25	75	100	2-1-0	3
	Departmental Elective – IV	DE	25	75	100	3-0-0	3
	Departmental Elective – V	DE	25	75	100	3-0-0	3

	Open Elective – II	OE	25	75	100	3-0-0	3
BTCSE 108	Essence of Indian Traditional knowledge	MC	25	75	100	2-0-0	0
					Total	**13-1-12**	**18**

Semester – VIII

Paper Code	**Title of the Paper**	**Course Type**	**Marks**			**L-T-P**	**Credits**
			Internal Assessment	**Semester Exam**	**Total**		
BTCSE 801	Dissertation	DISS	300	200	500	0-0-12	6
	Departmental Elective –VI	DE	25	75	100	3-0-0	3
	Open Elective – III	OE	25	75	100	3-0-0	3
	Open Elective – IV	OE	25	75	100	3-0-0	3
BTCSE 211	Environmental Sciences	MC	25	75	100	2-0-0	0
					Total	**11-0-12**	**15**

Total Credits – 150

Electives (Programme & Open Electives)

Professional Electives will be introduced in 4 threads besides the Open Elective. There are 6 slots for Professional Electives and 4 slots for Open Electives. The department may permit students to take 50% of these (Professional electives + open electives) from other disciplines, based on the choices of the students and consent of course advisors.

A. **Theory** B. **Systems** C. **Data Science** D. **Applications** and E. **Open Electives**

The students will have options of selecting the electives from the different threads depending on the specialization they wish to acquire. **There should be at least two electives from the open elective choices; the rest two can be taken from the other threads, if intended.**

Pls. see the Table.

The Electives are shown in different threads. The list is suggestive. The actual list of electives will depend on the availability of faculty and their research interests. However, there should be courses available in each thread.

On-line MOOC courses may contribute up to 20% of the credits, with in-house examination being conducted.

Programme Electives

Paper Code	Title of the Paper	Marks			L-T-P	Credits
		Internal Assessment	Semester Exam	Total		
Theory and Algorithms						
Departmental Elective –I						
BTCSE DET11	Theory of Computation	25	75	100	3-0-0	3
BTCSE DET12	Graph Theory	25	75	100	3-0-0	3
BTCSE DET13	Advanced Algorithms	25	75	100	3-0-0	3
Departmental Elective –II						
BTCSE DET21	Parallel and Distributed Algorithms	25	75	100	3-0-0	3
BTCSE DET22	Computational Complexity	25	75	100	3-0-0	3

BTCSE DET23	Computational Geometry	25	75	100	3-0-0	3
Departmental Elective –III						
BTCSE DET31	Queuing Theory and Modelling	25	75	100	3-0-0	3
BTCSE DET32	Computational Number Theory	25	75	100	3-0-0	3
BTCSE DET33	Game Theory	25	75	100	3-0-0	3
Departmental Elective –IV						
BTCSE DET41	Information Theory and Coding	25	75	100	3-0-0	3
BTCSE DET42	Information Retrieval	25	75	100	3-0-0	3
BTCSE DET43	Quantum Computing	25	75	100	3-0-0	3
Departmental Elective –V						
BTCSE DET51	Distributed Computing Systems	25	75	100	3-0-0	3
BTCSE DET52	Software Architecture	25	75	100	3-0-0	3
BTCSE DET53	Approximation of Algorithms	25	75	100	3-0-0	3
Departmental Elective –VI						
BTCSE DET61	Combinational Optimization	25	75	100	3-0-0	3
BTCSE DET62	Software Project Management	25	75	100	3-0-0	3
BTCSE DET63	Ethical Hacking	25	75	100	3-0-0	3
Systems						
Departmental Elective –I						
BTCSE DES11	Advanced Computer Architecture	25	75	100	3-0-0	3

BTCSE DES12	Software Engineering	25	75	100	3-0-0	3
BTCSE DES13	Distributed Systems	25	75	100	3-0-0	3
Departmental Elective –II						
BTCSE DES21	Embedded Systems	25	75	100	3-0-0	3
BTCSE DES22	Advanced Operating Systems	25	75	100	3-0-0	3
BTCSE DES23	Low Power Circuits and Systems	25	75	100	3-0-0	3
Departmental Elective –III						
BTCSE DES31	Fault Tolerant Computing	25	75	100	3-0-0	3
BTCSE DES32	Real Time Systems	25	75	100	3-0-0	3
BTCSE DES33	Software Re-engineering	25	75	100	3-0-0	3
Departmental Elective –IV						
BTCSE DES41	Signals and Networks	25	75	100	3-0-0	3
BTCSE DES42	Internet-of-Things	25	75	100	3-0-0	3
BTCSE DES43	Ad-Hoc and Sensor Networks	25	75	100	3-0-0	3
Departmental Elective –V						
BTCSE DES51	Agile Software Developments & DevOps	25	75	100	3-0-0	3
BTCSE DES52	Simulation and Modelling	25	75	100	3-0-0	3
BTCSE DES53	Software Testing & Quality Assurance	25	75	100	3-0-0	3
Departmental Elective –VI						

BTCSE DES61	Engineering System Analysis and Design	25	75	100	3-0-0	3
BTCSE DES62	Engineering System Design Optimization	25	75	100	3-0-0	3
BTCSE DES63	Engineering System Modelling and Simulation	25	75	100	3-0-0	3
Data Science and Machine Intelligence						
Departmental Elective –I						
BTCSE DED11	Artificial Intelligence	25	75	100	3-0-0	3
BTCSE DED12	Advanced Algorithms	25	75	100	3-0-0	3
BTCSE DED13	Machine Learning	25	75	100	3-0-0	3
Departmental Elective –II						
BTCSE DED21	Data Mining	25	75	100	3-0-0	3
BTCSE DED22	Soft Computing	25	75	100	3-0-0	3
BTCSE DED23	Speech and Natural Language Processing	25	75	100	3-0-0	3
Departmental Elective –III						
BTCSE DED31	Data Analytics	25	75	100	3-0-0	3
BTCSE DED32	Information Retrieval	25	75	100	3-0-0	3
BTCSE DED33	Neural Networks and Deep Learning	25	75	100	3-0-0	3
Departmental Elective –IV						
BTCSE DED41	Multi-agent Intelligent Systems	25	75	100	3-0-0	3

BTCSE DED42	Big Data Analytics	25	75	100	3-0-0	3
BTCSE DED43	Compiler Design	25	75	100	3-0-0	3
Departmental Elective –V						
BTCSE DED51	Pattern Recognition	25	75	100	3-0-0	3
BTCSE DED52	Bioinformatics	25	75	100	3-0-0	3
BTCSE DED53	Digital Communication	25	75	100	3-0-0	3
Departmental Elective –VI						
BTCSE DED61	Cloud Computing	25	75	100	3-0-0	3
BTCSE DED62	Cryptography and Network Security	25	75	100	3-0-0	3
BTCSE DED63	Network Programming	25	75	100	3-0-0	3
Applications						
Departmental Elective –I						
BTCSE DEA11	Digital Image Processing	25	75	100	3-0-0	3
BTCSE DEA12	Digital Signal Processing	25	75	100	3-0-0	3
BTCSE DEA13	Optimization Techniques	25	75	100	3-0-0	3
Departmental Elective –II						
BTCSE DEA21	Human Computer Interaction	25	75	100	3-0-0	3
BTCSE DEA22	Computer Graphics and Visualization	25	75	100	3-0-0	3
BTCSE DEA23	Script Programming	25	75	100	3-0-0	3
Departmental Elective –III						

BTCSE DEA31	Mobile Computing	25	75	100	3-0-0	3
BTCSE DEA32	Web and Internet Technology	25	75	100	3-0-0	3
BTCSE DEA33	Internet Web Programming	25	75	100	3-0-0	3
Departmental Elective –IV						
BTCSE DEA41	Embedded Computing Systems	25	75	100	3-0-0	3
BTCSE DEA42	Electronic Design Automation	25	75	100	3-0-0	3
BTCSE DEA43	Multimedia Computing	25	75	100	3-0-0	3
Departmental Elective –V						
BTCSE DEA51	Computer Vision	25	75	100	3-0-0	3
BTCSE DEA52	Human Computer Interface	25	75	100	3-0-0	3
BTCSE DEA53	Web Service and Service Oriented Architecture	25	75	100	3-0-0	3
Departmental Elective –VI						
BTCSE DEA61	VLSI System Design & Algorithms	25	75	100	3-0-0	3
BTCSE DEA62	Robotics	25	75	100	3-0-0	3
BTCSE DEA63	Android based App development	25	75	100	3-0-0	3

Open Electives

Paper Code	**Title of the Paper**	**Marks**			**L-T-P**	**Credits**
		Internal Assessment	**Semester Exam**	**Total**		

Open Elective – I						
BTCSE OE11	Soft Skills and Interpersonal Communication	25	75	100	3-0-0	3
BTCSE OE12	Human Resource Development and Organizational Behaviour	25	75	100	3-0-0	3
BTCSE OE13	Cyber Law and Ethics	25	75	100	3-0-0	3
Open Elective – II						
BTCSE OE21	History of Science	25	75	100	3-0-0	3
BTCSE OE22	Principles of Management	25	75	100	3-0-0	3
BTCSE OE23	Operational Research	25	75	100	3-0-0	3
Open Elective – III						
BTCSE OE31	Infrastructure Systems Planning	25	75	100	3-0-0	3
BTCSE OE32	Rural Technology & Community Development	25	75	100	3-0-0	3
BTCSE OE33	Supply Chain Management-Planning	25	75	100	3-0-0	3
Open Elective – IV						
BTCSE OE41	Enterprise Resource and	25	75	100	3-0-0	3

	Planning					
BTCSE OE42	Customer Relationship Management	25	75	100	3-0-0	3
BTCSE OE43	Planning for Sustainable Development	25	75	100	3-0-0	3
Open Elective – V						
BTCSE OE51	Probability and Stochastic Processes	25	75	100	3-0-0	3
BTCSE OE52	IPR and Cyber laws	25	75	100	3-0-0	3
BTCSEOE53	Disaster Management	25	75	100	3-0-0	3

4. MODE OF CURRICULUM DELIVERY

Mode of curriculum delivery includes classroom teaching, assignments, test, lab work, presentations, participation in relevant events and regularity.

5. THE GRADING SYSTEM

As per University Rule

6. CALCULATION OF SGPA AND CGPA OF A STUDENT IN A SEMESTER

As per University Rule

7. ADMISSION

A candidate, aspiring for admission to **B. Tech. (CSE) lateral entry Programme**, shall have to apply in the prescribed application form that is complete in all respect, on or before the last date of submission.

NOTE:

a. Different procedure may be adapted for admission of foreign/NRI/ Industry-sponsored candidates, who apply for admission in the prescribed form and fulfill the eligibility requirements.

b. The admission committee, duly constituted for purpose, would prepare a merit list on the basis of the selection criteria.

c. Admission committee shall display/publish the list of candidates that are declared eligible for admission, after the due approval of the competent authority.

d. Eligible candidates shall have to complete the prescribed formalities, for completion of admission, within the stipulated period of time; otherwise they will forfeit the right to admission.

8. ATTENDANCE

a. All students are supposed to attend every lecture and practical classes. However, the attendance requirement for appearing in the examination shall be a minimum of 75% of the classes held.

b. Each one-period teaching shall account for one attendance unit.

c. The concerned teacher will take a roll call in every scheduled class, maintains and consolidate the attendance record, which would be submitted to the Head of the Department at the conclusion of the semester.

d. Attendance on account of participation (with prior permission from the head of the department) in the co-curricular/extra-curricular activities can be granted by the Dean on receipt of certificates or recommendations of the respective activity issued by the Head of the Department.

e. Attendance records displayed on Notice Board from time to time, in respect of short attendance, shall be deemed to be a proper notification and no individual notice shall be sent to the students/local guardian.

f. In case a student is found to be continuously absent from the classes without information for a period of 30 days, the concerned teacher shall report it to the Head of the Department.

g. Head of the department may recommend for striking off the name of a student from rolls, after ensuring '**one month continuous absence**', from all the concerned teachers.

h. A student, whose name has been struck off on account of long absence, may apply to the Dean for readmission within 15 days of the notice of striking off the name. The readmission shall be effected on payments of prescribed readmission fees.

i. A student with less than 75% attendance, in aggregate shall not be allowed to appear in the semester examination. The Head of the Department shall recommend all such cases to the Dean of the faculty.

j. The Dean, on the recommendation of the Head of the Department, may consider the relaxation of attendance up to 10% on account of sickness and /or any other valid reason. No application for relaxation of attendance (duly certified by a Registered Medical Practitioner/Public hospital or a competent authority) will be entertained after 15 days from the recovery from illness etc.

k. A student detained on account of short attendance will start afresh in the same class in the next academic year on payment of current fees except enrollment fee, identity card fee and security deposits etc.

9. INTERNAL ASSESSMENT

a. Internal assessment, to be made by concerned teachers, will be based on minor tests, quizzes, presentation, programming test, demonstrations and assignments.

b. Maximum of Three minor tests, with a total of 20 marks, for each theory paper shall be mandatory. Other modes of assessment shall account for remaining 5 marks.

c. A minor test each shall be scheduled after the completion of first and second term.

d. Dates for minor test will be announced at the beginning of the semester, by the examination coordinator.

e. The teacher concerned shall maintain a regular record of the marks obtained by students in minor tests and display the same in due course.

f. The concerned teachers shall submit the compiled internal assessment marks to the Head of the Department, on the conclusion of teaching of the current semester.

g. The Head shall display a copy of the compiled sheet, of internal assessment marks of all the papers, before forwarding it to the Controller of Examination, i.e. at the conclusion of the semester.

h. A promoted candidate, who has to reappear in the examination of a paper, will retain internal assessment marks.

i. In the case of re-admission, the candidates shall have to go through the internal assessment process afresh and shall retain nothing of the previous year.

10. SEMESTER EXAMINATIONS

Prescriptions for conducting semester examinations of theory and lab papers, those shall be conducted after the conclusion of each of the semesters, are presented in the following table:

S.N.	Classification	Theory	Lab
1.	Mode	Written Only	Written, Demo, Programming viva- voce etc.
2.	Duration	03 Hours	04 Hours
3.	Total Marks	75 (Seventy Five Only)	50 (Fifty Only)

11. MAJOR PROJECT

Each student of the final semester will have to carry out a project under the guidance of one or two faculty members.

b. There shall be a mid-term evaluation of the progress and the internal supervisors.

c. All the candidates shall submit ***Three (03***) hard copies of the project report that are duly approved and signed by internal as well as external (if applicable) supervisors.

d. An external examiner, appointed for the purpose, shall evaluate the project report.

e. Head of the department shall forward the compiled total marks (awarded in internal assessment, project Report and Viva-voce Examination), in the project-semester of each of the candidate, to the Controller of Examination.

12. EXAMINATION

a. The performance of a student in a semester shall be evaluated through continuous class assessment and end semester examination. The continuous assessment shall be based on class tests, assignments/ tutorials, quizzes/ viva voce and attendance. The end semester examination shall be comprised of written papers, practical and viva voce, inspection of certified course work in classes and laboratories, project work, design reports or by means of any combination of these methods.

b. The marks obtained in a subject shall consist of marks allotted in end semester theory paper, practical examination and sessional work.

c. The minimum pass marks in each subject including sessional marks (Theory, Practical or Project etc.) shall be 40%.

13. PROMOTION SCHEME

a. A student will be required to clear minimum **40% of his/her papers** (including Labs; excluding non-credit papers) in a semester/annual examination to be eligible **for promotion to the next semester/year**. A student may appear in the supplementary examination after each semester/annual examination and can have a choice to appear in the backlog papers in the supplementary examination or in the subsequent regular semester/annual examination with a prescribed fee. A students detained due to shortage of attendance will repeat his/her paper in the subsequent semester concerned (even/odd).

b. A **detained** Student is not allowed to re-appear in the internal assessment (Unit test). His/her old internal assessment marks will remain same.

A student who cleared all the papers of a semester/annual examination of a programme/course will be eligible for improvement examination as per university rule.

After having passed all the SIX semesters, the students shall be eligible for the award of B. Tech. Computer Science & Engineering (CSE) degree of JAMIA HAMDARD.

14. CLASSIFICATION OF SUCCESSFUL CANDIDATES

The result of successful candidates, who fulfill the criteria for the award of **B. Tech. Computer Science & Engineering (CSE)**, shall be classified at the end of last semester, on the basis of his/her final CGPA (to be calculated as per university rule).

SEMESTER III

BTCSE 301: Analog Electronic Circuits

Course Outcomes:

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

- Understand the characteristics of transistors.
- Design and analyze various rectifier and amplifier circuits.
- Design sinusoidal and non-sinusoidal oscillators.
- Understand the functioning of OP-AMP and design OP-AMP based circuits.

UNIT 1: Diode circuits

P-N junction diode, I-V characteristics of a diode; review of half-wave and full-wave rectifiers, Zener diodes, clamping and clipping circuits

UNIT 2: BJT circuits

Structure and I-V characteristics of a BJT; BJT as a switch, BJT as an amplifier: small-signal model, biasing circuits, current mirror; common-emitter, common-base and common collector amplifiers; Small signal equivalent circuits, high-frequency equivalent circuits

UNIT 3: MOSFET circuits

MOSFET structure and I-V characteristics, MOSFET as a switch, MOSFET as an amplifier: small-signal model and biasing circuits, common-source, common-gate and common-drain amplifiers; small signal equivalent circuits - gain, input and output impedances, trans-conductance, high frequency equivalent circuit

UNIT 4: Differential, multi-stage and operational amplifiers

Differential amplifier; power amplifier; direct coupled multi-stage amplifier; internal structure of an operational amplifier, ideal op-amp, non-idealities in an op-amp (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product)

UNIT 5: Linear and Nonlinear applications of op-amp

Idealized analysis of op-amp circuits, Inverting and non-inverting amplifier, differential amplifier, instrumentation amplifier, integrator, active filter, P, PI and PID controllers and lead/lag compensator using an op-amp, voltage regulator, oscillators (Wein bridge and phase

shift), Analog to Digital Conversion. Hysteretic Comparator, Zero Crossing Detector, Square-wave and triangular-wave generators, Precision rectifier, peak detector, Mono-shot

Reference books:

- S. Sedra and K. C. Smith, "Microelectronic Circuits", New York, Oxford University Press, 1998.
- J. V. Wait, L. P. Huelsman and G. A. Korn, "Introduction to Operational Amplifier theory and applications", McGraw Hill U. S., 1992.
- J. Millman and A. Grabel, "Microelectronics", McGraw Hill Education, 1988.
- P. Horowitz and W. Hill, "The Art of Electronics", Cambridge University Press, 1989.
- P. R. Gray, R. G. Meyer and S. Lewis, "Analysis and Design of Analog Integrated Circuits", John Wiley & Sons, 2001.

BTCSE 302: Chemistry

Unit I: Atomic and molecular structure

Schrodinger equation, Particle in a box solution and their applications for conjugated molecules and nano-particles. Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations, Molecular orbitals of diatomic molecules and plots of the multicenter orbitals, Equations for atomic and molecular orbitals, Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity, Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties, Band structure of solids and the role of doping on band structures

UNIT 2: Spectroscopic techniques and applications

Principles of spectroscopy and selection rules, Electronic spectroscopy, Fluorescence and its applications in medicine, Vibrational and rotational spectroscopy of diatomic molecules, Applications, Nuclear magnetic resonance and magnetic resonance imaging, surface characterization techniques, Diffraction and scattering

UNIT 3: Intermolecular forces and potential energy surfaces

Ionic, dipolar and van Der Waals interactions, Equations of state of real gases and critical phenomena, Potential energy surfaces of H_3, H_2F and HCN and trajectories on these surfaces.

Organic reactions and synthesis of a drug molecule: Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings, Synthesis of a commonly used drug molecule

UNIT 4: Use of free energy in chemical equilibria and Periodic properties

Thermodynamic functions: energy, entropy and free energy, Estimations of entropy and free energies. Free energy and emf, Cell potentials, the Nernst equation and applications, Acid base, oxidation reduction and solubility equilibria, Water chemistry. Corrosion, Use of free energy considerations in metallurgy through Ellingham diagrams

UNIT 5:

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries Stereochemistry: Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds

Reference Books:

- University chemistry, by B. H. Mahan
- Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
- Fundamentals of Molecular Spectroscopy, by C. N. Banwell
- Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
- Physical Chemistry, by P. W. Atkins
- Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition http://bcs.whfreeman.com/vollhardtschore5e/default.asp

Course Outcomes

- The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications.
- Quantum theory is more than 100 years old and to understand phenomena at nanometer levels, one has to base the description of all chemical processes at

molecular levels. The course will enable the student to:

- Analyze microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
- Rationalize bulk properties and processes using thermodynamic considerations.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
- Rationalize periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
- List major chemical reactions that are used in the synthesis of molecules.

BTCSE 303: Data Structure & Algorithms

Objectives of the course:

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

Detailed contents:

UNIT 1:

Introduction: Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off.

Searching: Linear Search and Binary Search Techniques and their complexity analysis.

UNIT 2:

Stacks and Queues: ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation– corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.

UNIT 3:

Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked

representation of Stack and Queue, Header nodes, doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.

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

UNIT 4:

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

UNIT 5:

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

Reference books:

- "Fundamentals of Data Structures", Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press.
- Algorithms, Data Structures, and Problem Solving with C++", Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company
- "How to Solve it by Computer", 2nd Impression by R. G. Dromey, Pearson Education.

Course outcomes

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

- Student will able to implement Graph search and traversal algorithms and determine the time and computation complexity.

BTCSE 304: Digital Electronics

Course Outcomes:

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

- Understand working of logic families and logic gates.
- Design and implement Combinational and Sequential logic circuits.
- Understand the process of Analog to Digital conversion and Digital to Analog conversion.
- Be able to use PLDs to implement the given logical problem.

UNIT 1: Fundamentals of Digital Systems and logic families

Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes, characteristics of digital ICs, digital logic families, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-state logic

UNIT 2: Combinational Digital Circuits)

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

UNIT 3: Sequential circuits and systems

A 1-bit memory, the circuit properties of Bistable latch, the clocked SR flip flop, J- K-T and D types flip flops, applications of flip flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple(Asynchronous) counters, synchronous counters, counters design using flip flops, special counter IC's, asynchronous sequential counters, applications of counters.

UNIT 4: A/D and D/A Converter

Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter ICs, sample and hold circuit, analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/Dc converter, A/D converter using voltage to frequency and voltage to time conversion, specifications of A/D converters, example of A/D converter ICs

UNIT 5: Semiconductor memories and Programmable logic devices.

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

Reference books:

- R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
- M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.
- A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.

