Proposed Syllabus

B. Tech (CSE) + M. Tech. (CSE)

(Semester Scheme)

Five Year Degree Course

Department of Computer Science & Engineering
Faculty of Engg. & Technology
Jodhpur National University, Jodhpur

Academic Regulations

Five Year Dual Degree B.Tech. – M.Tech
(Semester Scheme)
Five Year Course

1. Abbreviations:-

CE- Civil Engineering Branch
Ch.E. – Chemical Engineering Branch
CS –Computer Science & Engineering Branch
EE –Electrical Engineering Branch
EC –Electronics & Communication Engineering Branch
IT –Information Technology Branch
ME –Mechanical Engineering Branch

2. All examination for B.Tech-M.TECH shall be governed by ordinance. Change in statutes/ordinance/rules/regulation/syllabi & books may from time to time be made by amendment and/or by redrafting and a student shall accept and comply with and abide by any change that applies to semester/year he has not completed at the time of the change.

3. Duration of Course

The course of study for B.Tech-M.TECH will extend over a period of 5 years (10 semesters) as an integrated course. A student shall follow the prescribed course as given in the teaching & examination scheme of the course to which he is admitted.

4 Eligibility for Admission

4.1 (a) A student for admission to the five year degree program for B.Tech-M.TECH must have passed (10+2) Senior Secondary/ (Physics, Chemistry & Mathematics) from Board of Secondary Education, Rajasthan/ University or other examinations recognized as equivalent or higher thereto and selected through RPET/AIEEE or otherwise as per the procedure laid down by the University from time to time.

4.1 (b) 5% relaxation is provided to students belonging to SC/ST category in qualifying aggregate marks.

4.2 Lateral entry to Diploma holder's in B.Tech-M.TECH Second Year

A student who has passed Diploma course in engineering conducted by a State Board of Technical Education with atleast 60% marks in aggregate or in Final year shall be eligible for admission directly to the II B.Tech-M.TECH. of the Five year course in the appropriate branch of engineering provided that in the case of a student belonging to SC/ST, minimum percentage marks secured at the Diploma shall be at least 55%.

Admission of such student shall be made on the basis of merit at the Diploma level and/or merit to be adjudged through a competitive test/viva voce.

The student who has appeared at the Final Year examination of Diploma course but whose result are awaited will also be permitted provisionally.

All such cases would be considered for admission against the 10% of sanctioned strength and the availability of seats due to drop outs & failures in respective branch of engineering and as per prevalent rules (of RPET in this respect) of the University.

5. Eligibility for appearing in the examination

The course of study for First year (I & II Semester) would be common for all branches.

5.1 (i) For all regular students in the Faculty of Engineering & Technolohy the minimum attendance requirement shall be that a student should have attended at least 75% of the lectures delivered and the tutorials held taken together as well as 75%for the practical and sessionals from the date of admission. (of respective semester separately)

(ii) A student who has attended a regular course of study in the Faculty of Engineering and Technology for the First Semester of First B.Tech-M.TECH in accordance with the scheme of examination shall be eligible for appearing at the first semester examination of First B.Tech-M.TECH for the B.Tech-M.TECH Degree which shall be common to all branches.

(iii) A student who has attended a regular course of study for the Second Semester of First B.Tech-M.TECH-M.TECH and has appeared in the First Semester examination shall be eligible for appearing at the Second Semester examination of First B.Tech-M.TECH in accordance with the scheme of examination which shall be common to all branches.

5.2. (i) The course of study from the Second B.Tech-M.TECH Examination shall be separate for all branches of study.

(ii) A student who after passing I & II Semester (combined) of Ist B.Tech-M.TECH examination with regular course of study in a particular branch of Engineering shall be eligible for appearing at the Third Semester examination of Second B.Tech-M.TECH- in that branch of study.

(iii) A student who has attended a regular course of study for the Fourth Semester examination of Second B.Tech-M.TECH and has also appeared in the Third Semester examination of Second B.Tech-M.TECH shall be eligible for appearing at the Fourth Semester Examination of Second B.Tech-M.TECH in that branch of study.

(iv) A student who has passed III & IV Semester of Second B.Tech-M.TECH examination and has attended a regular course of study in a particular branch of Engineering for the Fifth Semester of Third B.Tech-M.TECH in accordance with the scheme of examination shall be eligible for appearing at the Fifth Semester examination of Third B.Tech-M.TECH in that branch of study.

(v) A student who has attended a regular course of study for the Sixth Semester of Third B.Tech-M.TECH and also has appeared in the Fifth Semester examination of Third B.Tech-M.TECH in accordance with the scheme of examination shall be eligible for appearing at the Sixth Semester examination of Third B.Tech-M.TECH in that branch of study.

(vi) A student who has passed V and VI Semester of Third B.Tech-M.TECH examination and has attended a regular courses of study in particular branch of Engineering for the Seventh Semester of Forth B.Tech-M.TECH in accordance with the scheme of examination shall be eligible of appearing at the Seventh Semester examination of Final B.Tech-M.TECH in that branch of study.

(vii) A student who has attended a regular course of study for the Eighth Semester of Forth B.Tech-M.TECH and has also appeared in the Seventh Semester examination of Forth B.Tech-M.TECH in accordance with the scheme of examination shall be eligible for appearing at the Eighth Semester examination of Final B.Tech-M.TECH in that branch of study.

(viii) A student who has passed VII and VIII Semester of forth B.Tech-M.TECH examination and has attended a regular courses of study in particular branch of Engineering for the ninth Semester of Fifth B.Tech-M.TECH in accordance with the

scheme of examination shall be eligible of appearing at the Ninth Semester examination of B.Tech-M.TECH in that branch of study.

(ix) A student who has attended a regular course of study for the Ninth Semester of Fifth B.Tech-M.TECH and has also appeared in the Eighth Semester examination of Forth B.Tech-M.TECH in accordance with the scheme of examination shall be eligible for appearing at the Ninth Semester examination of Fifth B.Tech-M.TECH in that branch of study.

(x) A student who has passed IX and X Semester of fifth B.Tech-M.TECH examination and has attended a regular courses of study in particular branch of Engineering for the eleventh Semester of Fifth B.Tech-M.TECH in accordance with the scheme of examination shall be eligible of appearing at the Ninth Semester examination of Fifth B.Tech-M.TECH in that branch of study.

(xi) A student who has attended a regular course of study for the Tenth Semester of Fifth B.Tech-M.TECH and has also appeared in the Ninth Semester examination of Fifth B.Tech-M.TECH in accordance with the scheme of examination shall be eligible for appearing at the Tenth Semester examination of Fifth B.Tech-M.TECH in that branch of study.

5.3 Condonation of shortage of attendance:

The shortage of attendance up to the limits specified below may be condoned on valid reasons:

(i) A student can have a relaxation of 10% attendance on medical and special ground to the satisfaction of Dean and additional 5% can be granted by President.

(ii) The N.C.C./N.S.S. cadets sent out to parades and camps and such students who are deputed by the University to take part in games, athletics or cultural / Academic activities and to attend campus interviews may for the purpose of attendance be treated as present for the days of these absence in connection with the aforesaid activities and that period shall be added to their subject wise attendance.

6. Scheme of Study

6.1 The Medium of instruction and examination shall be English.

6.2 Students for the B.Tech-M.TECH Course shall be instructed and examined as per the Teaching and Examination scheme and course content of respective semester.

6.3 (i) The course of study for First year (I & II Semester) would be common for all branches.

(ii) The course of study from the **Second** B.Tech-M.TECH, **Third** B.Tech-M.TECH & **Fourth** B.Tech-M.TECH (from III to VIII Semester) shall be separate for each branch of study.

(iii) The Classes of B.Tech-M.TECH will held simultaneously.

(iv)The Teaching & Examination Scheme and the syllabus for five year dual degree B.Tech-M.Tech Course III year to IV Year (V Sem. To VIII Sem.) will have some additional courses of M.Tech in respective branch along with the course of four year B.Tech.

(v) The Teaching & Examination Scheme and the syllabus for the fifth year of dual degree B.Tech-M.Tech V Year will have all the course of M.Tech only.

7. **Examination** There shall be two sessional exams in theory and one university examination each in theory & Practical in each semester. These examinations will be designated as follows.

(i) During first year; B.Tech-M.TECH I semester Examination, B.Tech-M.TECH II Semester Examination.

(ii) During second year: B.Tech-M.TECH III Semester Examination, B.Tech-M.TECH- IV Semester Examination.

(iii) During third year: B.Tech-M.TECH V Semester Examination, B.Tech-M.TECH. VI Semester Examination.

(iv) During fourth year: B.Tech-M.TECH. VII semester Examination, B.Tech-M.TECH. VIII Semester Examination.

(v) During fifth year: B.Tech-M.TECH. IX semester Examination, B.Tech-M.TECH. X Semester Examination.

(vi) Examination shall be conducted by means of written papers and/or practical and/or viva voce exams, including sessional work done in the laboratories, workshops and training in engineering works or factories.

8. Standard of Passing

(A) For B.Tech:

8.1 (i) the student has to pass individually in all courses of each semester from I to VIII Semester. The results of I, III, V and VII Semester shall be declared without awarding the division. The division will be awarded on the basis of combined performance of I & II Semesters, III & IV Semesters, V & VI Semesters and VII & VIII Semesters respectively.

(ii) For pass in a course the student has to secure minimum 35% marks in theory papers including sessionals/ term papers however to pass in theory paper student must secure 35% marks in university theory paper (i.e. 28 marks out of 80) and student has to obtain 50% marks in practical and sessional (i.e. as a minimum 10 marks out of 20 and 15 marks out of 30 and in total 25 marks out of 50). Student must obtain aggregate of 45% marks in the grand total in that semester.

8.2 (i) No student will be awarded five year dual degree of B.Tech-M.TECH unless student has passed all the Ten semester.

(ii) Student will be awarded degree of Bachelor of Technology if student passes only eight semesters.

8.3 If a student fails in more than 50% theory papers and practicals taken together, he/she has to seek re-admission to the same class in which he/she failed.

8.4 If a student is promoted with ATKT due to fail in practicals, then he/she is eligible to attend Summer Semester classes (if arranged by the University) and attend all the lab., work. On completion of Summer Semeter he/she will be awarded sessional marks for the practicals by the concerned HoD. He/she will be appearing in the university practical examinations to be conducted at the end of Semmer Semester.

NOTE: A student, who is unable to appear at the semester examination in some theory papers, practical and sessionals due to any reason what so ever, shall be considered as having failed in those paper (s), practical (s) and sessional (s).

(B) For M.Tech: For M.Tech Academic Regulation of M.Tech course will apply.

NOTE: a student, who is unable to appear at the semester examination in some theory papers, Practical and sessionals due to any reason what so ever, shall be considered as having failed in those paper (s), Practical (s) and Sessional (s).

9. Criteria for passing and other conditions.

9.1 Students will be considered to have passed the semester only when the candidates passes in all the subjects (Including ATKT if any). Students will be given maximum ten years to complete his/her B.Tech-M.TECH.After this period, his enrolment stand cancelled. If candidate fails to appear in examination, then also his attempt will be counted.

9.2 For I to VIII Semester if a students fails in not more than 50% of the theory & Practical papers taken together. The student shall be allowed to keep term (ATKT) in the next higher semester. The student shall appear in those theory papers along-with regular candidates whenever examination of that semester are held and pass in which he/she fails. (Refer Regulation. 8.4 with regard to the passing practical Examinations.)