BTCSE 305: IT Workshop (Scilab/MATLAB)

UNIT1: Introduction

Basic features, Starting MATLAB, Quitting MATLAB, Creating MATLAB, Overwriting, Error, Making, Controlling the hierarchy of operations or, Controlling the appearance of floating point, Managing the, keeping track of your work, Entering multiple statements per line

UNIT2: Mathematical functions

Basics, Adding titles, axis labels, and annotations, Multiple data sets in one, Matrix, vector, Colon, Array operations and Linear equations, Matrix arithmetic operations, Array arithmetic operations , Solving linear equations , Matrix inverse

UNIT3: Introduction to programming in MATLAB

- ile Scripts, M-File, Anatomy of a M-File function, Input and output arguments, Input to a script file, Output commands, Control flow and operators: ‘‘if...end’’, Relational and logical , The ‘‘for...end’’ ,The ‘‘while...end’’ loop , Saving output to a , Debugging M-files

UNIT4: SciLab Introduction

, Installing, help, Mailing lists, wiki and bug , Getting help from Scilab demonstrations and macros , editor ,Docking , Using , Batch processing , Creating real, Variable , Comments and continuation ,Elementary mathematical functions ,Pre-defined mathematical variables ,Booleans , Complex numbers, Integers , Floating point integers , ans variable , Strings , Dynamic type of variables ,matrix , The colon ":" operator , The dollar "$" operator

UNIT5: SciLab Programming

Looping and branching , if statement ,select statement ,for statement , while statement , The break and continue , Functions ,Plotting ,Export

Reference Books:

- Introduction to MATLAB, 4e, Delores M. Etter, Pearson Education Inc, 2018
- Essentials of MATLAB Programming, 3e, Stephen J. Chapman, Cengage Learning, 2018
- Scilab, from theory to practice, Scilab: I. Fundamentals, Perrine Mathieu, Philippe Roux, 2016, ISBN: 978-2-8227-0293-5
- Scilab by example, Dr. M. Affouf, 2012, ISBN: 978-1479203444

BTCSE 306: Humanities-I (Effective Technical Communication)

Course Objective:

- To learn Design and Development of different kinds of technical documents.
- To learn Technical Writing, Grammar and Editing.

3. To learn how to develop and assessment oneself

- To learn about Communication and Technical Writing.

Unit – I: Information Design and Development

Different kinds of technical documents, Information development life cycle, Organization structures, factors affecting information and document design, Strategies for organization, Information design and writing for print and for online media.

Unit – II: Technical Writing, Grammar and Editing

Technical writing process, forms of discourse, Writing drafts and revising, Collaborative writing, creating indexes, technical writing style and language. Basics of grammar, study of advanced grammar, editing strategies to achieve appropriate technical style. Introduction to advanced technical communication, Usability, Hunan factors, Managing technical communication projects, time estimation, Single sourcing, Localization.

Unit – III: Self Development and Assessment

Self assessment, Awareness, Perception and Attitudes, Values and belief, Personal goal setting, career planning, Self-esteem. Managing Time; Personal memory, Rapid reading, Taking notes; Complex problem solving; Creativity

Unit – IV: Communication and Technical Writing

Public speaking, Group discussion, Oral; presentation, Interviews, Graphic presentation, Presentation aids, Personality Development. Writing reports, project proposals, brochures, newsletters, technical articles, manuals, official notes, business letters, memos, progress reports, minutes of meetings, event report.

Unit – V:: Ethics

Business ethics, Etiquettes in social and office settings, Email etiquettes, Telephone Etiquettes, Engineering ethics, Managing time, Role and responsibility of engineer, Work culture in jobs, Personal memory, Rapid reading, Taking notes, Complex problem solving, Creativity.

Text/Reference Books:

- David F. Beer and David McMurrey, Guide to writing as an Engineer, John Willey. New York, 2004

2. Diane Hacker, Pocket Style Manual, Bedford Publication, New York, 2003. (ISBN 0312406843)

3. Shiv Khera, You Can Win, Macmillan Books, New York, 2003.

4. Raman Sharma, Technical Communications, Oxford Publication, London, 2004.

5. Dale Jungk, Applied Writing for Technicians, McGraw Hill, New York, 2004. (ISBN: 07828357-4)

6. Sharma, R. and Mohan, K. Business Correspondence and Report Writing, TMH New Delhi 2002. Xebec, Presentation Book, TMH New Delhi, 2000. (ISBN 0402213)

Course Outcome: At the end of this course students will be able to

1. Design and Develop different kinds of technical documents.
2. Do Technical Writing, Grammar and Editing.

3. Self-assess themselves

4. Do Communication and Technical Writing.

BTCSE 307: Analog Electronic Circuits Laboratory

Lab based on Analog Electronic Circuits

BTCSE 308: Data Structure & Algorithms Laboratory

Lab based on Data Structure & Algorithms

BTCSE 309: Digital Electronics Laboratory

Lab based on Digital Electronics theory syllabus.

BTCSE 310: IT Workshop (Sci Lab/MATLAB) Lab

(You may choose to do any 10-12 exercises of either of them or both in parts.)

MATLAB:

Tutorial 1 – MATLAB Environment

Exercise 1 – MATLAB Environment

Tutorial 2 – The Workspace and Working Directory

Exercise 2 – The Workspace and Working Directory

Tutorial 3 – Matrix Operations

Exercise 3 – Matrix Operations

Tutorial 4 – Vectors

Exercise 4 – Vectors

Tutorial 5 – Statistics

Tutorial 6 – Plotting Graphs

Tutorial 7 – Plotting 3D Graphs

Tutorial 8 – MATLAB Programming Language

Tutorial 9 – M Files

Tutorial 10 – Functions in MATLAB

Tutorial 11 – File Operations

Tutorial 12 – Reading Microsoft Excel Files

Tutorial 13 – Some Miscellaneous Commands

Tutorial 14 – Mini Project

Scilab:

Tutorial 1 – Scilab Environment

Exercise 1 – Scilab Environment

Tutorial 2 – The Workspace and Working Directory

Exercise 2 – The Workspace and Working Directory

Tutorial 3 – Matrix Operations

Exercise 3 – Matrix Operations

Tutorial 4 – Sub-matrices

Exercise 4 – Sub-matrices

Tutorial 5 – Statistics

Tutorial 6 – Plotting Graphs

Tutorial 7 – Plotting 3D Graphs

Tutorial 8 – Scilab Programming Language

Tutorial 9 – Script Files and Function Files

Tutorial 10 – Functions in Scilab

Tutorial 11 – File Operations

Tutorial 12 – Reading Microsoft Excel Files

Tutorial 13 – Some Miscellaneous Commands

Tutorial 14 – Mini Project

BTCSE 101-Applied Physics – I

Course Objective

- This is an established fact that a sound understanding of concepts of Physics is an essential part of the training of a prospective engineer.

- In the present era the spectacular progress of technology bears witness to the fact that the attractive edifice of technology can only be built on the solid foundation of Physics.
- In the past hundred years or so Physics has seen major upheavals where conventional frameworks have underwent revolutionary changes.
- From technological perspective these changes and development of new concepts are very crucial. This makes it incumbent that the students are equipped with proper skills and understanding of Physics.
- In this spirit, this course aims to train the student in logical and analytical thinking through understanding and applications of the principles of Physics to actual problems.
- The emphasis of this course is on the development of conceptual skills and their application to actual problems rather than rigorous theoretical treatments.

UNIT 1: Semiconductor Physics

Energy bands in solids, Fermi level and Fermi distribution function, Intrinsic and extrinsic semiconductors, P-N junction, Forward and reverse bias, V-I characteristics, Mobility of electrons and holes, Drift velocity, Electrical conductivity, resistivity, Zener diode.

UNIT 2: Lasers

Einstein's theory of matter radiation interaction and A and B coefficients, amplification of light by population inversion, different types of lasers: He-Ne, Ruby, Properties of laser beams: monochromaticity, coherence, directionality and brightness, applications of lasers in science, engineering and medicine.

UNIT 3: Fiber Optics

Numerical aperture, step index and graded index fibers, attenuation and dispersion mechanism in optical fibers (Qualitative only), applications of optical fibers, optical communication (Block diagram only).

UNIT 4: Wave Optics

Huygens' Principle, superposition of waves and interference of light by wavefront splitting and amplitude splitting, Young's double slit experiment, Newton's rings, Fraunhoffer

diffraction from a single slit and N slit, Diffraction gratings, dispersive and resolving power of grating.

UNIT 5: Superconductivity

Introduction, Variation of resistivity with temperature, Difference between a metal and a superconductor, Meissner effect, Type I and Type II superconductors, Examples of superconductors, BCS Theory (Qualitative only), London's equations, applications of superconductors.

Course Outcome:

After studying this course the student is expected to:

- Develop good understanding of basic concepts related to semiconductors.
- Familiarize themselves with ideas related with LASER and develop an understanding of amazing properties of LASER heralding new pathways in technology.
- Get introduced to the working of optical fibers and their huge potential.
- Refresh and further develop their understanding of the two remarkable phenomena exhibited by light- interference and diffraction and related concepts.
- Get a feel of yet another mysterious phenomenon of nature-superconductivity and explore its technological potential.

Books Recommended:

- B.G. Streetman, "Solid State Electronic Devices", Prentice Hall of India, 1995.
- D.A. Neamen, "Semiconductor Physics and Devices," Times Mirror High Education Group, Chicago, 1997.
- O. Svelto, "Principles of Lasers", Springer Science & Business Media, 2010.
- Ghatak, "Optics", McGraw Hill Education, 2012.
- D. Neamen, D. Biswas, "Semiconductor Physics and Devices," McGraw Hill

Education

BTCSE 102 MATHEMATICS - 1

Objectives:

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

- To introduce the idea of applying differential and integral calculus to notions of curvature and to improper integrals. Apart from some applications it gives a basic introduction on Beta and Gamma functions.
- To introduce the fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.
- To develop the tool of power series and Fourier series for learning advanced Engineering Mathematics.
- To familiarize the student with functions of several variables that is essential in most branches of engineering.
- To develop the essential tool of matrices and linear algebra in a comprehensive manner.

UNIT 1: Calculus:

Evolutes and involutes;-Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

UNIT 2:

Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule; Maxima and minima.

UNIT 3: Sequences and series:

Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

UNIT 4: Multivariable Calculus (Differentiation):

Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.

UNIT 5: Matrices

Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation.

Textbooks/References:

- G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
- Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
- Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
- Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
- D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
- N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
- B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

BTCSE 105-Semiconductor Physics Laboratory

Laboratory based upon Applied Physics -1 BTCSE 101

SEMESTER IV

BTCSE 401: Discrete Mathematics

Objectives of the course

Throughout the course, students will be expected to demonstrate their understanding of Discrete Mathematics by being able to do each of the following:

- Use mathematically correct terminology and notation.
- Construct correct direct and indirect proofs.
- Use division into cases in a proof.
- Use counterexamples.
- Apply logical reasoning to solve a variety of problems.

UNIT 1:

Sets, Relation and Function: Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum and Product of Functions, Bijective functions, Inverse and Composite Function, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem.

Principles of Mathematical Induction: The Well-Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic.

UNIT 2:

Basic counting techniques-inclusion and exclusion, pigeon-hole principle, permutation and combination.

UNIT 3:

Propositional Logic: Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers.

Proof Techniques: Some Terminology, Proof Methods and Strategies, Forward Proof, Proof by Contradiction, Proof by Contraposition, Proof of Necessity and Sufficiency.

UNIT 4:

Algebraic Structures and Morphism: Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Congruence Relation and Quotient Structures, Free And Cyclic Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields. Boolean

algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form

UNIT 5:

Graphs and Trees: Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Eulerian and Hamiltonian Walks, Graph Coloring, Coloring maps and Planar Graphs, Coloring Vertices, Coloring Edges, List Coloring, Perfect Graph, definition properties and Example, rooted trees, trees and sorting, weighted trees and prefix codes, Bi-connected component and Articulation Points, Shortest distances.

Suggested books:

- Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw – Hill
- Susanna S. Epp, Discrete Mathematics with Applications, 4th edition, Wadsworth Publishing Co. Inc.
- C L Liu and D P Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, 3rd Edition by, Tata McGraw – Hill.

Reference books:

- J.P. Tremblay and R. Manohar, Discrete Mathematical Structure and Its Application to Computer Science", TMG Edition, Tata McGraw-Hill
- Norman L. Biggs, Discrete Mathematics, 2nd Edition, Oxford University Press. Schaum's Outlines Series, Seymour Lipschutz, Marc Lipson,
- Discrete Mathematics, Tata McGraw - Hill

Course Outcomes

- For a given logic sentence express it in terms of predicates, quantifiers, and logical connectives
- For a given a problem, derive the solution using deductive logic and prove the solution based on logical inference
- For a given a mathematical problem, classify its algebraic structure
- Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra
- Develop the given problem as graph networks and solve with techniques of graph theory.

BTCSE 402: Computer Organization &Architecture

Pre-requisites: Digital Electronics

Objectives of the course:

To expose the students to the following:

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

Detailed contents: UNIT

1

Functional blocks of a computer: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU – registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Case study – instruction sets of some common CPUs.

Data representation: signed number representation, fixed and floating-point representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic.

UNIT 2:

Introduction to x86 architecture.

CPU control unit design: hardwired and micro-programmed design approaches Case Study– design of a simple hypothetical CPU.

Memory system design: semiconductor memory Technologies, memory organization.

UNIT 3:

Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers–program controlled, interrupt driven and DMA, privileged and non- privileged instructions, software interrupts and exceptions. Programs and processes–role of interrupts in process state transitions, I/O device interfaces – SCII, USB

UNIT 4:

Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards.

Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency.

UNIT 5:

Memory organization: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.

Reference books:

- "Computer Organization and Design: The Hardware/Software Interface", 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.
- "Computer Organization and Embedded Systems", 6th Edition by Carl Hamacher, McGraw Hill Higher Education.
- "Computer Architecture and Organization", 3rd Edition by John P. Hayes, WCB/ McGraw-Hill
- "Computer Organization and Architecture: Designing for Performance", 10th Edition by William Stallings, Pearson Education.
- "Computer System Design and Architecture", 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education.

Course outcomes

- Draw the functional block diagram of single bus architecture of a computer and describe the function of the instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set.
- Write assembly language program for specified microprocessor forcomputing16bit multiplication, division and I/O device interface ADC,
- Write a flowchart for Concurrent access to memory and cache coherency in Parallel Processors and describe the process.
- Given a CPU organization and instruction, design a memory UNIT and analyze its operation by interfacing with the CPU.
- Given a CPU organization, assess its performance, and apply design techniques to enhance performance using pipelining, parallelism and RISC methodology

BTCSE 403: Operating Systems

Objectives of the course

To learn the fundamentals of Operating Systems.

- To learn the mechanisms of OS to handle processes and threads and their communication
- To learn the mechanisms involved in memory management in contemporary OS
- To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols
- To know the components and management aspects of concurrency management

UNIT 1:

Introduction: Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS - Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine. Case study on UNIX and WINDOWS Operating System.

Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching

Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads,

Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling

Criteria: CPU utilization, Throughput, Turn-around Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and non-pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time scheduling: RM and EDF.

UNIT 2:

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

UNIT 3:

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

UNIT 4:

Memory Management: Basic concept, Logical and Physical address map, Memory a l location: Contiguous Memory a l location – Fixedandvariablepartition–

InternalandExternalfragmentationandCompaction; Paging: Principle of operation – Page allocation–Hardware support for paging, Protection and sharing, Disadvantages of paging.

Virtual Memory: Basics of Virtual Memory–Hardware and control structures – Locality of reference, Page fault , Working Set , Dirty page/ Dirty bit–Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO),Second Chance (SC), Not Recently used (NRU) and Least Recently used (LRU).

UNIT 5:

I/O Hardware: I/O devices, Device controllers, direct memory access Principles of I/O Software: Goals of Interrupt handlers, Device drivers, Device independent I/O software, Secondary-Storage Structure: Disk structure, Disk scheduling algorithms

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods(contiguous, linked, indexed),Free-space management(bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance.

Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks

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Reference books:

- Operating System Concepts Essentials, 9th Edition by Avi Silberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.
- Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India.
- Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing
- Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley
- Design of the Unix Operating Systems, 8th Edition by Maurice Bach, Prentice-Hall of India
- Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly and Associates

Course Outcomes

- Create processes and threads.
- Develop algorithms for process scheduling for a given specification of CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time.

- For a given specification of memory organization develop t h e t e c h n i q u e s f o r optimally allocating memory to processes by increasing memory utilization and for improving the access time.
- Design and implement file management system.
- For a given I/O devices and OS (specify) develop the I/O management functions in OS as part of a uniform device abstraction by performing operations for synchronization between CPU and I/O controllers.

BTCSE 404: Design and Analysis of Algorithms

Pre-requisites: Programming for Problem Solving

Objectives of the course

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

UNIT 1:

Introduction: Characteristics of algorithm. Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average and worst-case behavior; Performance measurements of Algorithm, Time and space trade-offs, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem.

UNIT2:

Fundamental Algorithmic Strategies: Brute-Force, Greedy, Dynamic Programming, Branch-and-Bound and Backtracking methodologies for the design of algorithms; Illustrations of these techniques for Problem-Solving , Bin Packing, Knap Sack TSP. Heuristics – characteristics and their application domains.

UNIT 3:

Graph and Tree Algorithms: Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms, Transitive closure, Minimum Spanning Tree, Topological sorting, Network Flow Algorithm.

UNIT 4:

Tractable and Intractable Problems: Computability of Algorithms, Computability classes – P, NP, NP-complete and NP-hard. Cook's theorem, Standard NP-complete problems and Reduction techniques.

UNIT 5:

Advanced Topics: Approximation algorithms, Randomized algorithms, Class of problems beyond NP – P SPACE

Reference books:

- Introduction to Algorithms, 4TH Edition, Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, MIT Press/McGraw-Hill.
- Fundamentals of Algorithms – E. Horowitz et al.
- AlgorithmDesign,1STEdition,JonKleinbergand ÉvaTardos, Pearson.
- Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Michael T Goodrich and Roberto Tamassia, Wiley.
- Algorithms -- A Creative Approach, 3RD Edition, UdiManber, Addison-Wesley, Reading, MA.

Course Outcomes

- For a given algorithms analyze worst-case running times of algorithms based on asymptotic analysis and justify the correctness of algorithms.
- Describe the greedy paradigm and explain when an algorithmic design situation calls for it. For a given problem develop the greedy algorithms.
- Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Synthesize divide-and-conquer algorithms. Derive and solve recurrence relation.
- Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. For a given problems of dynamic-programming and
- Develop the dynamic programming algorithms, and analyze it to determine its computational complexity.
- For a given model engineering problem model it using graph and write the corresponding algorithm to solve the problems.
- Explain the ways to analyze randomized algorithms (expected running time, probability of error).
- Explain what an approximation algorithm is. Compute the approximation factor of an approximation algorithm (PTAS and FPTAS).

BTCSE 405 - Organizational Behaviour

Objectives

- OB deals with the field of study relating to 3 determinants of behaviour namely behaviour of individuals, organizations, groups.
- At the individual level, the course will focus to understand the motive of management theory and the psychology of individual in an organization.
- At the group level, the course will focus on group dynamics and processes, norms, roles, team building, power and politics, leadership.
- At the organizational level, the focus will be on organizational culture and change management.

UNIT 1: Contemporary Issues in Organizational Behaviour, Organizational Behavior Modification

UNIT II: Individual and Interpersonal Behavior, Values, Attitude, Job satisfaction

UNIT III: Learning Organization Structure & Design, Group and Group Behavior

UNIT IV: Power and Politics, Conflict and Negotiation

UNIT V: Organizational Climate & Culture, Organizational Change, Development and Effectiveness

Text/Reference Books

- Organization Behaviour – 13th Edition by Stephen P. Robbins, Timothy A. Judge & Seema Sanghi, Pearson Publication, New Delhi.
- Understanding Organizational Behaviour by Udai Pareek, Second Edition, Oxford University Press.
- Organizational Behaviour, Margie Parikh and Rajan Gupta, Tata McGraw Hill Education Private Limited, New Delhi.
- Organizational Behaviour, Steven L McShane, Mary Ann Von Glinow, Radha R Sharma, Tata McGraw-Hill Education Private Limited, New Delhi.
- Organizational Behaviour: Concepts and Applications, Dipak Kumar Bhattacharyya, Oxford University Press.
- Organizational Behaviour: Concepts, Realities, Applications and Challenges, P G Aquinas, Excel Books.

- Organizational Behaviour: Text and Cases, Kavita Singh, Pearson Publication, New Delhi.

- Organizational Behaviour: A Modern Approach by Arun Kumar and N Meenakshi, Vikas Publishing House Pvt. Ltd.
- Organizational Theory, Design and Change, Gareth R. Jones and Mary Mathew, sixth edition, Pearson, New Delhi.
- Organizational Behaviour: Text, Cases and Games, K. Aswathappa, Eighth Revised Edition 2008, Himalaya Publishing House, New Delhi.

BTCSE 406-Computer Organization &Architecture Laboratory

Lab based on Computer Organization &Architecture

BTCSE 407-Operating Systems Laboratory

Lab based on Operating Systems

BTCSE 408-Design and Analysis of Algorithms Laboratory

Lab based on Design and Analysis of Algorithms

BTCSE 202: Mathematics –II UNIT

1: Basic Probability:

Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.

UNIT 2: Continuous Probability Distributions

Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities.

UNIT 3: Bivariate Distributions

Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.

UNIT 4: Basic Statistics

Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation

UNIT 5: Applied Statistics

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations. Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

Reference books:

- Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
- P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).
- S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
- W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.
- N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
- B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
- Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.

BTCSE 203-PROGRAMMING FOR PROBLEM SOLVING

Unit 1:

Introduction to Programming: Introduction to components of a computer system (disks,

memory, processor, where a program is stored and executed, operating system, compilers etc.): Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/ Pseudo-code with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code

Unit 2:

Arithmetic expressions and precedence, Conditional Branching, Writing and evaluation of conditionals and consequent branching**,** Iteration and loops

Unit 3

Basic Algorithms: Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required), Arrays: Arrays (1-D, 2-D), Character arrays and Strings

UNIT 4

Function: Functions (including using built in libraries), Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference, Recursion: Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

UNIT 5

Structure: Structures, Defining structures and Array of Structures, Pointers: Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation), File handling (only if time is available, otherwise should be done as part of the Laboratory)

Suggested Text Books

- Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
- E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

Suggested Reference Books

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

Course Outcomes

The student will learn:

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

BTCSE 207- Programming for Problem Solving Laboratory

Lab based on Programming for Problem Solving

SEMESTER V

BTCSE 501-Signals and System

Course Objective:

- Knowledge about Basic Signal and System Modeling Concept and Definitions.
- Knowledge about the Application and use of Mathematical Transforms and State-Variables in order to Solve Electrical Engineering Problems.
- Knowledge in the use of a Modern Computation Software Tool for the Analysis of Electrical Engineering Problems.

Unit – I: Introduction to Signals and Systems Concepts

Signals and Systems Introduction: Signals and Systems as Seen in Everyday Life and in Various Branches of Engineering and Science, Signals: Energy and Power Signals, Continuous and Discrete Time Signals, Continuous and Discrete Amplitude Signals, System Properties: Linearity, Additivity and Homogeneity, Shift-Invariance, Causality, Stability, Realizability.