9.3 ATKT

If a student fails in not more than 50% of Theory & Practical courses during a year (Both semesters of a year taken together), he will be allowed to keep term (ATKT) in next year subject to the provisions of ordinance. As an example

At the end of academic year / Example	Total subject heads at the end of academic year.	50% of total subjects (To nearest full digit) for ATKT
B. Tech. I Year Theory / Practical	(7 + 6) + (7 + 6) = 26	13

Student allowed ATKT shall appear in failed subject (s) along with regular students whenever examination of that semester is held or in special examination if any held by the University. For the purpose of this clause, each written paper and each Practical and sessional of a semester shall be counted as a separate course.

9.4 i) If a student fails in more than 50% of theory papers and practicals and sesionals in a year, he/she shall be declared as failed in that year.

ii) A student failed in a year shall have to take re-admission as regular student in that year.

9.5 i) Where a student fails in Practicals and Sessionals and is given the benefit of ATKT as per clause 8 & 9, he/she may choose to attend laboratory/sessional classes and submit a revised laboratory record/sessional. Fees to such students will be notified from time to time. The schedule for such classes will be decided by concerned HoD.

10 Professional Training and Project

"Every student is required to undergo practical training in a engineering works/ organization of hardware & software technology, factory, workshop & design office approved by the Dean of the faculty for a period of 30 working days after B.Tech., III year.

Every student will be required to undertake 4 - 5 Industrial Visits spanning over a period of about 10 -15 days after B.Tech., II Year but before completing the course of B.Tech., III Year to be conducted by the department."

11 Award of Degree, Division and Rank

11.1 Five year dual degree B.Tech. – M.Tech will be awarded to the students who have passed in all the subjects of the all Ten semesters.

11.2 (i) First B.Tech-M.TECH to Fourth B.Tech-M.TECH. a student declared pass in a examination will be awarded division as follows:

First Class	If a student secure a minimum of 60 percent.
Second Class	If a student secure a minimum of 50 percent.
Pass Class	If a student secure a minimum of 45 percent.

(ii) (a) for award of division for B.Tech-M.TECH Degree as a whole marks shall be totaled up as follows:

First B.Tech-M.TECH	40%
Second B.Tech-M.TECH	60%
Third B.Tech-M.TECH	100%
Forth B.Tech-M.TECH	100%

However for M.Tech degree academic regulation of M.Tech courses will apply.

(iii) A students shall be awarded a degree with Honours if she/he secures a minimum of 75 percent of aggregate marks provided student clears all the courses in first attempt. A student shall be awarded a degree with First Class if she/he secures a minimum of 60 percent of aggregate marks. A student shall be awarded a degree with Second Class if she/he secures a minimum of 50 percent of aggregate marks. The rest of the successful students will be awarded pass class.

11.2 (iv) For determining merit position of the students at the Final Year level the marks obtained by student in the Second, Third and Final Year as described above shall only be considered, provided

(A) The student who obtains in first attempt the highest aggregate marks in both theory and sessional.

(B) The student must obtain at least 60% or more of the aggregate marks in all the theory & practical papers.

(C) The student must be a regular student of the Faculty of Engineering & Technology, Jodhpur National University, Jodhpur and have fulfilled the attendance criterion of the university.

(D) The nomination for award of University Gold Medial will to be approved by the Chairperson, Jodhpur National University, Jodhpur and his decision will be the final.

12. REVALUATION: Revaluation can be done on the request of student with requisite fee as per Rules laid down by university.

13. CONDONATION OF DEFICIENCY IN MARKS

With a view to moderate hard line cases in the examination the following rules shall be observed

13.1 Deficiency up to 5 marks be condoned to the best advantage of the Student for passing the examination, provided the student fails in maximum of two Theory, or one Theory and one practical or two practicals. This facility shall be available only to those students who appear at the semester examination in full (i.e. in all Theory, Practicals and sessional in first attempt.)

13.2 While declaring result of the student no marks shall be added to or subtracted from the aggregate for the deficiency condoned as above. However, student will pass the subjects cleared through clause 13.1 after condoning the deficiency the student's result shall be declared in the division, which the aggregate entitled him/her.

13.2.1 One grace mark will be given to the student who is failing/missing distinction/ missing first division by one mark, by the president in the B.Tech-M.TECH. Examination. This benefit will not, however, be available to a student getting advantage under clause 13.1

14. Ex-student:

14.1 (i)If a student fails in more than 50% of theory courses and/or more than 50% of practicals and sessionals in a year, student shall be declared as failed in that year.

14.1 (ii) A student failed in a year shall have to take admission as regular student in that year. However a student who has passed in all practicals and sessionals but has failed in Theory courses only may appear in that years' examination as Ex student in all Theory papers, his practical and sessional marks of that year shall be carried over. However, such an Ex-student can apply for regular course of study in the year in which student has failed. Being a regular student they shall appear in all the examinations of Theory, Practical and Sessionals.

14.2 (i) Where a student fails in Practicals and Sessionals and is given the benefit of ATKT as per clause 8 and 9, student may choose to attend laboratory/sessional classes and submit a revised laboratory reord/sessional. Fees to such students will be notified from time to time as decided by university for doing each practical and sessional course during the semester. Otherwidse his previous sessional marks shall be carried forward.

15. Change of Branch

A student may be permitted to change his/her branch of study after passing B.Tech-M.TECH I Year strictly on the basis of merit secured in B.Tech-M.TECH I Year examination (First and Second Semester examination taken together) depending upon the vacancies available in the sanctioned strength in particular branch of study or as per the rules of university.

16. Requirement of additional degree:

a) An engineering graduate of the Jodhpur National University, Jodhpur who wishes to qualify for an additional degree of Engineering of the University will be considered by a committee consisting of the Dean and the Head of Department concerned.

b) Student will be admitted in Third B.Tech-M.TECH class of the branch as regular student. The Theory papers and practicals and sessional which student has to appear as additional courses at the previous examinations in that branch will be decided by the above committee. .

c) Student will be awarded division as per regulation 11.

d) Mention will be made in the certificate that student has qualified for the additional degree.

17. A special Examination for VIII Semester will be held along with VII Semester examinations for students who fail in VIII Semester regular Examination.

18. The diploma passed students admitted to the Second B.Tech-M.TECH., (all branches) shall be required to undergo a regular course of study in Special Mathematics during the academic Session and shall have to appear and pass in this paper (Sessional) along with other theory papers of the Main Examination. For this subject, combined marks obtained in III & IV Semester shall be counted for pass as a pre-requisite of Clause 9.2 (ii) and will not be considered for award of division.

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Jodhpur National University, Jodhpur

Teaching & Examination Scheme

B. Tech. II Year (Computer Science & Engg.)

III SEMESTER

B. Tech.

S. No	Code No.	Subject	L	T	MM		
					Internal	End Term	Total
1.	BCS301	Digital Electronics	3	-	20	80	100
2.	BCS302	Electronic Devices & Circuits	3	1	20	80	100
3.	BCS303	Data Structure and Algorithms	3	-	20	80	100
4.	BCS304	Discrete Mathematical Structures	3	1	20	80	100
5.	BCS305	Mathematics III	3	1	20	80	100
6.	BCS306.1 BCS306.2 BCS306.3	Programming in C++ Line Communication E-Commerce	3	-	20	80	100
		Total	**18**	**3**	**120**	**480**	**600**

S. No	Code No.	Subject	P	MM		
				Sessional	Practical	Total
1.	BCS307	Digital Electronics Lab	2	60	40	100
2.	BCS308	Electronics Lab	3	60	40	100
3.	BCS309	Data Structure Lab	3	60	40	100
4.	BCS310	Humanities and Social Science	2	50	50	100
		Total	**10**	**230**	**170**	**400**

Jodhpur National University, Jodhpur

Teaching & Examination Scheme

B. Tech. II Year (Computer Science & Engg.)

IV SEMESTER

B. Tech.

S. No	Code No.	Subject	L	T	MM		
					Internal	End Term	Total
1.	BCS401	Principles of Programming Languages	3	-	20	80	100
2.	BCS402	Microprocessor and Interfaces	3	-	20	80	100
3.	BCS403	Java Programming	3	1	20	80	100
4.	BCS404	Computer Architecture	3	-	20	80	100
5.	BCS405	Statistics and Probability Theory	3	1	20	80	100
6.	BCS406.1 BCS406.2 BCS406.3	Management Information systems Intellectual Property Rights Open Source Technology	3	-	20	80	100
		Total	**18**	**2**	**120**	**480**	**600**

S. No	Code No.	Subject	P	MM		
				Sessional	Practical	Total
1.	BCS407	Web Programming Lab	2	60	40	100
2.	BCS408	Microprocessor Lab	3	60	40	100
3.	BCS409	Object Oriented Programming Lab	3	60	40	100
4.	BCS410	Computer Architecture Lab	3	60	40	100
		Total	**11**	**240**	**160**	**400**

Jodhpur National University, Jodhpur

Teaching & Examination Scheme
III B. Tech. + M. Tech. Computer Science & Engg. (5 Year Course)

V SEMESTER

B. Tech.

S. No	Code No.	Subject	L	T	MM		
					Internal	End Term	Total
1.	BCS501	Software Engineering & SAD	3	-	20	80	100
2.	BCS502	System Software Engg.	3	-	20	80	100
3.	BCS503	Database Management Systems	3	-	20	80	100
4.	BCS504	Computer Graphics & Multimedia	3	1	20	80	100
5.	BCS505	Advanced Java	3	1	20	80	100
6.	BCS506.1 BCS506.2 BCS506.3	Logic & Functional Programming Information Theory and Coding Advanced Data Structure	3	-	20	80	100
		Total	**18**	**2**	**120**	**480**	**600**

S. No	Code No.	Subject	P	MM		
				Sessional	Practical	Total
1.	BCS507	System Design Lab (UML)	3	60	40	100
2.	BCS508	Advance Prog. Lab (Advance JAVA)	3	60	40	100
3.	BCS509	Database Management Lab	3	60	40	100
4.	BCS5010	Graphics & Multimedia Lab	3	60	40	100
		Total	**12**	**240**	**160**	**400**

M. Tech.

Subject Code	Subject	Hrs./ Week				Marks		
		L	T	P	Total	Theory Exam/ Viva voce	Internal Assessment	Total
MCS103	Advanced Database Management Systems	4	2	-	6	100	50	150
MCS104	Software Project Management	4	2	-	6	100	50	150
	Total	**8**	**4**	**-**	**12**	**200**	**100**	**300**

Jodhpur National University, Jodhpur

Teaching & Examination Scheme
III B. Tech. + M. Tech. Computer Science & Engg. (5 Year Course)

VI SEMESTER

B. Tech.

S. No	Code No.	Subject	L	T	MM		
					Internal	End Term	Total
1.	BCS601	Operating Systems	3	-	20	80	100
2.	BCS602	Computer Networks	3	-	20	80	100
3.	BCS603	Design & Analysis of Algorithms	3	1	20	80	100
4.	BCS604	Embedded Systems	3	1	20	80	100
5.	BCS605	Theory Of Computation	3	1	20	80	100
6.	BCS606.1 BCS606.2 BCS606.3	Digital Signal Processing .NET Technology Microwave and Satellite Communication	3	-	20	80	100
		Total	**18**	**3**	**120**	**480**	**600**