Unit – II: Linear Shift-Invariant (LSI) Systems

Linear Shift-Invariant (LSI) systems: Impulse Response and Step Response, Convolution, Input Output Behavior with Aperiodic Convergent Inputs, Types of Shift Invariant Systems: Characterization of Causality and Stability of Linear Shift-Invariant Systems, System Representation through Differential and Difference Equations.

Unit – III: Fourier Series Representation

LSI Inputs and Response: Periodic and Semi-periodic Inputs to an LSI system, The Notion of a Frequency Response and its Relation to the Impulse Response, Fourier series representation: the Fourier Transform, Convolution/Multiplication and their effect in the frequency domain, Magnitude and Phase Response, Fourier Domain Duality: The Discrete- Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT), Parseval's Theorem: The Idea of Signal Space and Orthogonal Bases.

Unit – IV: Laplace and Z-Transform

The Laplace Transform: Notion of Eigen Functions of LSI systems, A Basis of Eigen Functions, Region of Convergence, Poles and Zeros of System, Laplace Domain Analysis: Solution to Differential Equations and System Behavior, The Z-Transform for discrete time signals and systems: Eigen Functions, Region of Convergence, Z-domain Analysis.

Unit – V: State-Space Analysis

State-Space Analysis and Multi-Input: Multi-Output Representation, State-Transition Matrix and its Role, Sampling Theorem and its Implications: Spectra of Sampled Signals, Reconstruction: Ideal Interpolator, Zero-Order Hold, First-Order Hold, and so on, Aliasing and its Effects: Relation between Continuous and Discrete Time Systems.

Text Books:

- A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", Prentice Hall, 1983.
- R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete", 4th edition, Prentice Hall, 1998.

Reference book:

- Robert A. Gabel, Richard A. Roberts, "Signals and Linear Systems", John Wiley and Sons, 1995.
- M. J. Roberts, "Signals and Systems - Analysis using Transform methods and MATLAB",TMH, 2003.
- J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, "Signals and Systems", TMH New Delhi, 2001.

Learning Outcomes:

- Analyze Different Types of Signals.
- Represent Continuous and Discrete Systems in Time and Frequency Domain using Different Transforms.
- Investigate whether the System is Stable.
- Sampling and Reconstruction of a Signal.

BTCSE 502-Database Management Systems

Course Objective:

- To understand the different Issues involved in the Design and Implementation of a Database System.
- To study the Physical and Logical Database Designs, Database Modeling, Relational, Hierarchical, and Network Models.
- To understand and use Data Manipulation Language to Query, Update, and Manage a Database.
- To develop an understanding of essential DBMS concepts such as: Database Security, Integrity, Concurrency, Distributed Database, and Intelligent Database, Client/Server (Database Server), Data Warehousing.
- To design and build a simple Database System and demonstrate competence with the fundamental tasks involved with Modeling, Designing, and Implementing a DBMS.

Unit – I: Database System Architecture

Database System Architecture: Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML), Data Models: Entity-Relationship

Model, Network Model, Relational and Object-Oriented Data Models, Integrity Constraints, Data Manipulation Operations.

Unit – II: Relational Query Languages

Relational Query Languages: Relational Algebra, Tuple and Domain Relational Calculus, SQL3: DDL and DML Constructs, Open Source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL Server, Relational Database Design: Domain and Data Dependency, Armstrong's Axioms, Normal Forms, Dependency Preservation, Lossless Design, Query Processing and Optimization: Evaluation of Relational Algebra Expressions, Query Equivalence, Join Strategies, Query Optimization Algorithms.

Unit – III: Transaction Processing

Transaction Processing: Concurrency Control, ACID Property, Serializability: Serializability of Scheduling, Locking and Timestamp Based Schedulers, Multi-version and Optimistic Concurrency Control schemes, Database Recovery.

Unit – IV: Storage and Security of Database

Storage Strategies: Indices, B-trees, Hashing. Database Security: Authentication, Authorization and Access Control, Security Models: DAC, MAC and RBAC Models, Intrusion detection: SQL injection.

Unit – V: Advanced Topics

Advanced Topics: Object Oriented and Object Relational Databases, Logical Databases, Web databases, Distributed databases, Data warehousing and Data Mining.

Text Books:

- "Database System Concepts", 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.
- "Principles of Database and Knowledge – Base Systems", Vol 1 by J. D. Ullman, Computer Science Press.

Reference Books:

- "Fundamentals of Database Systems", 5th Edition by R. Elmasri and S. Navathe, Pearson Education.
- "Foundations of Databases", Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley.

Learning Outcomes:

- For a given query write relational algebra expressions for that query and optimize the developed expressions.
- For a given specification of the requirement design the databases using E-R Method and Normalization.
- For a given specification construct the SQL queries for open source and Commercial DBMS -MYSQL, ORACLE, and DB2.

- For a given query optimize its execution using Query optimization algorithms.
- For a given transaction-processing system, determine the transaction atomicity, consistency, isolation, and durability.
- Implement the isolation property, including locking, time stamping based on concurrency control and Serializability of scheduling.

BTCSE 503-Formal Language & Automata Theory

Course Objectives:

- Develop a formal notation for strings, languages and machines.
- Design finite automata to accept a set of strings of a language.
- Prove that a given language is regular and apply the closure properties of languages.
- Design context free grammars to generate strings from a context free language and convert them into normal forms.
- Prove equivalence of languages accepted by Push down Automata and languages generated by context free grammars.
- Identify the hierarchy of formal languages, grammars and machines.
- Distinguish between computability and non-computability and Decidability and un-decidability.

Unit – I: Introduction to Regular Language and Grammar

Introduction: Alphabet, Languages and Grammars, Productions and Derivation: Chomsky Hierarchy of Languages, Regular Languages and Finite Automata: Regular Expressions and Languages: Deterministic Finite Automata (DFA) and Equivalence with Regular Expressions, Nondeterministic Finite Automata (NFA) and Equivalence with DFA, Regular Grammars and Equivalence with Finite Automata, Properties of Regular Languages: Pumping Lemma for Regular Languages, Minimization of Finite Automata.

Unit – II: Context-free Grammar and Languages

Context-free Languages and Pushdown Automata: Context-free grammars (CFG) and Languages (CFL), Chomsky and Greibach Normal Forms, Nondeterministic Pushdown Automata (PDA) and Equivalence with CFG, Parse Trees, Ambiguity in CFG, Pumping lemma for Context-free Languages, Deterministic Pushdown Automata, Closure Properties of CFLs.

Unit – III: Context-Sensitive Languages

Context-Sensitive Languages: Context-Sensitive Grammars (CSG) and languages, linear bounded automata and equivalence with CSG.

Unit – IV: Turing Machines

Turing Machines: The Basic Model for Turing Machines (TM), Turing-Recognizable (Recursively Enumerable) and Turing-Decidable (Recursive) Languages and their Closure

Properties, Variants of Turing Machines, Nondeterministic TMs and Equivalence with Deterministic TMs, Unrestricted Grammars and Equivalence with Turing Machines, TMs as Enumerators.

Unit – V: Un-Decidability

Un-Decidability: Church-Turing Thesis, Universal Turing Machine, Universal and Diagonalization Languages, Reduction between Languages and Rice s theorem, Un-decidable Problems about Languages.

Text Books:

- John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, Introduction to Automata Theory, Languages, and Computation, Pearson Education Asia.
- Harry R. Lewis and Christos H. Papadimitriou, Elements of the Theory of Computation, Pearson Education Asia.

Reference Books

- Dexter C. Kozen, Automata and Computability, Undergraduate Texts in Computer Science, Springer.
- Michael Sipser, Introduction to the Theory of Computation, PWS Publishing.
- John Martin, Introduction to Languages and the Theory of Computation, Tata McGraw Hill.

Learning Outcomes:

- Write a formal notation for strings, languages and machines.
- Design finite automata to accept a set of strings of a language.
- For a given language determine whether the given language is regular or not.
- Design context free grammars to generate strings of context free language.
- Determine equivalence of languages accepted by Push down Automata and languages generated by context free grammars.
- Write the hierarchy of formal languages, grammars and machines.
- Distinguish between computability and non-computability and Decidability and un-decidability.

BTCSE 504-Object Oriented Programming

Course Objectives:

1. The course will introduce standard tools and techniques for software development, using object-oriented approach.
2. Use of a version control system, an automated build process, and an appropriate framework for automated unit and integration tests.

Unit – I: Introduction

Introductory Concepts of ADT: Abstract Data Types and their Specifications.

Unit – II: Abstract Data Types

Implement an ADT: Concrete State Space, Concrete Invariant, Abstraction function, Implementing Operations, illustration by the Text examples.

Unit – III: Features of Object-Oriented Programming

Features of Object-Oriented Programming: Encapsulation, Object Identity, Polymorphism – but not inheritance.

Unit – IV: Object Oriented Design

Inheritance in OO design: Design Patterns, Introduction and Classification, The Iterator Pattern: Model-View-Controller Pattern, Commands as Methods and as Objects, Implementing OO Language Features, Memory Management.

Unit – V: Generic Types

Generic types and collections: GUIs, Graphical Programming with Scala and Swing, The Software Development Process.

Reference books

1. Barbara Liskov, Program Development in Java, Addison-Wesley, 2001.
2. Any book on Core Java.
3. Any book on C++

Learning Outcomes:

- Specify simple abstract data types and design implementations, using abstraction functions to document them.
- Recognize features of object-oriented design such as encapsulation, polymorphism, inheritance, and composition of systems based on object identity.
- Name and apply some common object-oriented design patterns and give examples of their use.
- Design applications with an event-driven graphical user interface.

BTCSE 505-Humanities II (Professional Practice, Law & Ethics)

UNIT I: History of Legal Profession in India:

Ancient legal texts including Manusmriti, Arthashastra, Quran refers to the law, advocates, judges and courts. Law and lawyers existed and played an important role at all times, even in ancient period. The system underwent certain changes during medieval and the period of British rule. Our present legal system including the judicial is to a large extent based upon the British legal and judicial system. This UNIT contains the study of legal profession in India in ancient, medieval and especially the changes which the profession underwent during British rule and other related aspects essential to understand the history of legal profession in India.

Legal Education in India: The system of legal education, as existed in India during various periods, the changes it underwent during British rule, the introduction of three and five year courses making the system more qualitative, the impact of globalization upon the legal system, particularly upon the legal education, etc will be the issues covered under this UNIT. The role played by Bar Council, UGC and other bodies in regulating legal education in India, the suggestions made by Law Commission of India in its 184th Report will also be discussed.

UNIT II: Professional Ethics and Duties of Lawyers:

"Ethics is basis of a civilized and organized society. Ethics is a system, a philosophy of conduct of principles practiced by a person or group of persons. Every profession has its code of conduct, pertaining to right and wrong in conduct based on the principles of morality." The need and necessity of ethics in the legal profession, relevant theories explaining its value and relevance in legal profession will be the core issue of discussion under this UNIT. In addition, duties of lawyers towards his clients, court, public, his fellow attorneys, self, society, etc., will also be undertaken for discussion. Indian code of ethics will be discussed in comparison with that of American Code and other countries will be taken up for discussion. An advocate should practice law for the purpose of administering justice and making a living afterwards. The UNIT will also include role played by a lawyer in the administration of justice. The discussion will also cover issues like an advocate's duty towards legal reform, duty to provide legal aid, etc.

UNIT III: Rights & Interests and Limitations of Such Rights:

The rights to practice, right to argue his case, right over his professional fees, etc will be the core contents of this UNIT. Decisions of courts on, Advocate's right to strike" will be subject of deliberation. Conflicts of interests [lawyer –v- client's interests] and limitations of the rights of lawyers including restrictions on advertising, bar from carrying on other professions, etc will also be taken up for discussion.

UNIT IV: Regulation of Legal Profession:

"Nobody has a more sacred obligation to obey the law than those who make the law". A lawyer, being one involved with the process of law-making and interpretation is also bound by law. This UNIT will cover issues relating to regulation of legal profession in India, focusing more on topics like - the nature, composition, constitution, power, responsibilities and other related topics relating to the Bar Councils, etc. The enrolment of advocates, disciplining of advocates, etc will also be covered.

UNIT V: Liability for Deficiency in Service and other Wrongs Committed By Lawyers:

This UNIT includes the analysis of case laws and relevant laws like Consumer Protection Act, Contempt of Court proceedings, etc which imposes liability upon an advocate for the wrongs he commits in the course of his professional service.

Other Important Issues: The following topics of importance will be taken up for class discussion during the course: - Impact of Globalization on legal profession - Legal outsourcing in India. - Role of advocate in providing legal aid services. – Advocate's role in outside court / informal settlement of disputes. - Age bar and entry into practice

Suggested Readings:

1. Raju Ramachandran, Professional Ethics: Changing Profession and Changing Ethics (Lexis Nexis, Butterworths).

2. Dr. P. B. Mukharji, Professional Ethics of The Advocate(University of Burdwan)

3. P. RamanathaAiyer,Legal & Professional Ethics – Legal Ethics, Duties & Privileges of a Lawyer(Wadhwa Publications, Nagpur).

4. Justice V. R. Krishna Iyer,Law, Lawyers and Justice(b. R. Publishing Corpn, Delhi).

5. Stephen Gillers, Regulation of Lawyers: Problems of Law & Ethics(Little, Brown & Com Boston Toronto, London).

6. Ross Grauston (ed.), Legal Ethics & Professional Responsibility(Clarendon Press, Oxford).

7. Gary Bellow & Bea Moultan,The Lawyering Process: Ethics and Professional Responsibility, (The Foundation Press, Inc.).

8. D.V. SubbaRao, Sanjiva Row's The Advocates Act, 1961(LexisNexis, Butterworths).

9. Nicolson and Webb, Professional Legal Ethics(OUP).

- C. Sarkar, Modern Advocacy and Professional Ethics…

BTCSE 507-Database Management Systems Laboratory

Lab based on Database Management Systems

BTCSE 508-Object Oriented Programming Laboratory

Lab based on Object Oriented Programming

BTCSE509 - Constitution of India

Course Objectives: Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.

2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.

3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

UNIT I: History of Making of the Indian Constitution:

History, Drafting Committee, (Composition & Working), Philosophy of the Indian Constitution: Preamble, Salient Features

UNIT II: Contours of Constitutional Rights & Duties:

Fundamental Rights: Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT III: Organs of Governance:

Parliament: Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

UNIT IV: Local Administration:

District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

UNIT V: Election Commission:

Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Suggested reading

- The Constitution of India, 1950 (Bare Act), Government Publication.

2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.

3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.

4.D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Course Outcomes:

Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.

2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.

3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.

4. Discuss the passage of the Hindu Code Bill of 1956.

BTCSE 104-Engineering Graphics & Design

UNIT 1: Introduction to Engineering Drawing covering, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections

including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales;

UNIT 2: Orthographic Projections covering, Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes; **Projections of Regular Solids** covering ,those inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.

UNIT 3 :Sections and Sectional Views of Right Angular Solids covering, Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)

UNIT 4: Isometric Projections covering, Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions; **Overview of Computer Graphics** covering, listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids];

UNIT 5: Customization& CAD Drawing consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;

Reference Books:

- Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
- Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
- (iii)Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
- Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
- (Corresponding set of) CAD Software Theory and User Manuals

Course Outcomes

All phases of manufacturing or construction require the conversion of new ideas and design concepts into the basic line language of graphics. Therefore, there are many areas (civil, mechanical, electrical, architectural and industrial) in which the skills of the CAD technicians

play major roles in the design and development of new products or construction. Students prepare for actual work situations through practical training in a new state-of-the-art

computer designed CAD laboratory using engineering software. This course is designed to address:

- to prepare you to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- to prepare you to communicate effectively
- to prepare you to use the techniques, skills, and modern engineering tools necessary for engineering practice

The student will learn:

- Introduction to engineering design and its place in society Exposure to the visual aspects of engineering design
- Exposure to engineering graphics standards Exposure to solid modeling
- Exposure to computer-aided geometric design Exposure to creating working drawings
- Exposure to engineering communication

BTCSE 107-Engineering Graphics & Design Laboratory
Laboratory based upon Engineering Graphics & Design BTCSE 104

SEMESTER VI

BTCSE 601 Project–I

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

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

BTCSE 602 Complier Design

Objectives of the course

- To understand and list the different stages in the process of compilation. Identify different methods of lexical analysis
- Design top-down and bottom-up parsers
- Identify synthesized and inherited attributes Develop syntax directed translation schemes
- Develop algorithms to generate code for a target machine

UNIT 1:

Introduction: Phases of compilation and overview, Lexical Analysis (scanner): Regular languages, finite automata, regular expressions, from regular expressions to finite automata, scanner generator (lex, flex)

UNIT 2:

Syntax Analysis (Parser): Context-free languages and grammars, push-down automata, LL(1) gram-mars and top-down parsing, operator grammars, LR(O), SLR(1), LR(1), LALR(1) grammars and bottom-up parsing, ambiguity and LR parsing, LALR(1) parser generator (YAAC, bison)

UNIT 3:

Semantic Analysis: Attribute grammars, syntax directed definition, evaluation and flow of attribute in a syntax tree

UNIT 4:

Symbol Table: Its structure, symbol attributes and management, Run-time environment: Procedure activation, parameter passing, value return, memory allocation, and Scope, Intermediate Code Generation: Translation of different language features, different types of intermediate forms. Code Improvement(optimization): Analysis: control-flow, data-flow dependence etc.; Code improvement local optimization, global optimization, loop optimization, peep-hole optimization etc. Architecture dependent code improvement: instruction scheduling (for pipeline), loop optimization (for cache memory) etc. Register allocation and target code generation

UNIT 5:

Advanced topics: Type systems, data abstraction, compilation of Object-Oriented features and non-imperative programming languages

Course Outcomes

- For a given grammar specification develop the lexical analyzer
- For a given parser specification design top-down and bottom-up parsers
- Develop syntax directed translation schemes
- Develop algorithms to generate code for a target machine

BTCSE 603-Computer Networks

Pre-requisites: Computer Organization and Architecture, Operating Systems

Objectives of the course

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

UNIT 1:

Data communication Components: Representation of data and its flow Networks, Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.

UNIT 2:

Data Link Layer and Medium Access Sub Layer: Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggy backing, Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA

UNIT 3:

Network Layer: Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.

UNIT 4:

Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.

UNIT 5:

Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography

Reference books

- Data Communication and Networking, 4th Edition, Behrouz A. Forouzan, McGraw-Hill.
- Data and Computer Communication, 8th Edition, William Stallings, Pearson Prentice Hall India.
- Computer Networks, 8th Edition, Andrew S. Tanenbaum, Pearson New International Edition.
- Internetworking with TCP/IP, Volume 1, 6th Edition Douglas Comer, Prentice Hall of India.
- TCP/IP Illustrated, Volume 1, W. Richard Stevens, Addison-Wesley, United States of America.

Course Outcomes

- Explain the functions of the different layer of the OSI Protocol.
- Draw the functional block diagram of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) describe the function of each block.
- For a given requirement (small scale) of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) design it based on the market available component
- For a given problem related TCP/IP protocol developed the network programming.
- Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available software and tools.

BTCSE 604-Complier Design Laboratory

Lab based on Complier Design

BTCSE 605-Computer Networks Laboratory

Lab based on Computer Networks

BTCSE 205-English Language UNIT

1: Vocabulary Building

The concept of Word Formation

Root words from foreign languages and their use in English

Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives.

Synonyms, antonyms, and standard abbreviations.

UNIT 2: Basic Writing Skills

Sentence Structures, Use of phrases and clauses in sentences, Importance of proper punctuation, Creating coherence, Organizing principles of paragraphs in documents, Techniques for writing precisely

UNIT 3: **Identifying Common Errors in Writing**

Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Clichés

UNIT 4: **Nature and Style of sensible Writing**

Describing, Defining, Classifying, Providing examples or evidence, Writing introduction and conclusion

UNIT 5 Writing Practices and Oral Communication

Comprehension, Précis Writing, Essay Writing,

Oral Communication

(This UNIT involves interactive practice sessions in Language Laboratory)

Listening Comprehension, Pronunciation, Intonation, Stress and Rhythm, Common Everyday Situations: Conversations and Dialogues Communication at Workplace, Interviews, Formal Presentations

Reference Books:

- Practical English Usage. Michael Swan. OUP. 1995.
- Remedial English Grammar. F.T. Wood. Macmillan.2007
- On Writing Well. William Zinsser. Harper Resource Book. 2001

- Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
- Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
- Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

Course Outcomes

The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

APPLIED PHYSICS-II
BTCSE/ECE-202

Course Objective

- The development of technology is unthinkable without a firm foundation of Physics.
- Therefore, the engineering education at the undergraduate level is incomplete without a proper and sufficient training of Physics for a prospective engineer.
- With a view to cater to this need the present course aims to train the student in understanding and applications of the principles of Physics to actual situations.
- The emphasis of this course is on the development of conceptual skills and their application to actual problems rather than rigorous theoretical treatments.
- Most of the concepts and skills dealt with relate to what is termed as "Modern Physics" with a view to enable the student to update his/her scientific knowledge.
- It is said that "There is no Physics without Quantum Mechanics". Therefore due attention has been paid on the development of quantum concepts and ideas.
- The treatment of relatively well established physical concepts related with Mechanics and Electromagnetism also find their place in order to train the student in these basic skills which are vital for a prospective engineer.

UNIT 1: Semiconductor Materials

Semiconductors materials of interest for optoelectronic devices, LEDs: device structure, materials, characteristics and figures of merit, Semiconductor photodetectors- P-N junction,

Avalanche and Zener breakdown: structures, materials, working principle and characteristics, Noise limits on performance, Solar cells.

UNIT 2: Electromagnetic Theory

Motion of charged particles in crossed electric and magnetic fields, Velocity selector, Gauss law, continuity equation, Inconsistency in Ampere's law, Maxwell's equations (differential and integral forms), Poynting theorem and Poynting vector, Propagation of plane electromagnetic waves in conducting and non-conducting medium.

UNIT 3: Quantum Mechanics

Introduction to Quantum mechanics, wave nature of particles, Time-dependent and time-independent Schrodinger equation for wave function, expectation values, Wave-packets, uncertainty Principle, Solution of stationary state Schrodinger equation for particle in a box problem, Single step barrier, tunneling effect.

UNIT 4: Mechanical Systems

Newton's laws, Conservative and non-conservative forces, Concept of potential energy, Work energy theorem, Periodic and oscillatory motion, Simple harmonic motion, Time period, Frequency, Phase and phase constant, Energy in simple harmonic motion, Damped and forced oscillations.

UNIT 5: X-Rays

Crystalline and amorphous solids, Bragg's law, Historical background: Discovery of X-rays, Production of X-rays, Moseley's law, Properties of X-rays, Continuous and characteristic X-rays, Soft and hard X-rays, Applications.