S. No	Code No.	Subject	P	MM		
				Sessional	Practical	Total
1.	BCS607	Shell Programming Lab	2	60	40	100
2.	BCS608	Network lab	2	60	40	100
3.	BCS609	.NET LAB	3	60	40	100
4.	BCS610	Microcontroller lab	3	60	40	100
		Total	**10**	**240**	**160**	**400**

M. Tech.

Subject Code	Subject	Hrs./ Week				Marks		
		L	T	P	Total	Theory Exam/ Viva voce	Internal Assessment	Total
MCS202	Advanced Computer Networks	4	2	-	6	100	50	150
MCS204	Information Retrieval (Elective)	4	2	-	6	100	50	150
	Total	**8**	**4**		**12**	**200**	**100**	**300**

Jodhpur National University, Jodhpur

Teaching & Examination Scheme
IV B. Tech. + M. Tech. Computer Science & Engg. (5 Year Course)

VII SEMESTER

B. Tech.

S. No	Code No.	Subject	L	T	MM		
					Internal	End Term	Total
1.	BCS701	Compiler Construction	3	1	20	80	100
2.	BCS702	Data Mining And Ware Housing	3	1	20	80	100
3.	BCS703	Advanced Logic System	3	-	20	80	100
4.	BCS704	Artificial Intelligence	3	-	20	80	100
5.	BCS705	Advanced Software Engineering	3	-	20	80	100
6.	BCS706.1 BCS706.2 BCS706.3	Service Oriented Architectures Soft Computing Real Time Systems	3	-	20	80	100
		Total	**18**	**2**	**120**	**480**	**600**

S. No	Code No.	Subject	P	MM		
				Sessional	Practical	Total
1.	BCS707	Compiler Design Lab	3	60	40	100
2.	BCS708	Data Mining And Ware Housing Lab	3	60	40	100
3.	BCS709	Advanced Logic System lab	2	30	20	50
4.	BCS710	Project Stage I	2	30	20	50
5.	BCS711	Practical Training Seminar	2	60	40	100
		Total	**12**	**240**	**160**	**400**

M. Tech.

Subject Code	Subject	Hrs./ Week				Marks		
		L	T	P	Total	Theory Exam/ Viva voce	Internal Assessment	Total
MCS101	Theory of Formal Languages	4	2	-	6	100	50	150
MCS102	Advanced Operating System	4	2	-	6	100	50	150
MCS105	Advanced Database Lab	-	-	6	6	50	50	100
	Total	**8**	**4**	**6**	**18**	**250**	**150**	**400**

Jodhpur National University, Jodhpur

Teaching & Examination Scheme
IV B. Tech. + M. Tech. Computer Science & Engg. (5 Year Course)

VIII SEMESTER

B. Tech.

S. No	Code No.	Subject	L	T	MM		
					Internal	End Term	Total
1.	BCS801	Information System and Securities	3	-	20	80	100
2.	BCS802	Mobile Computing	3	1	20	80	100
3.	BCS803	Advanced computer Technologies	3	1	20	80	100
4.	BCS804.1 BCS804.2 BCS804.3	Distributed Systems Image Processing Natural Language Processing	3	-	20	80	100
		Total	**12**	**2**	**80**	**320**	**400**

S. No	Code No.	Subject	P	MM		
				Sessional	Practical	Total
1.	BCS805	Information System and Securities Lab	3	60	40	100
2.	BCS806	Artificial Intelligence Lab	3	60	40	100
3.	BCS807	Advanced Web Lab	3	60	40	100
4.	BCS808	Project Stage II	2	120	80	200
5.	BCS809	Seminar Presentation	2	60	40	100
		Total	**13**	**360**	**240**	**600**

M. Tech.

Subject Code	Subject	Hrs./ Week				Marks		
		L	T	P	Total	Theory Exam/ Viva voce	Internal Assessment	Total
MCS201	Advanced Data Structures	4	2	-	6	100	50	150
MCS203	Information Protection & Computer Security	4	2	-	6	100	50	150
MCS205	Information Protection & Computer Security Lab	-	-	6	6	50	50	100
	Total	**8**	**4**	**6**	**18**	**250**	**150**	**400**

Jodhpur National University, Jodhpur

Teaching & Examination Scheme
V B. Tech. + M. Tech. Computer Science & Engg. (5 Year Course)

IX SEMESTER

M. Tech.

Subject Code	Subject	Hrs./ Week				Marks		
		L	T	P	Total	Theory Exam/ Viva voce	Internal Assessment	Total
MCS301	Fault Tolerant Computing	4	2	-	6	100	50	150
MCS302	Embedded System (Elective)	4	2	-	6	100	50	150
MCS303	Seminar	-	-	6	6	50	50	100
	Total	**8**	**4**	**6**	**18**	**250**	**150**	**400**

Jodhpur National University, Jodhpur

Teaching & Examination Scheme
V B. Tech. + M. Tech. Computer Science & Engg. (5 Year Course)

X SEMESTER

M. Tech.

Subject Code	Subject	Hrs./Week				Marks		
		L	T	P	Total	Theory Exam/ Viva voce	Internal Assessment	Total
MCS401	Dissertation	-	-	-	-	100	100	200
	Total	**-**	**-**	**-**	**-**	**100**	**100**	**200**

III Semester
BCS301- DIGITAL ELECTRONICS (3CS1)

Teaching Hrs. **Exam Hrs. - 3**
L3- T-0 P-0 **Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**Number systems**	Number systems, Coding Schemes: BCD, Excess-3, Grey, r's and (r-l)'s complement. Boolean Algebra, Fundamental theorems, Simplifications of Boolean expressions. Logic gates and their truth table. Gate implementation and Truth table of Boolean functions. **Lectures Req :6**
II	**Standard forms of Boolean functions**	Standard forms of Boolean functions. Minterm and Maxterm designation of functions. Simplification of functions on Karnaugh maps, Incompletely specified functions. Cubical representation of Boolean functions and determination of prime implicants. Selection of an optimal set of prime implicants. Multiple output circuits and map minimization of multiple output circuits. Tabular determination of multiple output prime implicants. **Lectures Req :9**
III	**Combinational circ**	Combinational circuits – Adder, subtractor, encoder, decoder, multiplexer. Design of Combinational circuit using Multiplexers. **Lectures Req :6**
IV	**Flip Flops**	RS, J-K, D, T. Sequential circuits. Clock, pulse and level mode sequential circuits. Analysis and design of sequential circuits. Synthesis of state diagrams, Finite memory circuits, equivalence relations equivalent states and circuits, determination of classes of indistinguishable states and simplification by implicants tables. Mealy and Moore machines, state assignment and memory element input equations, Partitioning and state assignment. **Lectures Req :9**
V	**Switching Devices**	Switching Devices. Positive and Negative logic of OR, AND, NOR, NAND, XOR and XNOR gates. Logic Family: RTL, DTL, DCTL, TTL, RCTL, ECL, HTL, MOS and CMOS logic circuit. Speed and delay in logic circuits, integrated circuit logic and noise immunity. **Lectures Req :6**

Total Lectures Req : 42

Reference Books:

1. Morris Mano: Digital Electronics,
2. Anand Kumar: Digital Electronics,
3. Malvind letch: Digital Electronics,
4. Salivanav: Digital Electronics,
5. Tomasi: Digital Electronics

BCS302- ELECTRONIC DEVICES & CIRCUITS (3CS2)

Teaching Hrs. **Exam Hrs.- 3**
L-3 T-0 P-0 **Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**Diode circuits**	Diode as a circuit. Element, load line concept, clipping & clamping circuits, voltages multipliers.**Lectures Req :6**
II	**Devices**	Devices: construction, characteristics and working principles of the following devices. Diodes, BJT, JFET, MOSFET, UJT, photo diodes, LEDs, photo transistors. Solar cells. Thermistor, LDR. **Lectures Req :9**

III	**Transistors**	Transistors: transistor characteristics, current components, current gains. Alpha and vita. Operating point. High bride model, h- parameter equivalent circuits. Ce, Cb and Cc configuration. Dc and ac analysis of Ce, Cc and Cb amplifiers. Evers- moll model. Biasing and stabilization techniques. Thermal run away, thermal stability. Equivalent circuits and blessing of JFETs and MOSFETs. Low frequency Cs and Cd JFET amplifiers. FET as a voltage variable resistor. **Lectures Req :6**
IV	**Small signal amplifiers**	Small signal amplifiers at low frequency: analysis of BJT and FET, dc and rc coupled amplifiers. Frequency esponse, midband gain, gains at low and high frequency. Analysis of dc and differential amplifiers, Millers' theorem. Cascading transistor amplifiers, Darlington and cascaded circuits. Emitter and source followers. **Lectures Req :9**
V	**Oscillators**	. concept of feedback classification, criterion for oscillation. Tuned collector, Hartley, Colpitts , rc- phase shift , Wein bridge and crystal oscillators, astable, monostable and bistable multivibrators . Schmitt trigger. **Lectures Req :6**

Total Lectures Req :42

Reference Books:
1. **Allen Mottershead: Electronic Devices**
2. **Boylestead & Nashlaky: Electronic Devices & CRT**
3. **Millman Halikas: Eritegratrd Electronics.**

BCS303- DATA STRUCTURE AND ALGORITHMS (3CS3)

Teaching Hrs. **Exam Hrs.- 3**
L-3 T-0 P-0 **Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**Data structure & Linked List**	Data Structure: Definition, Implementation, Operation, Application, Algorithm writing and convention. Analysis of algorithm, Complexity Measures and Notations. Arrays: Representation of arrays (multidimensional), Address calculation using column and row major ordering. Linked Lists : Implementation, Doubly linked list, Circular linked list, , skip-lists, Application (Sparse Matrix, Associative Array, Functional Programming) **Lectures Req : 10**
II	**Stacks & Queues**	Stacks : Definition, Implementation, Application (Tower of Hanoi, Function Call and return, Parentheses Matching, Expression Evaluation) Queues : Definition, deque, enque, priority queue, bounded queue, Implementation, Application **Lectures Req : 10**
III	**Tree**	Tree: Definition of elements, Binary trees: Types (Full, Complete, Almost complete), Binary Search Tree, Traversal (Pre, In, Post & Level order), Application: Arithmetic Expressions Evaluation Variations: Indexed Binary Tree, Threaded Binary Tree, AVL tree, Multi-way trees, B tree, B+ tree **Lectures Req : 8**
IV	**Graphs**	Graphs: Elementary definition, Representation (Adjacency Matrix, Adjacency Lists) Traversal (BFS, DFS). Application: Spanning Tree (Prim and Kruskal Algorithm), Dijkstra's algorithm, and Shortest path algorithms **Lectures Req :6**
V	**Sorting & Searching**	Sorting: Bubble, Selection, Insertion, Quick, Radix, Merge, Bucket and Heap sorts. Searching: Hashing, Binary Search, Simple String Searching **Lectures Req : 6**

Total Lectures Req :40

Reference Books:
1. **Schaum Series : Data Structure Through 'C', TMH**
2. **Trembly & Sorenson : An Introduction to Data Structures, Mc-Graw Hill International**

BCS304- DISCRETE MATHEMATICAL STRUCTURES (3CS4)