Course Outcome:

After studying this course the student is expected to:

- Further build on the concepts learnt in semester I. He/She should be able to appreciate how extraordinary properties of semiconductors have translated into highly efficient, useful and multi-purpose semiconductor devices.
- Familiarize themselves with ideas related with electromagnetism which serves as a model theory in Physics till date.
- Get introduced to the realm of "indispensible" Quantum Mechanics and appreciate its applications and beauty of the quantum ideas.
- Refresh and further develop their understanding of the "backbone" of Physics-Mechanics and to apply its ideas in diverse areas.
- Develop the understanding of very useful field of X-rays which are laden with immense potential for diverse applications.

Books Recommended:

1. E.S. Yang, "Microelectronic Devices", McGraw Hill, Singapore, 1988.

2. D.A. Neamen, “Semiconductor Physics and Devices,” Times Mirror High Education Group, Chicago, 1997.
3. B.G. Streetman, “Solid State Electronic Devices”, Prentice Hall of India, 1995.
4. David Griffiths, “Introduction to Electrodynamics”.
5. R. Robinett, “Quantum Mechanics,” OUP Oxford, 2006.
6. G. Streetman and S.K. Banerjee, “Solid State Electronic Devices”, 7th edition, Pearson. 2014.

BTCSE 206- Applied Physics – II Lab

Lab based on Applied Physics – II

BTCSE 209- English Language Lab

Lab based on English Language

SEMESTER VII

BTCSE 701 Project–II

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

1. Survey and study of published literature on the assigned topic;
2. Working out a preliminary Approach to the Problem relating to the assigned topic;
3. Conducting preliminary Analysis/ Modeling/ Simulation/ Experiment/ Design/ Feasibility;
4. Preparing a Written Report on the Study conducted for presentation to the Department;

5. Final Seminar, as oral Presentation before a departmental committee.

BTCSE 702-BIOLOGY

UNIT I: Introduction: Introduction, Different Fields of Biology.

UNIT II: Origin of Life and Evolution: Different theories of origin of life, Experimental evidences supporting different theories. Lamarck, Darwinism and other theories of evolution, Documentary evidences supporting different evolution theories.

UNIT III: Ecology: Ecosystem, Food Chain, And Pollution.

Physiology: Process of Food intake and Digestion, Nerves conduction and electrophysiology, Muscle contraction and locomotion, Different Methods of Reproduction in prokaryotic and eukaryotic system

UNIT IV: Structure and function of eukaryotic and prokaryotic cells

UNIT V: Biological System: Structure-function of biological macromolecules, Central Dogma of Life, Replication, Transcription, Translation.

Reference Books:

1. J. L. Tymoczko, J. M.Berg and L. Stryer, Biochemistry, 5th Ed, W. H. Freeman & Co, 2002.

2.D. L. Nelson and M. M. Cox, Lehninger Principles of Biochemistry, Macmillan Worth, 2000.

3. N. Hopkins, J. W. Roberts, J.A.Steitz, J. Watson and A. M. Weiner, Molecular Biology of the Gene, 4th Ed, Benjamin Cummings, 1987.

4.C. R. Cantor and P. R. Schimmel, Biophysical Chemistry (Parts I, II and III), W.H. Freeman & Co., 1980. 5. C. C. Chatterjee, Human Physiology, Vol 1 & 2, 11th Ed, Medical Allied Agency, 1987.

BTCSE 108-Essence of Indian Traditional knowledge

COURSE OBJECTIVE:

The objective of this course is to familiarize the prospective engineers with elements of Indian history and sociological concepts and theories by which they could understand contemporary issues and problems in Indian society. The course would enable them to analyze critically the social processes of globalization, modernization and social change. All of this is a part of the quest to help the students imbibe such skills that will enhance them to be better citizens and human beings at their work place or in the family or in other social institutions.

UNIT 1 Introduction to Elements of Indian History: What is history? ; History Sources-Archaeology, Numismatics, Epigraphy & Archival research; Methods used in History; History & historiography; Introduction to sociological concepts-structure, system, organization, social institutions, Culture social stratification (caste, class, gender, power).State & civil society; (7 Lectures)

UNIT 2: Indian history & periodization; evolution of urbanization process: first, second

&third phase of urbanization; Evolution of polity; early states to empires; Understanding social structures- feudalism debate; Understanding social structure and social processes: Perspectives of Marx, Weber & Durkheim;

UNIT 3 : From Feudalism to colonialism-the coming of British; Modernity & struggle for independence; Political economy of Indian society. Industrial, Urban, Agrarian and Tribal society; Caste, Class, Ethnicity and Gender; Ecology and Environment;

UNIT 4: Issues & concerns in post-colonial India (up to 1991); Issues & concerns in postcolonial India 2nd phase (LPG decade post 1991) ,

UNIT 5 : Social change in contemporary India: Modernization and globalization, Secularism and communalism, Nature of development, Processes of social exclusion and inclusion, Changing nature of work and organization

Reference Books:

- History
    - Desai, A.R. (2005), Social Background of Indian Nationalism, Popular Prakashan
    - Guha, Ramachandra (2007), India After Gandhi, Pan Macmillan
    - Thapar, Romila (2002), Early India, Penguin
    - Sharma R.S.(1965), Indian Feudalism, Macmillan
    - Deshpande, Satish (2002), Contemporary India: A Sociological View, Viking
    - Gadgil, Madhav & Ramachandra Guha(1993), This Fissured Land: An Ecological History of India, OU Press
- (b) Sociology:
    - Giddens, A (2009), Sociology, Polity, 6th edn.
    - Haralambos M, RM Heald, M Holborn (2000), Sociology, Collins
    - Xaxa, V (2008), State, Society and Tribes Pearson

- Chandoke, Neera & Praveen Priyadarshi (2009), Contemporary India: Economy, Society and Politics, Pearson

- Oommen,T.K.(ed.) (1997), Citizenship and National Identity: From Colonialism to Globalization, Sage.

- Mohanty, M (ed.) (2004), Class, Caste & Gender- Volume 5, Sage

- Dhanagare, D.N. , Themes and Perspectives in Indian Sociology, Rawat
- Ramaswamy, E.A. and Ramaswamy,U.(1981), Industry and Labour, OU Press
- Bhowmik, S (ed.) (2010), Street Vendors in the Global Urban Economy, Routledge
- Rao, M.S.A. (ed.) (1974), Urban Sociology, Orient Longmans

SEMESTER VIII

BTCSE 801 Dissertation

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

1. In depth study of the topic assigned in the light of the Report prepared under Project- I/ II;
2. Review and finalization of the Approach to the Problem relating to the assigned topic;

3. Preparing an Action Plan for conducting the investigation, including team work;
4. Detailed Analysis/Modeling/Simulation/Design/Problem Solving/Experiment as needed;
5. Final development of product/process, testing, results, conclusions and future directions;
6. Preparing a paper for Conference presentation/Publication in Journals, if possible;
7. Preparing a Dissertation in the standard format for being evaluated by the Department.
8. Final Seminar Presentation before a Departmental Committee.

BTCSE 211-Environmental Sciences

The syllabus of Environmental sciences provides an integrated, quantitative and interdisciplinary approach to the study of environmental systems. The students of Engineering undergoing this Course would develop a better understanding of human relationships, perceptions and policies towards the environment and focus on design and technology for improving environmental quality. Their exposure to subjects like understanding of earth processes, evaluating alternative energy systems, pollution control and mitigation, natural resource management and the effects of global climate change will help the students bring a systems approach to the analysis of environmental problems;

UNIT 1: Concepts of Environmental Sciences covering, Environment, Levels of organizations in environment, Structure and functions in an ecosystem; Biosphere, its Origin and distribution on land, in water and in air, Broad nature of chemical composition of plants and animals;

UNIT 2: Natural Resources covering Renewable and Non-renewable Resources, Forests, water, minerals, Food and land (with example of one case study); Energy, Growing energy needs, energy sources (conventional and alternative);

UNIT 3: Biodiversity and its conservation covering, Biodiversity at global, national and local levels; India as a mega-diversity nation; Threats to biodiversity (biotic, abiotic stresses), and strategies for conservation; Environmental Pollution covering, Types of pollution- Air, water (including urban, rural, marine), soil, noise, thermal, nuclear; Pollution prevention; Management of pollution- Rural/Urban/Industrial waste management [with case study of any one type, e.g., power (thermal/nuclear), fertilizer, tannin, leather, chemical, sugar], Solid/ Liquid waste management, disaster management;

UNIT 4: Environmental Biotechnology covering, Biotechnology for environmental protection- Biological indicators, bio-sensors; Remedial measures- Bio-remediation, phyto remediation, bio-pesticides, bio-fertilizers; Bio-reactors- Design and application. Social Issues and Environment covering, Problems relating to urban environment- Population pressure, water scarcity, industrialization; remedial measures; Climate change- Reasons, effects (global warming, ozone layer depletion, acid rain) with one case study; Legal issues- Environmental legislation (Acts and issues involved),Environmental ethics;

UNIT 5 Environmental Monitoring covering, Monitoring- Identification of environmental problem, tools for monitoring (remote sensing, GIS); Sampling strategies- Air, water, soil sampling techniques, Laboratory Work including Practical and Field Work covering, Plotting of bio-geographical zones and expanse of territorial waters on the map of India; Identification of biological resources (plants, animals, birds) at a specific location; Determination of (i) pH value, (ii) water holding capacity and (iii) electrical conductivity of different types of soils; Determination of energy content of plants by bomb calorimeter; Measurement and classification of noise pollution; Determination of particulate matter from an industrial area by high volume sampler; Determination of ico-chemical parameters (pH, alkalinity, acidity, salinity, COD, BOD) of tap water, well water, rural water supply industrial effluent and seawater & potability issues; Demonstration of Remote Sensing and GIS methods; Industrial visit for environmental biotechnology processes (e.g., any one of the fermentation, tissue culture, pharmaceutical industries)

OPEN ELECTIVES

BTCSE OE11: SOFT SKILLS AND INTERPERSONAL COMMUNICATION

COURSE OBJECTIVES

UNIT I - Self Analysis:

SWOT Analysis, Who am I, Attributes, Importance of Self Confidence, Self Esteem.

UNIT II - Creativity:

Out of box thinking, Lateral Thinking, OBJECTIVE THINKING, perception.

UNIT III - Attitude:

Factors influencing Attitude, Challenges and lessons from Attitude, Etiquette.

UNIT IV – Motivation:

Factors of motivation, Self-talk, Intrinsic & Extrinsic Motivators.

UNIT V: Goal Setting : Wish List, SMART Goals, Blue print for success, Short Term, Long Term, Life Time Goals. Time Management Value of time, Diagnosing Time Management, Weekly Planner To do list, Prioritizing work. Extempore

TEXT BOOK:

SOFT SKILLS, 2015, Career Development Centre, Green Pearl Publications .

REFERENCE BOOK:

1. Covey Sean, Seven Habits of Highly Effective Teens, New York, Fireside Publishers, 1998.
2. Carnegie Dale, How to win Friends and Influence People, New York: Simon & Schuster, 1998.
3. Thomas A Harris, I am ok, You are ok , New York-Harper and Row, 1972 4. Daniel Coleman, Emotional Intelligence, Bantam Book, 2006

BTCSE OE12: Human Resource Development and Organizational Behaviour

COURSE OBJECTIVES

The objectives of the course are to familiarize the participants with the behavioural patterns of human beings at individual and group levels in the context of an Organization.

Unit I Organizational Behavior:

Definition, Need for studying Organizational Behavior, Disciplines involved in the study of Organizational Behavior, -Contributing disciplines and area like psychology, social psychology, economics, anthropology etc. Application of Organizational Behavior in Business.

Unit II Individual behaviour:

Personality, perception, learning, attitudes inter-personal behaviour – Group and inter-group behaviour.

Unit III Group Dynamics:

Formal and Informal Group, Group Norms, Group Cohesiveness, Group Behaviour and Group Decision – making.

Unit IV Introduction: Conceptual foundations; Human aspect of management, Human Relations; Human Resource Management- Concept, Scope and Importance; Competencies of HR Manager: Employer branding and Competency mapping; Changing role of HRM- Workforce diversity, Technological change, Restructuring and rightsizing, Empowerment; TQM, Managing ethical issues.

Unit V- Human Resource Planning, Job Analysis, and Job Design:

Assessing Human Resource requirements; Human resource forecasting; Work load analysis; Job analysis; Job description and specifications; Job design; Job characteristic approach to job design. Recruitment, Selection, Training, and Development: Factors affecting recruitment; Sources of recruitment (internal and external); Basic selection model; Psychological tests for selection; Interviewing; Placement and Induction; Job Changes- Transfers, Promotions, and Separations; An overview of Training and Development; Emerging trends in Recruitment, Selection, and development.

Text books:

1. Organizational Behaviour, India Edition, Nelson & Quick, Cengage learning.

2. Organisational Behaviour, S. Fayyaz Ahamed and others, Atlantic publisher.

3. Organisation Behaviour, A modern approach – Arun Kumar & N. Meenakshi Vikas publishing House PVT Ltd.,

4. Behaviour in organizations, Indian Edition, Jerald Green Berg and Robert A. Baron – PHI Learning PVT Ltd.,

5. Organisational Behaviour, UMA Sekaran, Tata Mcgraw Hill.

6. D'Cenzo, David A., Stephen P. Robbins, and Susan L. Verhulst, Human Resource Management, John Wiley and Sons, NewDelhi.

7. Gomez-Mejia, Luis R., D. B. Balkin, and R. L. Cardy, Managing Human Resources, Prentice Hall, NewJersey.

8. Ian, Beardwell, and Len Holden, Human Resource Management, Prentice Hall.

9. Dessler, Garry, Human Resource Management, Prentice Hall of India

BTCSE OE13: Cyber Law and Ethics

COURSE OBJECTIVES

1. Students identify and analyze statutory, regulatory, constitutional, and organizational laws that affect the information technology professional.

2. Students lo

field.

cate and apply case law and common law to current legal dilemmas in the technology

3. Students apply diverse viewpoints to ethical dilemmas in the information technology field and recommend appropriate actions.

4. Students distinguish enforceable contracts from non-enforceable contracts.

5. Students demonstrate leadership and teamwork.

UNIT I: Applied Ethics

What ethics is and is not, Explore differences between laws and ethics, Ethical viewpoints, Virtue, Natural Rights, Fairness (Justice), Ethical decision making process, Laws and ethics of employee monitoring, Review ethical codes of IT professional organizations

UNIT II: Cyber Law: Legal Issues and Challenges in India, USA and EU

1. Data Protection, Cyber Security,

B) Legal recognition of Digital Evidence

C) Recognition of liability in the digital world

4. Jurisdiction Issues in Transnational Crimes

UNIT III: HIPAA: Health Insurance Portability and Accountability Act

Basics of HIPAA, Implications of HIPAA for IT professionals, Administrative procedures, Physical safeguards, Technical security services, Technical security mechanisms

UNIT IV Cyberspace Intellectual Property Laws and Issues

Copyright law: Fair use, DRM (Digital Rights Management) and the DMCA (Digital Millennium Copyright Act), Copyright Web issues; Patent Law: Software patents issues, Trademarks; Cybersquatting, Using trademarks in meta-tags, Software License agreements

UNIT V: Cyber Crime and Related Laws

Review of cybercrime statistics and trends, Cybercrime categories, Computer fraud, Gray Hat Hacking, Crimes and penalties under the Computer Fraud and Abuse Act (CFAA)

Textbook/Reference Book:

a. Yatindra Singh : Cyber Laws.

b. Ajit Narayanan and Bennum (ed.) : Law, Computer Science and Artificial Intelligence.

c. Linda Brennan and Victoria Johnson : Social, ethical and policy implication of Information Technology.

d. Kamath Nandan : Law relating to Computer, Internet and E-Commerce.

e. Arvind Singhal and Everett Rogers : India's Communication Revolution : From Bullock Carts to Cyber Marts.

f. Lawrence Lessing : Code and other Laws of cyberspace.

g. Mike Godwin : Cyber Rights Defencing free speech in the Digital Age.

h. Sunit Belapure and Nina Godbole, Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives, Wiley India Pvt. Ltd, 2011.

i. Mark F Grady, Fransesco Parisi, “The Law and Economics of Cyber Security”, Cambridge University Press, 2006

j. Jonathan Rosenoer, “Cyber Law: The law of the Internet”, Springer-Verlag, 1997.

BTCSE OE21: History of Science

Unit-I: Science and Technology-The beginning

Development in different branches of Science in Ancient India: Astronomy, Mathematics, Engineering and Medicine. 2. Developments in metallurgy: Use of Copper, Bronze and Iron in Ancient India. 3. Development of Geography: Geography in Ancient Indian Literature.

Unit-II: Developments in Science and Technology in Medieval India

Scientific and Technological Developments in Medieval India; Influence of the Islamic world and Europe; The role of *maktabs, madrasas* and *karkhanas* set up. 2. Developments in the fields of Mathematics, Chemistry, Astronomy and Medicine. 3. Innovations in the field of agriculture - new crops introduced new techniques of irrigation etc.

Unit-III: Developments in Science and Technology in Colonial India

Early European Scientists in Colonial India- Surveyors, Botanists, Doctors, under the Company‘s Service. Indian Response to new Scientific Knowledge, Science and Technology in Modern India: Development of research organizations like CSIR and DRDO; Establishment of Atomic Energy Commission; Launching of the space satellites.

Unit-IV: Prominent scientist of India since beginning and their achievement

Mathematics and Astronomy: Baudhayan, Aryabhtatta, Brahmgupta, Bhaskaracharya, Varahamihira, Nagarjuna. Medical Science of Ancient India (Ayurveda & Yoga): Susruta, Charak, Yoga & Patanjali. Scientists of Modern India: Srinivas Ramanujan, C.V. Raman, Jagdish Chandra Bose, Homi Jehangir Bhabha Dr. APJ Abul Kalam Azad and Dr. Vikram Sarabhai.

Textbook:

History of Science and Technology In India by Dr. Binod Bihari Satpathy

BTCSE OE22: Principles of Management

COURSE OBJECTIVES

To understand the principles of management and their application to the functioning of an organization

UNIT I: Management

Definition of management, science or art, manager vs entrepreneur; Types of managers - managerial roles and skills; Evolution of management-scientific, human relations, system and contingency approaches;

UNIT II: Types of Business Organizations

Sole proprietorship, partnership, company, public and private enterprises; Organization culture and environment; Current trends and issues in management.

UNIT III: Planning and Organization

Nature and purpose of Planning, types of Planning, objectives, setting objectives, policies, Strategic Management, Planning Tools and Techniques, Decision making steps & processes. Nature and purpose of Organizing, formal and informal organization, organization structure, types, line and staff authority, departmentalization, delegation of authority, centralization and Decentralization, job design, human resource management, HR Planning, Recruitment selection, training & development, performance management, career planning and management.

UNIT IV: Behaviour

Directing individual and group behaviour, motivation, motivation theories, motivational techniques, job satisfaction, job enrichment, leadership, types & theories of leadership, effective communication.

UNIT V: Control Techniques:

Controlling, system and process of controlling, budgetary and non-budget control technique, use of computer and IT in management control, productivity problems and management, control and performance, direct and preventive control, reporting.

Course Outcomes:

Upon completion of this course, the students will get a clear understanding of management functions in an organization

Text Books:

1. Robins S.P. and Couiter M., Management, Prentice Hall India, 10th ed., 2009.

2. Stoner JAF, Freeman RE and Gilbert DR, Management, 6th ed., Pearson Education, 2004.

3. Tripathy PC & Reddy PN, Principles of Management, Tata McGraw Hill, 1999.

BTCSE OE23: Operational Research

COURSE OBJECTIVES

Study the role of operational research in decision making. Learn, identify and develop operational research models from the verbal description of the real system. Understand the mathematical tools that are needed to solve optimisation problems. To study various types of deterministic and stochastic models for operations research viz. linear programming, waiting time model, project line model, transportation model, simulation.

UNIT I Introduction:

Definition, role of operations research in decision-making, applications in industry. Concept on O.R. model building –Types & methods.

UNIT II Programming (LP):

Programming definition, formulation, solution- graphical, simplex, BIG-M methods, Duality, PRIMAL-DUAL relations-its solution, shadow price, economic interpretation, dual-simplex, post-optimality & sensitivity analysis, problems.

UNIT III Deterministic Model:

Transportation model-balanced & unbalanced, north west rule, Vogel's Method, least cost or matrix minimal, Stepping stone method, MODI methods, degeneracy, assignment, traveling salesman, problems.

UNIT IV Waiting and Project Line Models:

Introduction, queue parameters, M/M/1 queue, performance of queuing systems, applications in industries, problems.

Network diagram, event, activity, defects in network, PERT & CPM, float in network, variance and probability of completion time, project cost- direct, indirect, total, Introduction to crashing of network & resources leveling in project, problems.

UNIT V Simulation and Decision Theory: Introduction, design of simulation, models & experiments, model validation, process generation, time flow mechanism, Monte Carlo methods- its applications in industries, Decision process, SIMON model, types of decision making environment - certainty, risk, uncertainty, decision making with utilities, problems.

Note: Concerned software's may be used to solve OR problems.

Course Outcomes: At the end of the course, the student shall be able to:

1. Discuss the role of operations research in decision-making, and its applications in industry and should be able to formulate and design real-world problems through models & experiments.

2. Knowledge of various types of deterministic models like linear programming, transportation model etc.

3. Explore various types of stochastic models like waiting line model, project line model, simulation etc.

4. Deduce the relationship between a linear program and its dual and perform sensitivity analysis.

5. Describe different decision making environments and apply decision making process in the real world situations.

Text Books:

1. Operation Research – TAHA, PHI, New Delhi.

2. Quantitative Techniques- Vohra, TMH, New Delhi

Reference Books:

1. Operation Research- Gupta & Sharma, National Publishers, New Delhi.

2. Introduction to Operations Research – Churchman, Ackoff, Arnoff. Pub. John Wiley

3. Principles of operation Research (with Applications to Managerial Decisions) by H.M.Wagher, Prentice Hall of India, New Delhi.

4. Operation Research – Sharma, Gupta, Wiley Eastern, New Delhi.

5. Operation Research – Philips, Revindran, Solgeberg, Wiley ISE.

BTCSE OE31: Infrastructure Systems Planning

COURSE OBJECTIVES

1. To provide an overview of Infrastructure scenario in India and their sector specific features
2. To provide required knowledge and skills planning and appraising sustainable civil Infrastructure systems and their interactions
3. To make student aware of the procurement management process involved in the infrastructure projects

UNIT 1 Introduction:

Infrastructure scenario in India: Sector wise details, infrastructure players, key issues and government initiatives in transport, power, telecom, urban and rural infrastructure sectors

UNIT II Infrastructure Project Planning:

Players in Infrastructure, Long term planning issues of infrastructure projects, Infrastructure planning process, Multi-criteria analysis for comparison of infrastructure alternatives; Infrastructure delivery methods including PPP

UNIT III: Infrastructure economics and financial models

Life cycle costing, Project structuring, Project Risks, Risk allocation and management, Integration of infrastructure systems.

UNIT IV: Infrastructure Project Appraisal:

Demand Analysis & Forecasting, Technical Analysis, Economic and Financial Analysis, Environmental Clearance Procedure in India, Environment Impact Assessment: Purpose & Process, EIA Hierarchy, Impact Indicators

UNIT V Infrastructure Project Management:

Project governance, Project management planning and control systems, Stake holder management, Legal and contractual issues, Procurement of infrastructure provider: process, pricing and negotiation, MIS for infrastructure projects

Learning Outcomes:

1. Student will have a broad understanding about the key infrastructure sectors and their related planning and management issues
2. Student will be capable of appraising an infrastructure project based on demand, technical and economic point of view
3. The student will be aware of the management process involved in the procurement of infrastructure projects

Reference Books:

1. James Parkin, D. Sharma, Infrastructure Planning, Thomas Telford, 1999
2. W. Ronald Hudson, Waheed Uddin, Ralph C. Haas, Infrastructure Management: Integrating Design, Construction, Maintenance, Rehabilitation and Renovation, McGraw-Hill Professional, 1997.
3. S. Goodman and M. Hastak, Infrastructure planning handbook: Planning, engineering, and economics, McGraw-Hill, New York, 2006.
4. J. D. Finnerty, Project financing - Asset-based financial engineering, John Wiley & Sons, New York, 1996.
5. Rajarshi Majumder, Infrastructure and Development in India, Interlinkages and Policy Issues, Rawat Publications, 2008.
6. P. Chandra, Projects: Planning, analysis, selection, financing, implementation, and review, Tata McGraw-Hill, New Delhi, 2009
7. Infrastructure Planning Handbook (Alvis S. Goodman and Makarand Hastak, 2006)
8. Infrastructure Management (Hudson, Haas and Uddin, 1997)

BTCSE OE32: Rural Technology and Community Development

Unit I: An Overview of Development

Traditional and Modern Concept of Development: Indicators of development; Theoretical approach to development (Marx, Rostov, Myrdal, International Dependence Theory).

UNIT 2: Major Issues in Development

Growth Vs. Distribution; Agricultural development Vs. Industrial development; Capital intensive Vs. Labour intensive technique; Urban Vs. Rural development; Centralisation Vs. Decentralisation.

UNIT 3: Rural Development and the nature of cultural transition in tribal society, Inequality and social development in Rural India State Analysis of Trends and Pattern in the period of Globalisation

UNIT 4 Importance, scope and objectives of rural Development

Various approaches to Rural Development – Gandhian approach for Community development, I.A.D.P., I.R.D.P., N.R.E.G.A., Neo Gandhian, (PURA), Need Based and demand based centers. Rural Development experiences of some Asian Countries – China, Malaysia, Sri Lanka, Bangladesh.

UNIT 5: Agriculture diversification

Population; pressure, small holdings, infrastructure, rural development. Role of Women in Rural Development, Marginalisation of Women in Land Reform Agenda, Situation of Dalitand Adivasi.

Reference Books:

1. Desai, Vasant. Fundamentals of Rural Development. New Delhi: Rawat Publications, 1991

2. Meier, Gerald (ed.). Leading Issues in Economic Development New Delhi: Oxford Uni. Press, 1987.

3. Prasad, B.K. Rural Development: Concept, Approach and Strategy New Delhi: Sarup & Sons, 2003.

4. Rau, S.K. Global Search for Rural Development Hyderabad: NIRD, 2001.

5. Satya Sundaram, I., Rural Development Mumbai: Himalaya, 2002.

BTCSE OE33: Supply Chain Management-Planning

COURSE OBJECTIVES

1. To introduce the major building blocks, major functions, major business processes, performance metrics, and major decisions

(strategic, tactical, and operational) in supply chain networks

2. To provide an insight into the role of Internet Technologies and Electronic Commerce in supply chain operations and to discuss

technical aspects of key ITEC components in supply chain management.

3. To bring out the role of stochastic models (Markov chains, queueing networks); optimization models (LP, ILP, MILP, GA, Constraint Programming); and simulation in supply chain planning and decision-making. This will provide the foundation for design and analysis of supply chains.

UNIT I: Building Blocks, Performance Measures, Decisions

Building Blocks of a Supply Chain Network, Performance Measures

Decisions in the Supply Chain World, Models for Supply Chain Decision-Making.

UNIT II Supply Chain Inventory Management

Economic Order Quantity Models, Reorder Point Models, Multiechelon Inventory Systems

UNIT III Mathematical Foundations of Supply Chain Solutions

Use of Stochastic Models and Combinatorial Optimization in: *Supply Chain Planning*, *Supply Chain Facilities Layout*, *Capacity Planning*, *Inventory Optimization*, *Dynamic Routing and Scheduling,* Understanding the "*internals"* of industry best practice solutions

UNIT IV Case Studies

Digital Equipment Case Study, IBM Case Study

UNIT V: Internet Technologies and Electronic Commerce in SCM

Relation to ERP, E-procurement, E-Logistics, Internet Auctions, E-markets, Electronic business process optimization, Business objects in SCM

Reference Books:

1. Analysis of Manufacturing Enterprises. Kluwer Academic Publishers.

2. Y. Narahari and S. Biswas. *Supply Chain Management: Models and Decision Making*

3. Ram Ganeshan and Terry P. Harrison. *An Introduction to Supply Chain Management*

4. D. Connors, D. An, S. Buckley, G. Feigin, R. Jayaraman, A. Levas, N. Nayak, R. Petrakian, R. Srinivasan. *Dynamic modelling for business process reengineering*. IBM Research Report 19944, 1995

5. W.J. Hopp and M.L. Spearman. Factory Physics: Foundations of Manufacturing Management

BTCSE OE41 Enterprise Resource and Planning

COURSE OBJECTIVES

1. Comprehend the technical aspects of ERP systems

Learn concepts of reengineering and how they relate to ERP system implementations

2. Be able to map business processes using process mapping techniques
3. Understand the steps and activities in the ERP life cycle
4. Be able to identify and describe typical functionality in an ERP system
5. You will gain competency in the main functional areas of SAP R/3: Sales & Distribution, Materials Management, Financial, Controlling, and HR.
6. You will understand current trends and issues related to Enterprise Systems.
7. You will learn about the change management issues in ERP implementations.

UNIT 1 Introduction

Introduction to ERP, Basic ERP Concepts, Justifying ERP Investments, Risks of ERP, Benefits of ERP

UNIT 2 ERP and Related Technologies

Business Intelligence, E-Business and E-Commerce, Business Process Reengineering (BPR), Data Warehousing, Data Mining, On-line Analytical Processing (OLAP) , Product Life Cycle Management (PLM), Supply Chain Management (SCM), Customer Relationship Management (CRM), Advanced Technology and ERP Security

UNIT 3 ERP Implementation Challenges

ERP Transition Strategies, ERP Implementation Life Cycle, Pre-implementation Tasks—Getting Ready, Requirements Definition, Implementation Methodologies, Not all package are created equal—Package Selection, Project Management & Monitoring, Post Implementation Activities, Implementation–Success and Failure Factors

UNIT 4 Operation and Maintenance of the ERP System

Measuring the Performance of the ERP System, Maximizing the ERP System

UNIT 5 Enterprise Integration Applications (EIA)

ERP and E-business: relationship and coexistence. ERP, Internet, and WWW—ERP II, ERP and Total Quality Management, Future Directions and Trends in ERP

Text Book

***1. Enterprise Resource Planning*, second edition,** Alexis Leon, Tata McGraw-Hill, 2008. ISBN 9780070656802

2. Concepts in Enterprise Resource Planning, Third Edition, Bret Wagner & Ellen Monk

©2009 | Course Technology, ISBN 10: 1-4239-0179-7 | ISBN 13: 978-1-4239-0179-2

Reference books

1. *Concepts in Enterprise Resource Planning*, Joseph A. Brady, Ellen F. Monk, Bret J. Wagner, Course Technology, 2001, ISBN 0-619-01593-4

2. *Enterprise Resource Planning Systems*, Daniel E. O'Leary, Cambridge University Press, 2000, ISBN 0-521-79152-9
3. *Using SAP R/3 FI*, Ben Rockfeller, John Wiley, 1998, ISBN 0-471-17996-5

BTCSE OE42: Customer Relationship Management

COURSE OBJECTIVES

a. To understand the concepts and principles of CRM

b. To appreciate the role and changing face of CRM as an IT enabled function, and

c. To enable managing Customer Relationship.

Unit – I CRM concepts

Acquiring customers, - Customer loyalty and optimizing customer relationships - CRM defined - success factors, the three levels of Service/ Sales Profiling - Service Level Agreements (SLAs), creating and managing effective SLAs.

Unit - II CRM in Marketing

One-to-one Relationship Marketing - Cross Selling & Up Selling - Customer Retention, Behaviour Prediction - Customer Profitability & Value Modeling, - Channel Optimization - Event-based marketing. - CRM and Customer Service - The Call Centre, Call Scripting - Customer Satisfaction Measurement.

Unit – III Sales Force Automation

Sales Process, Activity, Contact- Lead and Knowledge Management - Field Force Automation. - CRM links in e-Business - E-Commerce and Customer Relationships on the

Internet - Enterprise Resource Planning (ERP), - Supply Chain Management (SCM), - Supplier Relationship Management (SRM), - Partner relationship Management (PRM).

Unit – IV Analytical CRM

Managing and sharing customer data - Customer information databases - Ethics and legalities of data use - Data Warehousing and Data Mining concepts - Data analysis - Market Basket Analysis (MBA), Click stream Analysis, Personalization and Collaborative Filtering.

Unit – V CRM Implementation

Defining success factors - Preparing a business plan requirements, justification and processes.

- Choosing CRM tools - Defining functionalities - Homegrown versus out-sourced approaches - Managing customer relationships - conflict, complacency, Resetting the CRM strategy. Selling CRM internally - CRM development Team - Scoping and prioritizing - Development and delivery - Measurement.

References

1. Alok Kumar Rai, CUSTOMER RELATIONSHIP MANAGEMENT CONCEPT & CASES, Prentice Hall of India Private Limted, New Delhi. 2011

2.S. Shanmugasundaram, CUSTOMER RELA TIONSHIP MANAGEMENT, Prentice Hall of India Private Limted, New Delhi, 2008

3.Kaushik Mukherjee, CUSTOMER RELATIONSHIP MANAGEMENT, Prentice Hall of India Private Limted, New Delhi, 2008

4. Jagdish Seth, et al, CUSTOMER RELA TIONSHIP MANAGEMENT

5.V. Kumar & Werner J., CUSTOMER RELA TIONSHIP MANAGEMENT, Willey India, 2008

BTCSE OE43: Planning for Sustainable Development

COURSE OBJECTIVES

- The course seeks to build an inter-disciplinary perspective on understanding sustainable development concerns and challenges.

2. It also aims to provide students with a general introduction to the basic core competencies and practical skills

3. This course familiarizes students with current debates and perspectives in analyzing constraints and opportunities for sustainable development

UNIT I: Changing Perspectives

Definitions & Principles of Sustainable Development, Millennium Development Goals: Status (global and Indian), Inclusive Growth and Poverty Reduction, Impact on approach to development policy and practice in India, future directions

UNIT II: Challenges to Sustainable Development

Agriculture, Population & Food Security, Public Health and Nutrition, Education, Natural Resources (Forests, Energy, Water), Climate Change

UNIT III: Responses to sustainable Development Challenges

Public Policy (Community Participation and Participatory Learning)

Gender and Human Rights

Technology and Engineering

Economics and Policy Coherence

Learning outcomes

- The students will have a "generalist" development practitioner‟s perspective towards environmental management.

2. The students will have fairly good understanding of the current debates around concepts of sustainable development and practices.

Text/Reference Books

1. Hazell P. and Diao X. (2005) *The Role of Agriculture and Small Farms in Economic*

Development, Washington, D.C.: International Food Policy Research Institute.

2. Sachs J. (2006) *The End of Poverty: Economic Possibilities for Our Time*, Penguin (Chapters 1-4, 8, 14-18).

3. Cornwall A. and Brock K. (2005) What Do Buzzwords Do for Development Policy? A Critical Look at „Participation", „Empowerment" and „Poverty Reduction", *Third World Quarterly* 26(7), 1043–1060.

4. Human Development Reports

5. IPCC (2007) Summary for Policymakers of the Synthesis Report of the IPCC Fourth Assessment Report.

6. Johnson J.D. and Louka K. (2006) *Migration, Aid and Trade: Policy Coherence for Development*, OECD Development Centre Policy Brief No 28.

7. Laurence W.F. et al. (2001) The Future of the Brazilian Amazon, *Science*, Vol. 291 (5503), 438-439.

8. Luboobi L. and Mugisha J.T. (2005) *HIV/AIDS Pandemic in Africa: Trends and Challenges*, FondazioneEni Enrico Mattei.

9. Sachs D.J. and Wing T.W. (1994) *Structural Factors in the Economic Reforms of China, Eastern Europe and the Former Soviet Union,* Economic Policy, 9 (18), pp. 101-145.

10. Sachs J. and Malaney P. (2002) The Economic and Social Burden of Malaria, *Nature*, 415 (7).

11. Sarah D. (2004) *Key Policy Coherence Issues in Agriculture and Migration*, OECD.

12. UN Millennium Project (2005) *Innovation: Applying Knowledge in Development*, Science, Technology and Innovation Task Force Report.

13. UN Millennium Project (2005) *Investing in Development: A Practical Plan to Achieve the Millennium Development Goals, Overview.*

14. World Bank (2006) *Enhancing Agricultural Innovation: How to Go beyond the Strengthening of Research Systems,* World Bank: Agriculture and Rural Development

15. World Commission on Environment and Development (1987) *Our Common Future*, Oxford, OUP.

BTCSE OE51: Probability and Stochastic Processes

UNIT I: Sets and set operations

Probability space; Conditional probability and Bayes theorem; Combinatorial probability and sampling models.

UNIT II: Discrete random variables

Probability mass function, probability distribution function, example random variables and distributions; Continuous random variables, probability density function, probability distribution function

UNIT III: Distributions

Joint distributions, functions of one and two random variables, moments of random variables;

Conditional distribution, densities and moments; Characteristic functions of a random variable; Markov, Chebyshev and Chernoff bounds;

UNIT IV: Random Sequences

Random sequences and modes of convergence (everywhere, almost everywhere, probability,

Distribution and mean square); Limit theorems; Strong and weak laws of large numbers, central

Limit theorem.

UNIT V Random process

Stationary processes. Mean and covariance functions. Ergodicity. Transmission of random process through LTI. Power spectral density.

Text/Reference Books:

- H. Stark and J. Woods, ``Probability and Random Processes with Applications to Signal Processing," Third Edition, Pearson Education

2. A.Papoulis and S. Unnikrishnan Pillai, ``Probability, Random Variables and Stochastic Processes," Fourth Edition, McGraw Hill.

3. K. L. Chung, Introduction to Probability Theory with Stochastic Processes, Springer International

4. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability, UBS Publishers,

6. S. Ross, Introduction to Stochastic Models, Harcourt Asia, Academic Press.

Course Outcomes:

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

1. Understand representation of random signals
2. Investigate characteristics of random processes
3. Make use of theorems related to random signals
4. To understand propagation of random signals in LTI systems.

BTCSE OE52 IPR and Cyber Laws Unit

1: IPR -Concepts and Evolution

Introduction to Intellectual Property Rights (IPR), Evolution of Intellectual Property Laws Standards and Concepts in Intellectual Property, Conventions and Treaties Relating to Global administration of Intellectual Property Rights, Protection and Classification Regional Conventions and Treaties, Organization, Jurisdiction enforcement and Administration of IPRs, IPRs and Information Technology IPRs and Bio- technology, IPRs and Traditional Knowledge, Management of Intellectual Property Rights, Law of Intellectual Property and Ethical Issues, Knowledge Driven Economy and IPR, Intellectual Property Rights in India and abroad.

Unit -2: Law of Copyright, Patents and Trademarks

Introduction ,Evolution of patent Law, Scope and Purpose, Classification of Patents, Patent Law in India: Patent Act of 1970, The Patents (Amendments) Act, 2002, Patent Office and Authorities, Grant of Patent, Right and Obligation of a Patentee, Infringement of Patents,

Offenses and penalties, Patents and other commercial Law, Patents – International Law, Patents Law- Emerging Trends, Social Implication of Patents.

Introduction to Copyrights as forms of Intellectual Property, Copyright Law in India (Copyright Act of 1957) - meaning, Form of Copyright and Ownership Assignment/License, Registration and terms of Copyright, Copyright infringement , Offences, Remedies and Enforcement, Broad casting Organization and performers, Copyright – International Law, Introduction to trademarks, Trademarks – forms of Intellectual Property, Law of trade Marks in India (trademark act of 1999)-meaning, registration and Authorities, Right conferred by Registration and use of Trademarks, Infringement of Trademarks and passing off, Offences, remedies and enforcement, Trademarks –International Law

Unit 3 : Law of Designs, geographical Indications and other Intellectual Property

Introduction to designs – Industrial Designs, Design Laws in India: Designs Act of 2000, Registration of Design, Owners Rights, Piracy of Designs, Offence, Remedies and Enforcement, Designs- International Law, Introduction to Geographical Indication, Law of Geographical Indication in India: Geographical Indication of Goods (Registration and Protection) Act, 1999, Register of Geographical Indication, Infringement of Registered Geographical Indication Offence, Remedies and Enforcement

The Semiconductor Integrated Circuit Lay Out design Act, 2000, The protection of Plant varieties and Farmers rights Act, 2001, Law Relating to Diversity

Unit 4 : Introduction to Cyber Law & Information Technology Act, 2000

Evolution of Computer Technology, Emergence of Cyberspace, Cyber Jurisprudence, Jurisprudence and Law, Doctrinal Approach, Consensual Approach, Real Approach, Cyber Ethics, Cyber- Jurisdiction, Hierarchy of Courts, Civil and Criminal Jurisdictions, Cyberspace –Web space (WWW), Web Hosting and Web Development Agreements (specimen), Domain Names, Internet as a Tool for Global Access, Overview of IT Act, 2000, Amendments and Limitations of IT Act, Digital Signatures, Cryptography, Cryptographic Algorithm, Public Cryptography, Private Cryptography, Electronic Governance, Legal Recognition of Electronic Records, Legal Recognition of Digital Signature, Certifying authorities, Cyber Crime and Offences, Network Service Provider Liability, Cyber Regulation Appellate tribunal, Penalties and Adjudication

Unit 5 : Cyber law issues and related legislation

Patent Laws, Trademark law, Copyright, Software –copyright or patented, Domain Name and Copyright disputes, Electronic Database and its Protection, IT Act and Civil procedure Code, IT Act and Criminal procedure Code, Relevant Sections of Indian Evidence Act, Relevant Sections of Bankers Book Evidence Act, Relevant Section of Indian penal Code, Relevant Section of Reserve Bank of India Act, Law Relating to Employees and Internet, Alternative Dispute resolution, Online Dispute Resolution (ODR)

References

1. Law and practice of intellectual property in India by Vikas Vashishth

2. Intellectual property by A.Kalank
3. Intellectual property- patents,copyrights,trade marks and allied rights by Cornish W R
4. Patents ,copyrights, trade marks and design by B L Wadhera
5. Intellectual property law by P Narayana
6. Patents ,copyrights, trade marks and design by Rajeev Jain

BTCSE OE53: Disaster Management

COURSE OBJECTIVES

1. To provide basic conceptual understanding of disasters and its relationships with development.
2. To gain understand approaches of Disaster Risk Reduction (DRR) and the relationship between vulnerability, disasters, disaster prevention and risk reduction.
3. To understand Medical and Psycho-Social Response to Disasters.
4. To prevent and control Public Health consequences of Disasters
5. To enhance awareness of Disaster Risk Management institutional processes in India
6. To build skills to respond to disasters

UNIT-1: Introduction to Disaster

Concepts of Hazard, Vulnerability, Risks, Natural Disasters (earthquake, Cyclone, Floods, Volcanoes), and Man Made Disaster (Armed conflicts and civil strip, Technological disasters, Human Settlement, Slow Disasters (famine, draught, epidemics) and Rapid Onset Disasters(Air Crash, tidal waves, Tsunami) Risks, Difference between Accidents and Disasters, Simple and Complex Disasters, Refugee problems, Political, Social, Economic impacts of Disasters, Gender and Social issues during disasters, principles of psychosocial issues and recovery during emergency situations, Equity issues in disasters, Relationship between Disasters and Development and vulnerabilities, different stake holders in Disaster Relief. Refugee operations during disasters, Human Resettlement and Rehabilitation issues during and after disasters, Inter-sectoral coordination during disasters, Models in Disasters.

UNIT-II: Approaches to Disaster Risk Reduction

Disaster Risk Reduction Strategies, Disaster Cycle, Phases of Disaster, Preparedness Plans, Action Plans and Procedures, Early warning Systems Models in disaster preparedness,

Components of Disaster Relief-(Water, food, sanitation, shelter, Health and Waste Management), Community based DRR, Structural non structural measures in DRR, Factors affecting Vulnerabilities, , Mainstreaming disaster risk reduction in development, Undertaking risk and vulnerability assessments, Policies for Disaster Preparedness Programs, Preparedness Planning, Roles and Responsibilities, Public Awareness and Warnings, Conducting a participatory capacity and vulnerability analysis, , Sustainable Management,

Survey of Activities Before Disasters Strike, Survey of Activities During Disasters, DRR Master Planning for the Future, Capacity Building, Sphere Standards. Rehabilitation measures and long term reconstruction. Psychosocial care provision during the different phases of disaster.

UNIT- III: Prinicples of Disaster Medical Management

Introduction to disaster medicine, Various definitions in disaster medicine, Disaster life cycle, Disaster planning, Disaster preparation, Disaster recovery in relation to disaster medical management, Medical surge, Surge capacity, Medical triage, 275 National Assessing the nature of hazardous material - Types of injuries caused, Self protection contaminated area and decontaminated area – Pre hospital medical management of victims – Triaging medical & psychosocial identification of hospitals and other medical facilities to offer efficient disastrous medical service – Safe patient transportation –Identification of valuable groups (Pregnancy, pediatric and geriatric other people with associated medical co morbidities) (DM, Systemic Hypertension / Cardiac, Pulmonary, Cerebral and Renal) – knowledge about antidotes, - and Body decontaminations procedures (skin, GI tract, Respiratory tract and from blood) – Poly trauma Care - Specific treatment in emergency and Intensive Care Units – allocation of specialists in Local EMS System including equipments, safe use of equipments.