Teaching Hrs. **Exam Hrs.- 3**
L-3 T-1 P-0 **Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**Formal Logic**	Formal Logic: Statement, Symbolic Representation and Tautologies, Quantifiers, Predicator and validity, Normal form. Propositional Logic, Predicate Logic, Logic Programming and Proof of correctness. **Lectures Req :6**
II	**Mathematical Induction & proof**	Proof, Relation and Analysis of Algorithm Techniques for theorem proving: Direct Proof, Proof by Contra position, Proof by exhausting cares and proof by contradiction, principle of mathematical induction, principle of complete induction. Recursive definitions, solution methods for linear, first-order recurrence relations with constant coefficients. **Lectures Req :9**
III	**Graph Theory**	Graph Theory: Graphs - Directed and Undirected, Eulerian chains and cycles Hamiltonian chains and cycles, Trees, chromatic number, connectivity and other graphical parameters Applications. Polya's Theory of enumeration and its applications.Tree : Introduction, Spanning tree, Planner & non-Planner dual graph **Lectures Req :9**
IV	**Sets,Relation & functions**	Sets and Functions: Sets, relations, functions, operations, equivalence relations, relation of partial order, partitions, binary relations , Poset, Lattice, Hasse Diagram **Lectures Req :9**
V	**Monoids & Groups**	Monoids and Groups: Groups, Semigroups and Monoids cyclic semi graphs and sub monoids, Subgroups and cosets. Congruence relations on semi groups. Morphism, Normal sub groups. Structure off cyclic groups, permutation groups and dihedral groups elementary applications in coding theory. **Lectures Req :9**

Total Lectures Req :42

Reference Books:

1. **Kolman b. Busby : DMS for Computer Science**
2. **Narsingh Deo : Graph Theory, PHI**

BCS305- MATHEMATICS III (3CS5)

Teaching Hrs. **Exam Hrs.-3**
L-3 T-1 P-0 **Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**Introduction**	Engineering application of optimization, Statement and classification of optimization problem, single variable and multivariable optimization with and without constraints. **Lectures Req :6**
II	**Linear Programming**	Formulation of Linear Programming problem, Graphical Approach, General Linear Programming problem, Simple Method. Duality in Linear Programming and Transportation Problems. **Lectures Req :9**
III	**Project Scheduling**	Project Scheduling by PERT and CPM Network Analysis. Sequencing Theory: General Sequencing problem n-jobs through 2 machines & 3 machines and 2-jobs through m **Lectures Req :9**
IV	**Transform Calculus**	Laplace Transform with its simple properties, applications to the solution of ordinary and partial differential equation having constant coefficients with special reference to the wave and diffusion equation. Fourier transforms and solution of particular differential equation with constant coefficient. **Lectures Req :9**

V	**Numerical Methods**	Solution of Algebraic and transcendental equations, interpolation- finite differences, inverse interpolation, numerical differentiation and integration, numerical solution of differential equations and partial differential equations, solution of difference equation. **Lectures Req :9**

Total Lectures Req: 42

Reference Books:
1. **Mathematics III- Mehta, Sharma**
2. **Mathematics III- Gokhroo, Jain**
3. **Mathematics III- Gaur, Kaul**

BCS306.1-PROGRAMMING in C++ (3CS6.1)

Teaching Hrs. **Exam Hrs. - 3**
L-3 T-1 P- 0 **Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**INTRODUCTION OF OOP**	Concept of OOP, Features of OOP,OOP Paradigm, Advantages of OOP, Functional Programming, Characteristics & Application of OOP, OOP Language(Object Bassed & Object Oriented) **Lectures Req : 4**
II	**OVERVIEW OF C++**	Introduction of Keywords, Constants, Operators, Variables, Data Types, Input and Output Statements and Controls Statements in C++. Introduction of C++ Programming Structure, Class, Class Member Function, Class Data Members, Object, Array Of Object, Memory Allocation Of Objects, Client-Server Architecture in C++ , **Lectures Req : 5**
III	**FUNDAMENTAL OF C++**	Constructors, Copy Constructor, Destructors, Inline Functions, Static class members, & Functions, Friend Functions, Function Overloading. Operator Overloading, **Lectures Req : 8**
IV	**INHERITANCE & EXCEPTION HANDLING**	Concept of Inheritance, Different Type of Inheritance, Virtual Base Class, Virtual Functions, Pure Virtual Function , Polymorphism, Compile Time & Runtime Polymorphism. Basic of Exception Handling, Exception Handling Mechanism, Throwing Mechanism, Catching Mechanism **Lectures Req : 7**
V	**FILES HANDLING & TEMPLATES**	Opening and Closing of files, stream state member functions, binary file operations, structures and file operations, classes and file operations, random access file processing, Concept of Templates, Class Templates, Class Templates with Multiple Parameters, Function Templates, Function Templates with Multiple Parameters, Overloading of Templates **Lectures Req : 8**

Total Lectures Req :32

Reference Books:
1. **E. Balagurusamy : C++**
2. **Complete Reference Of C++ : Herbert Shield**

BCS306.2-LINE COMMUNICATION (3CS6.2)