UNIT-IV: Public Health Response and International Cooperation

Principles of Disaster Epidemiology, Rapid Health Assessment, Rapid Health needs assessment. Outbreak Investigation Environment health hygiene and sanitation issues during disasters, Preventive and prophylactic measures including Measles immunization, ORS, water, supply, chemoprophylaxis, food fortification, food supplements, MISP-Reproductive Health Care, International cooperation in funding on public health during disaster, To identify existing and potential public health problems before, during and after disasters. (168 countries Framework Disaster Risk Reduction), International Health Regulation, United Nation International Strategy for Disaster Risk Reduction (UNISDR), United Nation Disaster Management Team, International Search and Rescue Advisory Group, (INSARAG, Global Facility for Disaster Risk Reduction (GFDRR), Asean Region Forum (ARF), Asian disaster Reduction Centre (ADRC), SAARC

UNIT-V: Disaster Risk Management in India

Hazard and Vulnerability Profile India, Disaster Management Indian scenario, India's vulnerability profile, Disaster Management Act 2005 and Policy guidelines, National Institute of Disaster Management, , National Disaster Response Force (NDRF)National Disaster

Management Authority, States Disaster Management Authority, District Disaster Management Authority Cases Studies : Bhopal Gas Disaster, Gujarat Earth Quake, Orissa Super-cyclone, south India Tsunami, Bihar floods, Plague- Surat, Landslide in North East,

Heat waves of AP& Orissa, Cold waves in UP. Bengal famine, best practices in disaster management, Local Knowledge Appropriate Technology and local Responses, Indigenous Knowledge, Development projects in India (dams, SEZ) and their impacts, Logistics management in specific emergency situation. Rajiv Gandhi Rehabilitation package, Integrated Coastal Zone Management, National Flood Risk Mitigation Project (NFRMP), Mines Safety in India, Indian Meteorological Department, National Crisis Management Committee, Indian NATIONAL Centre for Oceanic Information System (INCOIS)

Text/Reference books :

1. Disaster Management Guidelines. GOI-UNDP Disaster Risk Reduction Programme (2009-2012.

2. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003

3. Guerisse P. 2005 Basic Principles of Disaster Medical Management. Act Anaesth. Belg; 56:395-401

4. Aim and Scope of Disaster Management. Study Guide prepared by Sharman and Hansen. UW-DMC, University of Washington.

5. Sphere Project (2011). Humanitarian Charter and Minimum Standards in Disaster Response.

6. Geneva: Sphere Project. *http://www.sphereproject.org/* handbook/

7. Satapathy S. (2009) Psychosocial care in Disaster management, A training of trainers manual (ToT), NIDM publication.

8. Prewitt Diaz, J.O (2004). The cycle of disasters: from Disaster Mental Health to Psychosocial Care. Disaster Mental Health in India, Eds: Prewitt Diaz, Murthy, Lakshmi Narayanan, Indian Red Cross Society Publication.

9. Sekar, K (2006). Psychosocial Support in Tsunami Disaster: NIMHANS responses. Disaster and Development, 1.1, pgs 141-154.

10. Inter Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC.

11. Alexander David, 2000 Introduction in 'Confronting Catastrophe', Oxford University Press.

12. Andharia J. 2008 Vulnerability in Disaster Discourse, JTCDM, Tata Institute of Social Sciences Working Paper no. 8,

13. Blaikie, P, Cannon T, Davis I, Wisner B 1997. At Risk Natural Hazards, Peoples' Vulnerability and Disasters, Routledge.

14. Coppola P Damon, 2007. Introduction to International Disaster Management, Carter, Nick 1991. Disaster Management: A Disaster Manager's Handbook. Asian Development Bank, Manil

Course Objective: **BTCSE DET11-Theory of Computation**

4. Understand various Computing models like Finite State Machine, Pushdown Automata, and Turing Machine.
5. Be aware of Decidability and Un-decidability of various problems.
6. Learn types of grammars.

UNITWISE SYLLABUS

Unit – I: Introduction to Theory of Computation Concepts

Introduction: Basic Mathematical Notation and techniques, Finite State systems: Basic Definitions, Finite Automaton: DFA & NDFA, Finite Automaton with €- moves, Regular Languages: Regular Expression, Equivalence of NFA and DFA, Equivalence of NDFA‟s with and without €-moves, Equivalence of finite Automaton and regular expressions, Minimization of DFA: Pumping Lemma for Regular sets, Problems based on Pumping Lemma.

Unit – II: Grammars

Grammar Introduction: Types of Grammar, Context Free Grammars and Languages, Derivations and Languages: Ambiguity, Relationship between derivation and derivation trees, Simplification of CFG: Elimination of Useless symbols, Unit productions: Null productions, Greiback Normal form, Chomsky normal form, Problems related to CNF and GNF.

Unit – III: Pushdown Automata

Pushdown Automata: Definitions, Moves, Instantaneous descriptions, Deterministic pushdown automata: Equivalence of Pushdown automata and CFL, pumping lemma for CFL, Problems based on pumping Lemma.

Unit – IV: Turing Machines

Definitions of Turing machines: Models, Computable languages and functions: Techniques for Turing machine construction, Multi head and Multi tape Turing Machines, The Halting problem, Partial Solvability, Problems about Turing machine, Chomskian hierarchy of languages

Unit – V: Nsolvable Problems And Computable Functions

Unsolvable Problems and Computable Functions: Primitive recursive functions, Recursive and recursively enumerable languages, Universal Turing machine, Measuring And Classifying Complexity, Tractable and Intractable problems: Tractable and possibly intractable problems, P and NP completeness, Polynomial time reductions.

Text Books:

1. Hopcroft J.E., Motwani R. and Ullman J.D, "Introduction to Automata Theory, Languages and Computations", Second Edition, Pearson Education, 2008. (UNIT 1,2,3)
2. John C Martin, "Introduction to Languages and the Theory of Computation", Third Edition, Tata McGraw Hill Publishing Company, New Delhi, 2007. (UNIT 4,5)

Reference book:

4. Mishra K L P and Chandrasekaran N, "Theory of Computer Science – Automata, Languages and Computation", Third Edition, Prentice Hall of India, 2004.
5. Harry R Lewis and Christos H Papadimitriou, "Elements of the Theory of Computation", Second Edition, Prentice Hall of India, Pearson Education, New Delhi, 2003.
6. Peter Linz, "An Introduction to Formal Language and Automata", Third Edition, Narosa Publishers, New Delhi, 2002.
7. Kamala Krithivasan and Rama. R, "Introduction to Formal Languages, Automata Theory and Computation", Pearson Education 2009.

Learning Outcomes:

5. Design Finite State Machine, Pushdown Automata, and Turing Machine.
6. Explain the Decidability or Un-decidability of various problems

Course Objective: **BTCSE DET12-Graph Theory**

a. Be familiar with the most fundamental Graph Theory topics and results.

2. Be exposed to the techniques of proofs and analysis.

UNITWISE SYLLABUS

Unit – I: Introduction to Graph Theory Concepts

Graphs; Introduction, Isomorphism, Sub graphs, Walks, Paths, Circuits: Connectedness, Components, Euler graphs, Hamiltonian paths and circuits, Trees: Properties of trees, Distance and centers in tree, Rooted and binary trees.

Unit – II: Trees, Connectivity & Planarity

Spanning trees: Fundamental circuits, Spanning trees in a weighted graph, Cut sets: Properties of cut set, All cut sets, Fundamental circuits and cut sets, Connectivity and separability, Network flows: Isomorphism, Combinational and geometric graphs: Planer graphs, Different representation of a planer graph.

Unit – III: Matrices, Colouring AND Directed Graph

Chromatic number: Chromatic partitioning, Chromatic polynomial, Matching, Covering, Four color problem, Directed graphs: Types of directed graphs, Digraphs and binary relations, Directed paths and connectedness, Euler graphs.

Unit – IV: PERMUTATIONS & Combinations

Fundamental principles of counting: Permutations and combinations, Binomial theorem: combinations with repetition, Combinatorial numbers: Principle of inclusion and exclusion, Derangements: Arrangements with forbidden positions.

Unit – V: Generating Functions

Generating functions: Partitions of integers, Exponential generating function: Summation operator, Recurrence relations: First order and second order, Non-homogeneous recurrence relations, Method of generating functions.

Text Books:

1. Write precise and accurate mathematical definitions of objects in graph theory.
2. Use mathematical definitions to identify and construct examples and to distinguish examples from non-examples.
3. Validate and critically assess a mathematical proof.
4. Use a combination of theoretical knowledge and independent mathematical thinking in creative investigation of questions in graph theory.
5. Reason from definitions to construct mathematical proofs. Hopcroft J.E., Motwani R. and Ullman J.D, "Introduction to Automata Theory, Languages and Computations", Second Edition, Pearson Education, 2008. (UNIT 1,2,3)

Reference book:

a. Narsingh Deo, "Graph Theory: With Application to Engineering and Computer

Science", Prentice Hall of India, 2003.

b. Grimaldi R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", Addison Wesley, 1994.

Learning Outcomes:

i. Clark J. and Holton D.A, "A First Look at Graph Theory", Allied Publishers, 1995.

2. 2. Mott J.L., Kandel A. and Baker T.P. “Discrete Mathematics for Computer Scientists and Mathematicians” , Prentice Hall of India, 1996.

3. 3. Liu C.L., “Elements of Discrete Mathematics”, Mc Graw Hill, 1985.

4. 4. Rosen K.H., “Discrete Mathematics and Its Applications”, Mc Graw Hill, 2007.

Course Objective: **BTCSE DET13-Advanced Algorithms**

1. To learn the graph search algorithms.
2. To study network flow and linear programming problems.
3. To learn the hill climbing and dynamic programming design techniques.
4. To develop recursive backtracking algorithms.
5. To get an awareness of NP completeness and randomized algorithms.

UNITWISE SYLLABUS

Unit – I: Review of Analysis Techniques

Growth of Functions: Asymptotic notations, Standard notations and common functions, Recurrences and Solution of Recurrence equations: The substitution method, The recurrence, Tree method, The master method: Amortized Analysis, Aggregate, Accounting and Potential Methods.

Unit – II: Graph Algorithms

Bellman - Ford Algorithm: Single source shortest paths in a DAG, Johnson's Algorithm for sparse graphs: Flow networks and Ford-Fulkerson method: Maximum bipartite matching. Polynomials and the FFT: Representation of polynomials, The DFT and FFT, Efficient implementation of FFT.

Unit – III: Number -Theoretic Algorithms

Elementary notions: GCD, Modular Arithmetic, Solving modular linear equations: The Chinese remainder theorem: Powers of an element, RSA cryptosystem, Primality testing, Integer factorization.

Unit – IV: String-Matching Algorithms

Naïve string Matching: Rabin - Karp algorithm: String matching with finite automata: Knuth- Morris-Pratt algorithm: Boyer – Moore algorithms.

Unit – V: Probabilistic and Randomized Algorithms

Probabilistic algorithms: Randomizing deterministic algorithms, Monte Carlo and Las Vegas algorithms, Probabilistic numeric algorithms.

Text Books:

- T. H Cormen, C E Leiserson, R L Rivest and C Stein: Introduction to Algorithms, 3rd Edition, Prentice-Hall of India, 2010.
- Kenneth A. Berman, Jerome L. Paul: Algorithms, Cengage Learning, 2002.

Reference book:

- Ellis Horowitz, Sartaj Sahni, S.Rajasekharan: Fundamentals of Computer Algorithms, 2nd Edition, Universities press, 2007.

Learning Outcomes:

1. Design and apply iterative and recursive algorithms.
2. Design and implement optimization algorithms in specific applications.
3. Design appropriate shared objects and concurrent objects for applications.

BTCSE DET21- Parallel and Distributed Algorithms

Course Objective:

1. To expose students to both the abstraction and details of parallel and distributed systems.

2. To introduce concepts related to parallel and distributed computing systems.

3. To focus on performance and flexibility issues related to systems design decisions.

UNITWISE SYLLABUS

Unit – I:Characterization of Parallel and Distributed Systems

Parallel Programming Platforms: Implicit Parallelism, Trends in Microprocessor Architectures: Limitations of Memory System Performance, Dichotomy of Parallel Computing Platforms, Physical Organization of Parallel Platforms, Communication Costs in Parallel Machines Routing Mechanisms for Interconnection Networks, Impact of Process-Processor Mapping and Mapping Techniques Introduction, Examples of distributed Systems: Resource sharing and the Web Challenges, Architectural models, Limitation of Distributed system: absence of global clock, shared memory, Logical clocks: Lamport's & vectors logical clocks.

Concepts in Message Passing Systems: causal order, total order, total causal order, Techniques for Message Ordering: Causal ordering of messages, global state, termination detection.

Unit – II: Principles of Parallel Algorithm Design algorithms & Distributed Mutual Exclusion and Deadlock

Decomposition Techniques: Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing, Methods for Containing Interaction Overheads, Parallel Algorithm Models, Classification of distributed mutual exclusion: requirement of mutual exclusion theorem, Token based and non-token based algorithms, performance metric for distributed mutual exclusion algorithms, Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

Unit – III: Dense Matrix Algorithms Agreement Protocols & Distributed Resource Management

Matrix-Vector Multiplication, Matrix-Matrix Multiplication, Agreement Protocols: Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system, Distributed Resource Management: Issues in distributed File Systems, Mechanism for building distributed file systems, Design issues in Distributed Shared Memory, Algorithm for Implementation of Distributed Shared Memory.

Unit – IV: Sorting, Graph Algorithms Failure Recovery and Fault Tolerance

Sorting: Issues in Sorting on Parallel Computers, Sorting Networks, Bubble Sort and its Variants, Quick sort, Graph Algorithms: Definitions and Representation, Minimum Spanning Tree: Prim's Algorithm, Single-Source Shortest Paths: Dijkstra's Algorithm, All-Pairs Shortest Paths, Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recovery in Concurrent systems, Obtaining consistent Checkpoints, Recovery in Distributed Database Systems, Fault Tolerance: Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamic voting protocols.

Unit – V: Programming Using the Message Passing Paradigm, Transactions and Concurrency Control

Unsolvable Principles of Message-Passing Programming: The Building Blocks: Send and Receive Operations MPI, Message Passing Interface, Topologies and Embedding, Overlapping Communication with Computation, Collective Communication and Computation Operations, Groups and Communicators, Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control, Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.

Text Books:

1. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education.
2. Tenanuanbaum, Steen," Distributed Systems", PHI.

3. Distributed Operating Systems: Concepts And Design By Pradeep K. Sinha Eastern Economy Edition.

Reference book:

a. Parallel Programming in C with MPI and OpenMP by M.J. Quinn, McGraw-Hill Science/Engineering/Math, 1 st edition, 2003, ISBN: 0072822562.

Learning Outcomes:

1. Define terminology commonly used in parallel and distributed computing, such as efficiency and speedup.

2. Describe different parallel and distributed architectures, inter-connect networks, programming models, and algorithms for common operations such as matrix-vector multiplication.

3. Given a problem, develop an efficient parallel and distributed algorithm to solve it.

4. Given a parallel and distributed algorithm, analyze its time complexity as a function of the problem size and number of processors.

5. Given a parallel and distributed algorithm, an input to it, and the number of processors, show the steps performed by that algorithm on that input.

6. Given a parallel and distributed algorithm, implement it using MPI, OpenMP, pthreads, or a combination of MPI and OpenMP.

Course Objective: **BTCSE DET22-Computational Complexity**

a. This is an intermediate level computer science course.

b. It is about the design and the analysis of algorithms for computational problems and how to think clearly about analyzing the correctness and running time.

UNITWISE SYLLABUS

Unit – I: Introduction to Computational Complexity

Introduction: Easy and hard problems, Algorithms and complexity, Turing machines: Models of computation, Multi-tape deterministic and non-deterministic Turing machines, Decision problems.

Unit – II: The Halting Problem and Undecidable Languages

The Halting Problem and Undecidable Languages: Counting and diagonalization, Tape reduction, Universal Turing machine, Undecidability of halting, Reductions, Rice's theorem,

Deterministic Complexity Classes: DTIME[t], Linear Speed-up Theorem, P Time, Polynomial reducibility, Polytime algorithms: 2-satisfiability, 2-colourability.

Unit – III: NP and NP-completeness

NP and NP-completeness: Non-deterministic Turing machines, NTIME[t], NP, Polynomial time verification, NP-completeness, Cook-Levin Theorem, Polynomial transformations: 3-satisfiability, clique, colourability, Hamilton cycle, partition problems, Pseudo-polynomial time, Strong NP-completeness, Knapsack, NP-hardness.

Unit – IV: Space complexity and hierarchy theorems

Space complexity and hierarchy theorems: DSPACE[s], Linear Space Compression Theorem, PSPACE, NPSPACE. PSPACE = NPSPACE, PSPACE-completeness, Quantified Boolean Formula problem is PSPACE-complete, L, NL and NL- completeness, NL=coNL. Hierarchy theorems.

Unit – V: Randomized Complexity Optimization and approximation

Randomized Complexity: The classes BPP, RP, ZPP, Interactive proof systems: IP = PSPACE, Optimization and approximation: Combinatorial optimization problems, Relative error, Bin-packing problem, Polynomial and fully polynomial approximation schemes, Vertex cover, traveling salesman problem, minimum partition.

Text Books:

1. Syllabus Oriented Textbook: Sanjeev Arora and Boaz Barak, Computational Complexity: A Modern Approach, Cambridge University Press, 2009.

Reference book:

1. Anany V. Levitin, Introduction to the Design and Analysis of Algorithms, Addison Wesley.
2. T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, Introduction to Algorithms, MIT Press.
3. Walter Savitch, JAVA, An introduction to Computer Science & Programming, Prentice Hall (if necessary, additional information about programming in Java).

Learning Outcomes:

1. Explain and use fundamental algorithms and algorithmic techniques (brutal force

techniques, greedy techniques, divide-and-conquer and dynamic programming, randomized algorithms).

2. Explain the use of big-O, Omega, and Theta notation to describe the amount of work done by an algorithm, and apply them to provide tight bounds on algorithmic complexity.

3. Discuss factors other than computational efficiency that influence the choice of algorithms, such as programming time, maintainability, and the use of application specific patterns in the input data.

4. Design new algorithms for specific applications, using the algorithms and algorithmic techniques presented.

5. Design Finite State Machine, Pushdown Automata, and Turing Machine.

6. Explain the Decidability or Un-decidability of various problems

Course Objective: **BTCSE DET23-Computational Geometry**

1. Introduce rigorous algorithmic analysis for problems in Computational Geometry.
2. Discuss applications of Computational Geometry to graphical rendering.
3. Introduce the notions of Voronoi diagrams and Delaunay Triangulations.
4. Develop expected case analyses for linear programming problems in small dimensions.

UNITWISE SYLLABUS

Unit – I: Introduction to Computational Complexity

Randomized Algorithms: Quicksort, Randomized Quicksort, Expected Running Time Analyses, Quickselect, Randomized Quickselect, Expected Running Time Analyses, High Probability Bound, Convex Hulls: Convexity definition, Convex Sets, Orientation, Simple Hull, Incremental Hull, Divide and Conquer approach, Jarvis' March, Quickhull, Line Segment Intersection: Line Segment Intersection, The Doubly-Connected Edge List, Computing the Overlay of Two Subdivisions, Boolean Operations

Unit – II: The Polygon Triangulation

Polygon Triangulation: Guarding and Triangulations, Partitioning a Polygon into Monotone Pieces, Triangulating a Monotone Polygo, Linear Programming: Half-Plane Intersection,

Incremental Linear Programming, Randomized Linear Programming, Unbounded Linear Programs, The Smallest Enclosing Disk Problem.

Unit – III: Orthogonal Range Searching

Orthogonal Range Searching: 1-Dimensional Range Searching, Kd-Trees, Range Trees, Higher-Dimensional Range Trees, General Sets of Points, Fractional Cascading, Point Location: Point Location and Trapezoidal Maps, A Randomized Incremental Algorithm, Dealing with Degenerate Cases, A Tail Estimate.

Unit – IV: Voronoi Diagrams Arrangements and Duality

Voronoi Diagrams: Definition and Basic Properties, Computing the Voronoi Diagram, Arrangements and Duality: Duality, Arrangements of Lines, Efficient Angular Sweep, Computing the Discrepancy of a point set, More Geometric Data Structures: Interval Trees, Priority Search Trees, Segment Trees.

Unit – V: Delaunay Triangulations

Delaunay Triangulations: Triangulations of Planar Point Sets, The Delaunay Triangulation, Properties of the Delaunay Triangulation, A randomized incremental algorithm for computing the Delaunay Triangulation, Binary Space Partitions: The Definition of BSP Trees, BSP

Trees and the Painter's Algorithm, Constructing a BSP Tree, The Size of BSP Trees in 3-Space.

Text Books:

1. Ketan Mulmuley. Computational Geometry: An Introduction through Randomized Algorithms. Prentice Hall, 1st edition, 1994.

Reference book:

1. M. de Berg, M. van Kreveld, M. Overmars, and O. Schwarzkopf. Computational Geometry - Algorithms and Applications. Springer-Verlag, 2nd edition, 2000.

Learning Outcomes:

Upon successful completion of this course, students will be able to:

a. Analyze randomized algorithms for small domain problems.

b. Use line-point duality to develop efficient algorithms.

c. Apply geometric techniques to real-world problems in graphics.

d. Solve linear programs geometrically.

BTCSE DET51: Distributed Computing Systems

UNIT I: CHARACTERIZATION OF DISTRIBUTED SYSTEMS

Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. 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.

Concepts in Message Passing Systems: causal order, total order, total causal order, Techniques for Message Ordering, Causal ordering of messages, global state, termination detection.

UNIT II : DISTRIBUTED MUTUAL EXCLUSION AND DEADLOCK DETECTION

Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.

Distributed Deadlock Detection:System model, resource vs communication deadlocks, deadlockprevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

UNIT III: AGREEMENT PROTOCOLS

Agreement Protocols: Introduction, System models, classification of Agreement Problem,Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system.

Distributed Resource Management: Issues in distributed File Systems, Mechanism for buildingdistributed file systems, Design issues in Distributed Shared Memory, Algorithm for Implementation of Distributed Shared Memory.

UNIT IV: FAILURE RECOVERY IN DISTRIBUTED SYSTEMS

Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recovery in Concurrent systems, Obtaining consistent Checkpoints, Recovery in Distributed Database Systems.

Fault Tolerance: Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamic voting protocols.

UNIT V: DISTRIBUTED TRANSACTIONS

Transactions and Concurrency Control: Transactions, Nested transactions, Locks, OptimisticConcurrency control, Timestamp ordering, Comparison of methods for concurrency control.

Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols,Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.

BOOKS:

1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill

2. Ramakrishna,Gehrke," Database Management Systems", McGraw Hill

3. Vijay K.Garg Elements of Distributed Computing , Wiley

4. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education

5. Tanenbaum, Steen," Distributed Systems", PHI

BTCSE DET52: Software Architecture

OBJECTIVES:

•Understand software architectural requirements and drivers

•Be exposed to architectural styles and views

•Be familiar with architectures for emerging technologies

UNIT I : INTRODUCTION AND ARCHITECTURAL DRIVERS

Introduction – What is software architecture? – Standard Definitions – Architectural structures – Influence of software architecture on organization-both business and technical – Architecture Business Cycle- Introduction – Functional requirements – Technical constraints – Quality Attributes.

UNIT II : QUALITY ATTRIBUTE WORKSHOP

Quality Attribute Workshop – Documenting Quality Attributes – Six part scenarios – Case studies.

UNIT III : ARCHITECTURAL VIEWS

Introduction – Standard Definitions for views – Structures and views – Representing views-available notations – Standard views – 4+1 view of RUP, Siemens 4 views, SEI's perspectives and views – Case studies

UNIT IV: ARCHITECTURAL STYLES

Introduction – Data flow styles – Call-return styles – Shared Information styles – Event styles – Case studies for each style.

UNIT V : DOCUMENTING THE ARCHITECTURE

Good practices – Documenting the Views using UML – Merits and Demerits of using visual languages – Need for formal languages – Architectural Description Languages – ACME – Case studies. Special topics: SOA and Web services – Cloud Computing – Adaptive structures

OUTCOMES

: Upon Completion of the course, the students will be able to

•Explain influence of software architecture on business and technical activities

•Identify key architectural structures

•Use styles and views to specify architecture

•Design document for a given architecture

TEXT BOOKS:

•Len Bass, Paul Clements, and Rick Kazman, "Software Architectures Principles and Practices", 2nd Edition, Addison-Wesley, 2003.

•Anthony J Lattanze, "Architecting Software Intensive System. A Practitioner's Guide", Auerbach Publications, 2010.

REFERENCES:

•Paul Clements, Felix Bachmann, Len Bass, David Garlan, James Ivers, Reed Little, Paulo Merson, Robert Nord, and Judith Stafford, "Documenting Software Architectures. Views and Beyond", 2nd Edition, Addison-Wesley, 2010.

•Paul Clements, Rick Kazman, and Mark Klein, "Evaluating software architectures: Methods and case studies. Addison-Wesley, 2001.

•Mark Hansen, "SOA Using Java Web Services", Prentice Hall, 2007

David Garlan, Bradley Schmerl, and Shang-Wen Cheng, "Software Architecture-Based Self-Adaptation," 31-56. Mieso K Denko, Laurence Tianruo Yang, and Yan Zang (eds.), "Autonomic Computing and Networking". Springer Verlag, 2009

BTCSE DET53: Approximation of Algorithms

UNIT I : INTRODUCTION

Review of algorithmic analysis, Asymptotic Notations; Solving Recurrences: Substitution methods, Recursion-Tree method and Master method.

UNIT II: ALGORITHM DESIGN TECHNIQUES

Divide and Conquer Approach, Dynamic Programming, Greedy Algorithms, Greedy versus Dynamic Programming, Miscellaneous algorithmic problems.

UNIT III: GRAPH ALGORITHMS

Breadth First Search, Depth First Search; Minimum Spanning Trees, Shortest Path Algorithms, Dijkstra's Algorithm.

UNIT IV: ALGORITHMS FOR APPROXIMATION

The Bellman-Ford Algorithm, The Floyd-Warshall's Algorithm; Maximum Flow; Flow Networks, The Ford-Fulkerson Algorithm.

UNIT V: NP COMPLETENESS

P and NP classes, Unsolvable problems, NP Completeness and Reducibility, Circuit Satisfiability, Examples and Proofs of NP-Complete problem.

Books:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, “Introduction to Algorithms”, Third Edition, September 2009, MIT Press USA.

2) Alfred V. Aho, John E. Hopcroft, Jeffery D. Ullman, "The Design and Analysis of Computer Algorithms", Addison-Wesley, 2001.

3) John Kleinberg, Eva Tardos, "Algorithm Design", Addison Wesley

4)Ellis Horowitz, Sartaj Sahni, "Fundamentals of Computer Algorithms", Galgotia Publications, 2001.

BTCSE DET61: Combinational Optimization

UNIT-I: BASICS OF OPERATIONS RESEARCH

Decision-making procedure under certainty and under uncertainty ,Operations Research-Probability and decision- making-,Queuing or Waiting line theory, Simulation and Monte-Carlo Technique-,Nature and organization of optimization problems, Scope and hierarchy of optimization, Typical applications of optimization.

UNIT- II: FORMULATION OF OPTIMIZATION PROBLEMS

Essential features of optimization problems, Objective function, Continuous functions, Discrete functions , Unimodal functions , Convex and concave functions, Investment costs and operating costs in objective function , Optimizing profitably constraints, Internal and external constraints, Formulation of optimization problems. Continuous functions, Discrete functions.

UNIT-III: LINEAR PROGRAMMING AND TRANSPORTATION PROBLEM

Necessary and sufficient conditions for optimum of unconstrained functions-Numerical methods for unconstrained functions, One-dimensional search, Gradient-free search with fixed step size. Linear Programming, Basic concepts of linear programming , Graphical interpretation, Simplex method , Apparent difficulties in the Simplex method.

Transportation Problem, Loops in transportation table, Methods of finding initial basic feasible solution, Tests for optimality. Assignment Problem, Mathematical form of assignment problem, methods of solution.

UNIT-IV: ASSIGNMENT PROBLEM and NETWORK FLOW PROBLEM

Network analysis by linear programming and shortest route, maximal flow problem. Introduction to Non-traditional optimization, Computational Complexity,NP-Hard, NP-Complete. Tabu Search-Basic Tabu search, Neighborhood, Candidate list, Short term and Long term memory

UNIT-V: GENETIC ALGORITHM and SIMULATED ANNEALING

Genetic Algorithms- Basic concepts, Encoding, Selection, Crossover, Mutation. Simulated Annealing- Acceptance probability, Cooling, Neighborhoods, Cost function. Application of GA and Simulated Annealing in solving sequencing and scheduling problems and Travelling salesman problem.

BOOKS:

1. Rao S.S., Optimization Theory and Applications, Wiley Eastern.

2. Hamdy A. Taha, Operations Research – An introduction, Prentice – Hall India.

3.G. Zapfel, R. Barune and M. Bogl, Meta heuristic search concepts: A tutorial with applications to production and logistics, Springer.

4. Gass S. I., Introduction to Linear Programming, Tata McGraw Hill.

5. Reeves C., Modern heuristic techniques for combinatorial problems, Orient Longman.

6.Goldberg, Genetic algorithms in Search, optimization and Machine Learning, Addison Wesley.

7.K. Deb, Optimization for engineering design – algorithms and examples, Prentice Hall of India.

BTCSE DET62: Software Project Management

UNIT-I: INTRODUCTION AND SOFTWARE PROJECT PLANNING

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.

UNIT-II: PROJECT ORGANIZATION AND SCHEDULING

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.

UNIT-III: PROJECT MONITORING AND CONTROL

Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.

UNIT-IV: SOFTWARE QUALITY ASSURANCE AND TESTING

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, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process.

UNIT-V: PROJECT MANAGEMENT AND PROJECT MANAGEMENT TOOLS

Software Configuration Management: 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 Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis.

BOOKS:

1. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
2. Royce, Software Project Management, Pearson Education
3. Kieron Conway, Software Project Management, Dreamtech Press
4. S. A. Kelkar, Software Project Management, PHI Publication.
5. Harold R. Kerzner, Project Mangment "A Systems Approach to Planning, Scheduling, and Controlling" Wiley.
6. Mohapatra, Software Project Management, Cengage Learning.

BTCSE DET63: Ethical Hacking

UNIT-I: ETHICAL HACKING

Introduction, Networking & Basics, Foot Printing, Google Hacking, Scanning, Windows Hacking, Linux Hacking, Trojans & Backdoors, Virus & Worms.

UNIT-II: VULNERABILITIES AND ATTACKS

Proxy & Packet Filtering, Denial of Service, Sniffer, Social Engineering System and Network Vulnerability and Threats to Security , Various types of attack and the various types of attackers in the context of the vulnerabilities associated with computer and information systems and networks Physical Security, Steganography.

UNIT-III: HIJACKING AND HACKING

Cryptography, Wireless Hacking, Firewall & Honeypots, IDS & IPS, Vulnerability, Penetration Testing, Session Hijacking, Hacking Web Servers, SQL Injection, Cross Site Scripting, Exploit Writing, Buffer Overflow.

UNIT-IV: REVERSE ENGINEERING

Reverse Engineering, Email Hacking, Incident Handling & Response, Bluetooth Hacking, Mobile Phone Hacking Basic ethical hacking tools and usage of these tools in a professional environment. Legal, professional and ethical issues likely to face the domain of ethical hacking.

UNIT-V: ETHICAL ISSUES

Ethical responsibilities, professional integrity and making appropriate use of the tools and techniques associated with ethical hacking.

BOOKS:

1. Dominic Chell , Tyrone Erasmus, Shaun Colley, Oflie Whitehouse, The Mobile Application Hacker's Handbook , Wiley
2. Michael Gregg, "Certified Ethical Hacker (CEH) Cert Guide", Pearson India, 2014
3. Rafay Baloch, "Ethical Hacking and Penetration Testing Guide" CRC Press
4. Allen Harper , Shome Harris, Jonathan Ness ,Chris Eagle, Gideon Lenkey,TerronVilliams "Gray Hat Hacking The Ethical Hakers Handbook." TMH
5. Patrick Engebretson, "The Basics of Hacking and Penetration Testing, Second Edition:Ethical Hacking and Penetration Testing Made Easy, 2nd Edition, Elsevier

6. Jon Erickson “HACKING, The art of Exploitation”, William Pollock.

BTCSE DES11: Advanced Computer Architecture

Unit – I

PARALLEL COMPUTER MODELS: The state of computing, Classification of parallel computers, Multiprocessors and multicomputer, Multi Vector and SIMD computers.

PROGRAM AND NETWORK PROPERTIES: Conditions of parallelism, Data and resource Dependences, Hardware and software parallelism, Program partitioning and scheduling, Grain Size and latency, Program flow mechanisms, Control flow versus data flow, Data flow Architecture, Demand driven mechanisms, Comparisons of flow mechanisms.

Unit – II

SYSTEM INTERCONNECT ARCHITECTURES: Network properties and routing, Static interconnection networks, Dynamic interconnection Networks, Multiprocessor system interconnects, Hierarchical bus systems, Crossbar switch and multiport memory, Multistage and combining network.

PROCESSORS AND MEMORY HIERARCHY: Advanced processor technology, Instruction-set Architectures, CISC Scalar Processors, RISC Scalar Processors, Superscalar Processors, VLIW Architectures, Vector and Symbolic processors.

Unit – III

MEMORY TECHNOLOGY: Hierarchical memory technology, Inclusion, Coherence and Locality, Memory capacity planning, Virtual Memory Technology.

BACKPLANE BUS SYSTEM: Backplane bus specification, Addressing and timing protocols, Arbitration transaction and interrupt, Cache addressing models, Direct mapping and associative caches.

Unit – IV

PIPELINING: Linear pipeline processor, Nonlinear pipeline processor, Instruction pipeline design, Mechanisms for instruction pipelining, Dynamic instruction scheduling, Branch handling techniques, Arithmetic Pipeline Design, Computer arithmetic principles, Static arithmetic pipeline, Multifunctional arithmetic pipelines.

Unit – V

VECTOR PROCESSING PRINCIPLES: Vector instruction types, Vector-access memory schemes. Synchronous Parallel Processing: SIMD Architecture and Programming Principles, SIMD Parallel Algorithms, SIMD Computers and Performance Enhancement.

TEXT BOOKS

1. Kai Hwang, *Advanced computer architecture*, TMH, 2000.

· J. P.Hayes, *Computer Architecture and organization*, TMH, 1998.

· M.J Flynn, *Computer Architecture, Pipelined and Parallel Processor Design*, Narosa Publishing, 1998.

REFERENCE BOOKS

4. D. A. Patterson, J. L. Hennessy, *Computer Architecture: A quantitative approach*, Morgan Kauffmann, 2002.

· Hwang and Briggs, *Computer Architecture and Parallel Processing*, MGH, 2000.

BTCSE DES12: Software Engineering

Unit – I

Introduction, Software Model and Process: Software Crisis, Need and Definition of Software Engineering, Software Myths, Process Model: Waterfall Model, V-Model, Incremental Model, Evolutionary Model,

Unit – II

Requirement Engineering: Inception, Elicitation, Elaboration, Negotiation, Specification, Validation, Requirements, Analysis & Model: Domain Analysis, Data Flow Modeling, Class-based Modeling, CRC Modeling.

Unit – III

Software Design Concepts: Abstraction, Modularity, Cohesion, Coupling, Software Design: Architectural Design, Data Design: Entity Relationship Design, User Interface Design, Object Oriented Design, Web Application Design: Aesthetic Design, Content Design, Navigation Design

Unit – IV

Testing and Quality: Software Testing, Verification and Validation, Test Strategy: Unit Testing, Integration Testing, System Testing, User Acceptance Testing: Alpha & Beta Testing, Internal and External View of Testing: White Box Testing, Black Box Testing, Quality Concepts, Garvin's Quality Dimension, McCall's Quality Factors, ISO 9126 Quality Factors

Unit – V

Maintenance and Software Metrics: Maintenance: Corrective, Perfective, Adaptive, Metrics: Size Oriented Metrics, Function Point Metrics, CK Metrics suite, Introduction to Risk Management

TEXT BOOKS

· R. S. Pressman, "Software Engineering – A practitioner's approach", 7th Edition, McGraw Hill Int. Ed., 1992.
· K. K. Agarwal and Yogesh Singh, Software Engineering, New Age

REFERENCE BOOKS

· P. Jalote, “An Integrated approach to Software Engineering”, Narosa, 1991.
· Stephen R. Schach, “Classical & Object Oriented Software Engineering”, IRWIN, 1996.
· James Peter, W Pedrycz, “Software Engineering”, John Wiley & Sons

BTCSE DES13: Distributed Systems

Unit – I

Introduction Of Distributed System: Goals, Types of Distributed systems**. Architectures:** Architectural Styles, System architectures, Self-management in distributed systems.

Unit – II

Processes: Threads, Virtualization, Clients, Servers, Code Migration, Software Agents.

Communication: Fundamentals, Remote Procedure Call, Message Oriented Communication, Stream-Oriented Communication, Multicast Communication**.**

Unit – III

Naming: Names, Identifiers and Addresses, Flat Naming, Structured Naming, Attribute-Based

Naming

Synchronization: Clock Synchronization, Logical Clocks, Mutual Exclusion, Global Positioning of nodes, Election Algorithms.

Unit – IV

Consistency and Replication: Introduction, Data-Centric Consistency Models, Client Centric Consistency Models, Replica Management, Consistency Protocols, Examples.

Unit – V

Fault Tolerance: Introduction to Fault Tolerance, Process Resilience, Reliable Client-Server

Communication, Reliable Group Communication, Distributed Commit, Recovery.

Security: Introduction, Secure channels, Access Control, Security Management

TEXT BOOKS

Distributed Systems – Principles and Paradigms, Andrew S. Tanenbaum, Maarten Van Steen, 2 /e, PHI.

REFERENCE BOOKS

1. Distributed Systems Concepts and Design, George Couloris, Jean Dollimore, Tim Kindberg, Gordan Blair, 4/e, PEARSON.
2. Distributed Operating Systems Concepts and Design, Pradeep K. Sinha, PHI.

BTCSE DES21: Embedded Systems

Unit – I

INTRODUCTION: Evolution of embedded systems & their applications, architectural diversity for embedded system development**.**

Unit – II

TECHNIQUES AND TOOLS FOR EMBEDDED SOFTWARE DEVELOPMENT:

Embedded Programming principles, Instruction Set, Architectures for embedded software development: arithmetic and logical, program control, string instructions, special or privileged instructions, Interrupt system, Input output programming, Memory management, Using High level languages for embedded programming, structured and Object Oriented Programming.

Unit – III

RE-CONFIGURABLE FPGA FOR EMBEDDED COMPUTING R-FPGA and

hardware software development, issues in Reconfigurable computing, placement and scheduling techniques, Design of digital systems on FPGAs, fault tolerant design on FPGAs, Retarget able assembling and compilation.

Unit – IV

APPLICATIONS: Specific applications.

Unit – V

LATEST TRENDS IN EMBEDDED SYSTEM: On-chip networks: scalable, communication-centric embedded system design paradigm, Systematic Approach to Exploring Embedded System Architectures at Multiple Abstraction Levels, Selective Instruction Compression For Memory Energy, Reduction in Embedded Systems.

TEXTBOOKS

· Steve Kilts, *Advanced FPGA Design: Architecture, Implementation, and Optimization*, Wiley.
· David Pellerin, *Practical FPGA Programming in C*, PHI.
· Jean-Pierre Deschamps, Gery J.A. Bioul, Gustavo D. Sutter *Synthesis of Arithmetic Circuits: FPGA, ASIC and Embedded Systems*, Wiley.

REFERENCE BOOKS

· James O. Hamblen, Tyson S. Hall, Michael D. Furman, *Rapid Prototyping of Digital*

Systems, Springer.
· Anthony J. Massa, *Embedded Software Development with eCos* (Bruce Perens' Open Source Series),

BTCSE DES22: Advanced Operating System

Unit – I

INTRODUCTION TO UNIX : History, Need of change, Standards.

THE PROCESS AND THE KERNEL : Mode, space and context, Process abstraction, executing in kernel mode, synchronization by blocking interrupts, process scheduling, signals, process creation, termination, awaiting process termination, zombie processes.

Unit – II

INTRODUCTION TO THREADS: Fundamental abstractions, Lightweight process design, issues to consider, User level thread libraries, scheduler activations, Multi threading on Solaris, Pthreads library, Thread library implementation.

Unit – III

SIGNALS AND SESSION MANAGEMENT : Signal generation and handling, Unreliable signals, Reliable signals, Signals in SVR4, Signals implementation, Exceptions, Process Groups and Terminal management, SVR4 Sessions architecture Process Scheduling : Clock interrupt handling, Scheduler Goals, Traditional UNIX scheduling.

Unit – IV

SYNCHRONIZATION AND MULTIPROCESSING: Introduction, Synchronization in Traditional UNIX Kernels, Multiprocessor Systems, Multiprocessor synchronization issues, Semaphores, spin locks, condition variables Read-write locks for multiprocessor systems, Reference counts and other considerations

Unit – V

FILE SYSTEM INTERFACE AND FRAMEWORK : The user interface to files, File systems, Special files, File system framework, The Vnode/Vfs architecture, Implementation Overview, File System dependent objects, Mounting a file system, Operations on files.

FILE SYSTEM IMPLEMENTATIONS : System V file system (s5fs) implementation, Berkeley FFS, FFS functionality enhancements and analysis, Temporary file systems, Buffer cache and other special-purpose file systems.

TEXTBOOKS

- Uresh Vahalia, *UNIX Internals*, Pearson Education, 2005.
- Silberschatz & Galvin, *Operating System Concepts*, Wiley.

REFERENCE BOOKS

- Richard Stevens, Stephen Rago, *Advanced Programming in the UNIX Environment*, Pearson Education.

BTCSE DES23: Low Power Circuits And Systems

Unit – I

Introduction: Introduction and Historical background, low power, source of power dissipations, Dynamic power and static power, Low power Design Methodologies. Basic MOS fabrication process, nMOS fabrication steps, cMOS Fabrication steps, short channel effects, emerging technologies for low power

Unit – II

Analog and Digital low power circuits: MOS Transistors, modes and operation of MOS transistors, MOS Inverters and characteristics, MOS inverter configuration, MOS Combinational circuits, Pass transistor logic, Gate logic, MOS Dynamic circuits.

Unit – III

Sources of power dissipation, Dynamic power dissipation, short circuit power dissipation, switching power dissipation, Glitching power dissipation, leakage power dissipation, supply voltage Scaling, Minimize switched capacitance, Minimized leakage power.

Unit – IV

Battery-Aware systems, Overview of battery technologies, Nickel cadmium, Nickel-metal hydride, Lithium ion, rechargeable alkaline, Li-polymer, Battery Characteristics, principle of Battery discharge, battery modeling, battery driven system design, Energy aware routing,

Unit – V

Low Power Software approaches introduction, the Hardware, Machine Independent software optimizations, compilation for low power, combining loop optimization with DVFS, loop unrolling, loop tiling, loop permutation, strength reduction, loop fusion, loop peeling, loop un-switching, power aware software prefetching, compilation for low power.

Text Books:

1. Low-Power VLSI Circuits and Systems, Authors: Pal, Ajit, Springer publication.

BTCSE DES32 Real Time Systems

Unit – I 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.

Unit – II REAL TIME SCHEDULING 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, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

Unit – III RESOURCES ACCESS CONTROL: Effect of Resource Contention and Resource Access Control (RAC), Nonpreemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling 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.

Unit – IV MULTIPROCESSOR SYSTEM ENVIRONMENT: Multiprocessor and Distributed System Model, Multiprocessor Priority-Ceiling Protocol, Schedulability of Fixed- Priority End-to-End Periodic Tasks, Scheduling Algorithms for End-to-End Periodic Tasks, End-to-End Tasks in Heterogeneous Systems, Predictability and Validation of Dynamic Multiprocessor Systems,

Scheduling of Tasks with Temporal Distance Constraints

Unit – V REAL TIME COMMUNICATION: 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, Real Time Protocols, Communication in Multicomputer System, An Overview of Real Time Operating Systems.

Reference Book

- Jane W. S. Liu, Real Time Systems, Pearson Education Publication.
- Prof. Albert & M. K. Cheng, Real-Time Systems: Scheduling, Analysis, and Verification,

  John Wiley and Sons Publications.

BTCSE DES33 Software Re-Engineering

Unit 1: Introduction To Software Reengineering (Reverse Engineering), Origin & Need Of Software Reengineering, Review Of Software Development Life Cycle, Software Evaluation Process, Software Maintenance

Unit 2: Program Comprehension, Requirement Of Software Reengineering, Business Redefinition, Process Identification, Process Evaluation, Process Specification & Design, Prototyping, Refinement

Unit 3: Legacy Software System, Software Version & Release Management, Architectural Evolution, Types Of Restructuring, Automatic Program Restructuring, Data Restructuring,

Source Code Translation, Forward Engineering, Difference Between Reverse & Forward Engineering

Unit 4: Software Reengineering Activities, Code Slicing, Code Refracting, Software Aging & Code Decay, Software Reusability.

Unit 5: Economics Of Software Reengineering, Cost Of Maintenance & Benefits, Legal & Ethical Issues In System Reengineering

Reference Book

- Seacord, Plakosh, Lewis, "Modernizing Legacy Systems: Software Technologies, Engineering Processes, And Business Practices", Addison-Wesley ISBN 0321118847, 2003
- "Refactoring: Improving The Design From Existing Code", Addison-Wesley ISBN 0201485672, 2000
- Miller, "Reengineering Software Legacy Systems", Butterworth Publishers, ISBN 1555581951, 1998.
- Alam, T. Padenga, "Application Software Reengineering", Pearson, ISBN 9788131731857, 2010

BTCSE DES42 Internet of Things

Unit 1 – Overview: Iot-An Architectural Overview– Building An Architecture, Main Design Principles And Needed Capabilities, An Iot Architecture Outline, Standards Considerations. M2M And Iot Technology Fundamentals- Devices And Gateways, Local And Wide Area Networking, Data Management, Business Processes In Iot, Everything As A Service(Xaas), M2M And Iot Analytics, Knowledge Management

Unit 2 – Reference Architecture: Iot Architecture-State Of The Art – Introduction, State Of The Art, Reference Model And Architecture, Iot Reference Model - Iot Reference Architectureintroduction, Functional View, Information View, Deployment And Operational View, Other Relevant Architectural Views. Real-World Design Constraints- Introduction, Technical Design Constraints-Hardware Is Popular Again, Data Representation And Visualization, Interaction And Remote Control.

Unit 3 – IoT Data Link Layer & Network Layer Protocol: (3GPP MTC, IEEE 802.11, IEEE 802.15), Wirelesshart,Z-Wave,Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-Ipv4, Ipv6, 6lowpan, 6tisch,ND, DHCP, ICMP, RPL, CORPL, CARP

Unit 4 – Transport & Session Layer Protocols: Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS) – Session Layer-HTTP, Coap, XMPP, AMQP, MQTT

Unit 5 – Service Layer Protocols & Security: Service Layer -ONEM2M, ETSI M2M, OMA, BBF – Security In IoT Protocols – MAC 802.15.4 , 6LOWPAN, RPL, Application Layer

Reference Book

- Jan Holler, Vlasiostsiatsis, Catherine Mulligan, Stefan Avesand, Stamatiskarnouskos, David Boyle, "From Machine-To-Machine To The Internet Of Things: Introduction To A New Age Of Intelligence", 1 St Edition, Academic Press, 2014.
- Peter Waher, "Learning Internet Of Things", PACKT Publishing, BIRMINGHAM – MUMBAI
- Bernd Scholz-Reiter, Florian Michahelles, "Architecting The Internet Of Things", ISBN 978-3-642-19156-5 E-ISBN 978-3-642-19157-2, Springer
- Daniel Minoli, "Building The Internet Of Things With Ipv6 And Mipv6: The Evolving World Of M2M Communications", ISBN: 978-1-118- 47347-4, Willy Publications
- Vijay Madisetti And Arshdeepbahga, "Internet Of Things (A Hands-On Approach)", 1 St Edition, VPT, 2014.

BTCSE DES43 Ad-Hoc And Sensor Networks

Unit 1 - Introduction: Fundamentals Of Wireless Communication Technology – The Electromagnetic Spectrum – Radio Propagation Mechanisms – Characteristics Of The Wireless Channel -Mobile Ad Hoc Networks (Manets) And Wireless Sensor Networks (Wsns) :Concepts And Architectures. Applications Of Ad Hoc And Sensor Networks. Design Challenges In Ad Hoc And Sensor Networks.

Unit 2 - MAC Protocols For Ad Hoc Wireless Networks: Issues In Designing A MAC Protocol- Classification Of MAC Protocols- Contention Based Protocols- Contention Based Protocols With Reservation Mechanisms- Contention Based Protocols With Scheduling Mechanisms – Multi Channel MAC-IEEE 802.11

Unit 3 - Routing Protocols And Transport Layer In Ad Hoc Wireless Networks: Issues In Designing A Routing And Transport Layer Protocol For Ad Hoc Networks- Proactive Routing, Reactive Routing (On-Demand), Hybrid Routing- Classification Of Transport Layer Solutions-TCP Over Ad Hoc Wireless Networks.

Unit 4 - Wireless Sensor Networks (WSNs) And MAC Protocols: Single Node Architecture: Hardware And Software Components Of A Sensor Node - WSN Network Architecture: Typical Network Architectures-Data Relaying And Aggregation Strategies - MAC Layer Protocols: Self-Organizing, Hybrid TDMA/FDMA And CSMA Based MAC-IEEE 802.15.4.

Unit 5 - WSN Routing, Localization & QOS: Issues In WSN Routing – OLSR- Localization – Indoor And Sensor Network Localization-Absolute And Relative Localization, Triangulation-QOS In WSN-Energy Efficient Design-Synchronization-Transport Layer Issues.

Reference Book

- C.K.Toh, "AdHoc Mobile Wireless Networks", First Edition, Pearson Education, 2002.
- William Stallings, "Wireless Communications and Networks", Pearson Education, 2002.
- C.S. Raghavendra, Krishna M. Sivalingam, Taieb Znati, "Wireless Sensor Networks", Springer Science & Business Media.

BTCSE DES51 Agile Software Developments & DevOps

UNIT I: AGILE METHODOLOGY

Theories for Agile Management, Agile Software Development, Traditional Model vs. Agile Model, Classification of Agile Methods, Agile Manifesto and Principles, Agile Project Management, Agile Team Interactions, Ethics in Agile Teams, Agility in Design, Testing , Agile Documentations, Agile Drivers, Capabilities and Values

UNIT II: AGILE PROCESSES

Lean Production, SCRUM, Crystal, Feature Driven Development, Adaptive Software Development, Extreme Programming: Method Overview, Lifecycle, Work Products, Roles and Practices.

UNIT III: AGILITY AND KNOWLEDGE MANAGEMENT

Agile Information Systems, Agile Decision Making, Earl_S Schools of KM, Institutional Knowledge Evolution Cycle, Development, Acquisition, Refinement, Distribution, Deployment , Leveraging, KM in Software Engineering, Managing Software Knowledge,

Challenges of Migrating to Agile Methodologies, Agile Knowledge Sharing, Role of Story-Cards, Story-Card Maturity Model (SMM).

UNIT IV: AGILITY AND REQUIREMENTS ENGINEERING

Impact of Agile Processes in RE, Current Agile Practices, Variance, Overview of RE Using Agile, Managing Unstable Requirements, Requirements Elicitation, Agile Requirements Abstraction Model, Requirements Management in Agile Environment, Agile Requirements Prioritization, Agile Requirements Modeling and Generation, Concurrency in Agile Requirements Generation.

UNIT V DevOps

Linux Basics, Introduction to DevOps, Introduction to Cloud Computing, GIT: version control, Chef for Configuration Management, AWS, Puppet for configuration management, Jenkins-continuous integration, Docker containers.

Reference Books:

- David J. Anderson and Eli Schragenheim, ―Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, Prentice Hall, 2003.
- Hazza and Dubinsky, ―Agile Software Engineering, Series: Undergraduate Topics in Computer Science, Springer, 2009.
- Craig Larman, ―Agile and Iterative Development: A Managers Guide, Addison-Wesley, 2004.
- Kevin C. Desouza, ―Agile Information Systems: Conceptualization, Construction, and Management, Butterworth-Heinemann, 2007.

BTCSE DES52: Simulation and Modelling

UNIT I

Simulation Basics; Dynamical, finite state, and Complex Model Simulation; Actor based and Mesh Based Simulation; Converting to parallel and Distributed Simulation; Partitioning the data; partitioning the Algorithms

UNIT II

Probability and statistics for simulation and analysis; Introduction to queues and random noise; random variation generation; simulation results analysis and viewing tools-display forms, Terminals and web interfaces; validation of model results

UNIT III

Analysis of simulation data: input modelling, data collection, assessing sample independence, hypothesizing distribution family with data, parameter estimation, goodness of fit test, selecting input models in absence of data

Unit IV

Introduction to modelling; Modelling Concepts and Definitions; Parallel process modelling; continuous system modelling; Model classification-conceptual, abstract and simulation model; basics of system theory

UNIT V

Verification and Validation: Model building, verification of simulation model, calibration and validation of model, validation of model assumption, validating input output model

Reference Books:

1. Fishwick P.: Simulation Model Design and Execution, Prentice Hall,
2. Law A., Kelton D.: Simulation Modelling and Analysis, McGraw-Hill
3. Ross, S.: Simulation, Academic Press

UNIT I

BTCSE DES53: Software Testing & Quality Assurance

Introduction: Basic testing vocabulary, quality assurance vs quality control, software quality factors, defect, scope of testing, testing constraints, life cycle testing, levels of testing, the 'v' concept of testing

UNIT II

Testing techniques and test administration: structural technique, functional technique, verification and validation, static and dynamic testing, test planning, customization of test process, budgeting, scheduling

UNIT III

SDLC phases: requirement, analysis, design, coding, testing, delivery, and maintenance; SDLC model: water fall model, V model, Agile model, prototype model, spiral model; Software testing methodologies: white box testing, black box testing, grey box testing; test case design technique: static technique, dynamic technique, structural technique

UNIT IV

Test case design: write and review test cases, test cases template, types of test cases, test scenario and test cases; Defect tracking and reporting: types of bugs, identifying the bugs, bug/defect life cycle, reporting the bugs, severity and priority, criteria for test closure; test summary report

UNIT V

Quality assurance, Quality control, quality engineering, software quality standards, five view of software quality, McCall's quality factors and criteria, ISO 9126 Quality Characteristics, ISO 9000:2000 fundamentals, ISO 9001:2000 requirements,

Reference Books:

a. Software Quality Engineering: Testing, Quality Assurance and Quantifiable Improvement, by Jeff Tian, published by Wiley
b. P. Ammann and J. Offutt. Introduction to Software Testing. Cambridge University Press
c. Software testing and quality assurance: Theory and Practice by kshirasagar Naik & Priyadarshi Tripathi; Publisher: Wiley
d. Fundamentals of software testing by Aditya P. Mathur; Publisher: Pearson

BTCSE DES61: Engineering System Analysis and Design

UNIT I

Data information, functional allocation of management, qualities of information, system analysis and design life cycle, system design, system implementation, system evaluation, tools used in system analysis

UNIT II

Feasibility analysis, quantification of costs and benefits, tools for prototype creation, data flow diagram, structural system analysis and design, example and cases, specification oriented design, procedure oriented design,

UNIT III

Data oriented systems design, Entity Relationship Model, E-R diagrams, relationships cardinality and participation, normalizing relations, various normal forms and their need, some examples of relational data base design,

UNIT IV

Data input methods, coding techniques, requirements of coding schemes, error detection of codes, validating input data, input data controls interactive data input Designing outputs, output devices, designing output reports, screen design, graphical user interfaces , interactive I/O on terminals

UNIT V

Object oriented systems modelling, objects and their properties, classes, inheritance, polymorphism, some cases of object oriented system modelling, Control, objectives of control, techniques used in control, testing information systems, types of tests, how to generate tests, security of information systems, disaster recovery, business process continuity.

Reference Books:

e. Systems Analysis and Design by Kenneth E. Kendall and Julie E. Kendall, Publisher: Prentice Hall PTR, 5th Edition, 2001
f. System Analysis design by Arunesh Goyal, Prentice Hall India
g. System Analysis and Design by Dennis and Wixom, Wiley
h. Real-Time systems design and Analysis: Tools for Practitioners, Wiley

UNIT 1 **BTCSE DES62 Engineering System Design Optimization**

Introduction to system design, Morphology of design with a flow chart, Brief discussion on market analysis, profit, time value of money, Suitable examples of discounted cash flow technique, Concept of workable design, practical example on workable system and optimal design.

UNIT 2

Classification of system simulation, Successive substitution method examples, Newton Raphson method - one unknown – examples, Newton Raphson method multiple unknowns – examples, Gauss Seidel method – examples, Rudiments of finite difference method for partial differential equations with an example.

UNIT 3

Introductory ideas on Regression and Curve Fitting, Need for regression in simulation and optimization, Concept of best fit and exact fit, Exact fit - Lagrange interpolation, Newton's divided difference examples, Least square regression - theory, examples from linear regression with one and more unknowns examples, Power law forms – examples, Gauss Newton method for nonlinear least squares regression examples.

UNIT 4

Optimization introduction, Formulation of optimization problems – examples, Calculus techniques – Lagrange multiplier method – proof, examples, Search methods – Concept of interval of uncertainty, reduction ratio, reduction ratios of simple search techniques like exhaustive search, dichotomous search, Fibonacci search and Golden section search – numerical examples,

UNIT 5

Method of steepest ascent/ steepest descent, conjugate gradient method – examples, Geometric programming – examples, Dynamic programming – examples, Linear programming – two variable problem –graphical solution, New generation optimization techniques – Genetic algorithm and simulated annealing examples, Introduction to Bayesian framework for optimization examples

References:

1. Introduction to optimum design, J.S.Arora, Mc Graw Hill, 1989.
2. Optimization for engineering design - algorithms and examples, K.Deb, Prentice Hall, 1995.
3. Essentials of Thermal System Design and Optimization, Prof. C. Balaji, Aue Books, New Delhi in India and CRC Press in the rest of the world.
4. Design and optimization of thermal systems, Y.Jaluria, Mc Graw Hill, 1998.
5. Elements of thermal fluid system design, L.C.Burmeister, Prentice Hall, 1998.

BTCSE DES63 Engineering System Modelling and Simulation

UNIT 1

Introduction to modelling, Examples of models, Modelling of dynamic systems, Introduction to simulation, Introductory ideas on the tools available for simulation.

UNIT 2

Bond graphs modelling, Bond graph model and causality, Generation of system equations, Methods of drawing bond graph models for mechanical systems, Methods of drawing bond graph models for electrical systems.

UNIT 3

Basic system models for mechanical systems, Basic system models for electrical systems, Basic system models for hydraulic systems, Basic system models for pneumatic systems, Basic system models for thermal systems.

UNIT 4

System models: Linearity and non- linearity in systems, System models of combined rotary and translator systems, System models of Electro mechanical systems, System models of Hydro mechanical systems, System models of robots.

UNIT 5

Simulation using SIMULINK, Simulation of simple and compound pendulums, Simulation of planar mechanisms, Simulation of wheeled mobile robots, Validation and verification of simulation models

References:

1. Dynamic Systems and Response, Kelly, Cengage Publication

2.Identification and Control of Mechanical Systems, Juang and Phan, Cambridge University Press

3.Feedback Control of Dynamic Systems, Franklin, Powell and Naeini, Pearson Education

4. Dynamic Systems Control, Skelton, John Wiley and Sons

5. Control System Design, Friedland, Dover Publication

BTCSE DED11: ARTIFICIAL INTELLIGENCE

Unit-I

INTRODUCTION: Introduction to Artificial Intelligence, Background and Applications, Turing Test and Rational Agent Approaches, Introduction to intelligent agents.

Unit-II

PROBLEM SOLVING AND SEARCHING TECHNIQUES: Problem Characteristics, Breadth First Search, Depth First Search, Bidirectional Search, Local Search, Heuristics Search Techniques, Best First Search, A* Algorithm, Constraint Satisfaction Problem, Means-End Analysis, Introduction to Game Playing, Min Max and Alpha Beta Pruning.

Unit-III

KNOWLEDGE REPRESENTATION: Introduction to First Order Predicate Logic, Resolution Principle, Unification. Rule based Systems: Forward versus backward reasoning, conflict resolution, Structured Knowledge Representation: Semantic Nets, Frames, conceptual dependency.

Unit-IV

PROGRAMMING IN LOGIC: Fundamental and concepts of Programming languages like Prolog. Relationship of languages with Knowledge representation and inferences.

PLANNING: The Planning Problem, Planning with State Space Search, Partial Order Planning.

Unit-V

RESEARCH ISSUES IN AI: Study of Computational Intelligence methodology such as machine learning, fuzzy systems and swarm intelligence.

TEXTBOOKS

- Russell & Norvig, *Artificial Intelligence- A Modern Approach*, 3rd edition, Prentice Hall, 2010.
- Elaine Rich, Kevin Knight, Shivashankar & B. Nair, *Artificial Intelligence*, 3rd edition, TMH, 2009.
- D W Patterson, *Artificial Intelligence and Expert Systems*, Prentice Hall of India, 2002.

- William F. Clocksin, Christopher S. Mellish, *Programming in Prolog*, 5th edition, Springer-Verlag, 2003.

REFERENCE BOOKS

- Saroj Kaushik, *Artificial Intelligence*, 1st edition, Cengage Learning, 2011.
- Ivan Bratko, *Prolog Programming for Artificial Intelligence*, 4th edition, Pearson Education, 2011.

BTCSE DED12: PATTERN RECOGNITION

UNIT-I

Introduction to pattern recognition and applications to OCR, speech recognition, fingerprints, signatures etc. Commercial importance of applications. Introduction to Statistical, Neural and Structural Approaches.

UNIT-II

Statistical Pattern Recognition: Patterns and classification, discriminant functions, Bayes decision rule, nearest neighbour rule, probability of error.

UNIT-III

Linear discriminant functions: Perceptrons and training, LMSE approaches. Unsupervised learning and clustering. Feature extraction.

UNIT-IV

Neural Approach: Introduction to artificial neural networks, feed forward networks, delta rule and backpropagation, Hopfield networks and unsupervised learning, Adaptive resonance architectures, related techniques. Pattern associators and content addressable memories, hardware realizations.

UNIT-V

Syntactic pattern recognition: Formal languages and grammars Pattern grammars and higher dimensional grammars, Parsing, Automata realizations, stochastic grammars, Grammatical Inference, computational learning theory, Valiant`s framework.

TEXT BOOKS

- "Pattern Recognition: Statistical, Structural and Neural Approaches" R. J. Schalkoff; Wiley, 1992.

REFERENCE BOOKS

- "Pattern Classification and Scene Analysis" by R. O. Duda and P. E. Hart; Wiley, New York, 1973.
- "Structural Methods in Pattern Recognition" by L. Miclet; North Oxford Academic, London, 1986.

BTCSE DED42 Big Data Analytics

Outcomes:

The objective of this course is to provide learners with a deep and systematic knowledge of business and technical strategies for data analytics and the subsequent skills to implement solutions in these areas. The students will be able to conduct independent research and analysis in the field of data analytics and learn to identify, develop and apply detailed analytical, creative, problem solving skills.

UNIT I : INTRODUCTION TO BIG DATA AND HADOOP

Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Infosphere BigInsights and Big Sheets.

UNIT II : HDFS (Hadoop Distributed File System)

The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures.

UNIT III : Map Reduce

Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.

Unit IV : Hadoop Eco System

Pig : Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators.

Hive : Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions.

Hbase : HBasics, Concepts, Clients, Example, Hbase Versus RDBMS.
Big SQL : Introduction

UNIT V : Data Analytics with R

Machine Learning : Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with BigR.

Text Books

1. Tom White " Hadoop: The Definitive Guide" Third Edit on, O'reily Media, 2012.

• Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.

References

• Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
• Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013)
• Tom Plunkett, Mark Hornick, "Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R

Enterprise and Oracle R Connector for Hadoop", McGraw-Hill/Osborne Media (2013), Oracle press.

• Anand Rajaraman and Jef rey David Ulman, "Mining of Massive Datasets", Cambridge University Press, 2012.
• Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012.

BTCSE DED51 : DATA MINING

Outcomes:

The students will Learn data mining concepts understand association rules mining and to solve real world problems in business and scientific information using data mining. The learner will be able to perform the preprocessing of data and apply mining techniques on it and to identify the association rules, classification and clusters in large data sets.

UNIT - I

Introduction to Data Mining: Introduction, What is Data Mining, Definition, KDD, Challenges, Data Mining Tasks, Data Preprocessing, Data Cleaning, Missing data,

Dimensionality Reduction, Feature Subset Selection, Discretization and Binaryzation, Data Transformation; Measures of Similarity and Dissimilarity- Basics.

UNIT - II

Association Rules: Problem Definition, Frequent Item Set Generation, The APRIORI Principle, Support and Confidence Measures, Association Rule Generation; APRIOIRI Algorithm, The Partition Algorithms, FP-Growth Algorithms, Compact Representation of Frequent Item Set- Maximal Frequent Item Set, Closed Frequent Item Set.

UNIT - III

Classification: Problem Definition, General Approaches to solving a classification problem , Evaluation of Classifiers , Classification techniques, Decision Trees-Decision tree Construction , Methods for Expressing attribute test conditions, Measures for Selecting the Best Split, Algorithm for Decision tree Induction ; Naive-Bayes Classifier, Bayesian Belief Networks; K- Nearest neighbour classification-Algorithm and Characteristics.

UNIT - IV

Clustering: Problem Definition, Clustering Overview, Evaluation of Clustering Algorithms, Partitioning Clustering-K-Means Algorithm, K-Means Additional issues, PAM Algorithm; Hierarchical Clustering-Agglomerative Methods and divisive methods, Basic Agglomerative Hierarchical Clustering Algorithm, Specific techniques, Key Issues in Hierarchical Clustering, Strengths and Weakness; Outlier Detection.

UNIT - V

Web and Text Mining: Introduction, web mining, web content mining, web structure mining, we usage mining, Text mining –unstructured text, episode rule discovery for texts, hierarchy of categories, text clustering.

TEXT BOOKS:

1. Data Mining- Concepts and Techniques- Jiawei Han, Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, 2 Edition, 2006.
2. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education.
3. Data mining Techniques and Applications, Hongbo Du Cengage India Publishing

REFERENCE BOOKS:

1.Data Mining Techniques, Arun K Pujari, 3rd Edition, Universities Press.
2.Data Mining Principles & Applications – T.V Sveresh Kumar, B. Esware Reddy, Jagadish S Kalimani, Elsevier.
3. Data Mining, Vikaram Pudi, P Radha Krishna, Oxford University Press

BTCSE DED43 (COMPILER DESIGN)

Unit – I

INTRODUCTION: Introduction to Translators (interpreter, compiler & cross-compiler), Phases of compilation and overview, Introduction to GCC.

LEXICAL ANALYSIS (SCANNER): Regular language, finite automata, regular expression and their applications to lexical analysis, from regular expression to finite automata, Implementation of lexical analyzers, lexical-analyzer generator, LEX-compiler, Formal grammars and their application to syntax analysis, ambiguity, YACC.

Unit – II

SYNTAX ANALYSIS (PARSER): Context-free language and grammar

BASIC PARSING TECHNIQUES: Parsers, Top down parsing, Shift reduce parsing, operator grammar, operator precedence parsing, predictive parsers. LL(1) grammar, LR(0), SLR(1), LR(1), LALR(1) grammars and Bottom-up parsing, ambiguity and LR parsing, LALR(1) parser generator (yacc,bison).

Unit – III

SYNTAX-DIRECTED TRANSLATION: Syntax-directed Translation schemes, Implementation of Syntax directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser.

Unit – IV

SEMANTIC ANALYSIS: Attribute grammar, syntax directed definition, evaluation and flow of attribute in a syntax tree.

SYMBOL TABLE: Data structure for symbols tables, representing scope information, symbol attributes and management. Run-time environment: Procedure activation, parameter passing, value return, memory allocation, and scope. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.

Unit – V

INTERMEDIATE CODE GENERATION: Translation of different language features, different types of intermediate codes.

CODE IMPROVEMENT (OPTIMIZATION): Analysis: control-flow, data-flow dependence etc., Code improvement local optimization, global optimization, loop optimization, peep-hole optimization

TEXTBOOKS

- Alfred V. Aho, Monica S. Lam, Ravi Sethi & Jeffrey D. Ullman, *Compilers: Principles, Techniques, and Tools*, 2nd edition, Prentice Hall, 2006.

REFERENCE BOOKS

- Allen I. Holub, *Compiler Design in C* , PHI, 2003.
- *C. N. Fischer and R. J. LeBlanc, Crafting a compiler with C, Benjamin Cummings.*
- J.P. Bennet, *Introduction to Compiler Techniques*, 2nd Edition, TMH, 2003.
- Henk Alblas and Albert Nymeyer, *Practice and Principles of Compiler Building with C*, PHI, 2001.