Teaching Hrs. **Exam Hrs. - 3**
L-3 T-0 P-0 **Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**Transmission Lines**	Types of transmission lines. General transmission line equation, line constant. Equivalent circuits, infinite line. Reflection on a line. SWR of line with different type of terminations. Distortion less and dissipation less lines, coaxial cables, transmission lines at audio and radio frequencies, Losses in transmission line, Transmission equalizers. Characteristics of quarter wave, half wave and other lengths. Smith chart and its application. Transmission line applications. Stub

		matching. Measurement of parameters of transmission line, Measurement of attenuation, insertion loss, reflection coefficient and standing wave ratio. **Lectures Req :6**
II	**Attenuators & Filters**	Elements of telephone transmission networks, symmetrical and Asymmetrical two port networks. Different Attenuators, pi-section, T-section filter, m-derived filter sections, Lattices filter section. **Lectures Req :9**
III	**Carrier Telephony**	Multi-channel systems; Frequency division and time division multiplexing, power time carrier communication. **Lectures Req :6**
IV	**Telephone Transmission**	Telephone Instrument; Rotary dial and Touch tone dial types, two wire/four wire transmission: Echo & singing, Echo suppressors and cancellers. Cross talk. **Lectures Req :9**
V	**Basic Of Automatic Telephony**	Trunking concepts. Grade of service, Traffic definition, Introduction to switching networks, classification of switching systems. Electronic Exchange, EPABX and SPC Exchange, principle of STD, ISD. Recent Trends in Telecommunication: Voice frequency telegraphy, Facsimile and telex services. **Lectures Req :6**

Total Lectures Req: 42

BCS306.3-E-COMMERCE (3CS6.3)

Teaching Hrs. **Exam Hrs.-3**
L-3 T-0 P-0 **Marks Theory Exam.-80 Term Test-20 Total 100**

Units	Topics	CONTENT OF SYLLABUS
I	**Business Strategy in an Electronic Age :**	Value Chain-supply chains, Proter's value chain, model and Inter- Organizational value chains. Competitive Advantage-Competitive strategy, Proter's Model, First Mover advantage and competitive advantage using e-commerce Business strategy Introduction to Business Strategy, Strategic Implications of IT technology e-commerce Implementation and evaluation. **Lectures Req : 8**
II	**Business to Business Electronic Commerce :**	Business to Business Electronic Commerce: Inter-organizational Transactions, The credit Transaction Trade cycle.A variety of transactions, Electronic markets-markets and electronic markets, usage of electronic markets,Advantages and disadvantages of electronic markets. **Lectures Req : 6**
III	**Electronic Data Interchange (EDI)**	l technology, standards, communications, implementation, agreements and curities. EDI trading patterns and transactions. **Lectures Req : 6**
IV	**Building an E-Commerce Site :**	Introduction to object behavior, components, active scripting. Object models,Infrastructure objects, service object and data objects, choosing the objects. Building a scalable application, Addition the configure method, connecting to the database, Accessing and versioning the database. Building the catalog object with example. Creating shopping basket-Holding state, creating the tables for a shopping basket, modifying the object model and making the basket accessible **Lectures Req : 8**
V	**J2EE Architecture Overview:**	J2EE Architecture Overview: Enterprise components, Information technology in the enterprises, introduction to enterprise objects and enterprise component model. The J2EE model features, J2EE components-container architecture. Enterprises Java and J2EE architecture. **Lectures Req : 6**

Total Lectures Req : 34

Reference Books:

1. **David Whiteley : E – Commerce Strategy, TMH**
2. **Kalakota : Frontiers of Electronic Commerce, Pearson Education**

BCS307-DIGITAL ELECTRONICS LAB (3CS7)

1. Experimental study of characteristics of CMOS integrated circuits.
2. Interfacing of CMOS to TTL and CMOS.
3. Study of various combinatorial circuits based on: AND/NAND Logic blocks and OR/NOR Logic blocks.
4. Study of following combinational circuits: Multiplexer; Demultiplexer and Encoder. Verify truth tables of various logic functions.
5. To study various waveforms at different points of transistor bistable multivibrator and its frequency variation with different parameters.
6. To study transistor astable multivibrator.
7. To design a frequency driver using IC-555/timer.
8. To study Schmitt trigger circuit.
9. To study OP-AMP as Current to voltage and voltage to current converter comparator.
10. BCD to binary conversion on digital/IC trainer.
11. Study various Flip flops and construct Parallel-in-Serial-out register. Testing of digital IC by automatic digital IC trainer.

BCS308-ELECTRONICS LAB (3CS8)

1. Study the following devices:
(a) Analog & digital multimeters
(b) Function/Signal generators
(c) Regulated D.C. power supplies (constant, voltage and constant current operations).
2. Study of analog CRO measurement of time period, amplitude, frequency and phase angle using Lissajous figures.
3. Application of diode as clipper and clamper.
4. Plot V-I characteristic of zener diode & study zener diode as voltage, reverse Saturation current and static & dynamic resistances.
5. Plot V-I characteristic of zener diode & study zener diode as voltage regulator. Observe the effect of load changes and determine load limits of the voltage regulator.
6. Plot frequency response curve for audio amplifier and to determine gain bandwidth product.
7. Plot drain current-drain voltage and drain current-gate bias characteristics of field effect transistor and measurement of I & VP.
8. Plot gain: frequency characteristic of two stages RC coupled amplifier and calculate its bandwidth and compare it with theoretical value.
9. Plot gain: frequency characteristic of two stages RC coupled amplifier and calculate its bandwidth and compare it with theoretical value.
10. Plot input and output characteristics of BJT in CB, CC and CE configurations. Find their h-parameters.
11. Study half wave rectifier and effect of filter network on D.C. voltage output and ripple factor.

12. Study bridge rectifier and measure the effect of filter network on D.C. voltage output and ripple factor.

BCS309-DATA STRUCTURE LAB (3CS9)

1. Program on array searching, sorting (Bubble sort, Quick sort, Marge sort etc.)
2. Program to insert element at desire position, replacing element, deletion in array.
3. Various matrices operations.
4. Various strings programs.
5. Implementation of stack and queue using array
6. Implementation of stack and queue using link lists
7. Implementation of circular queue using link lists.
8. Polynomial addition, multiplication.
9. Two-way link lists programs.
10. Infix to postfix/prefix conversion.
11. BST implementation (addition, deletion, searching).
12. Graph traversal (BFS, DFS).

BCS310-Humanities and Social Science (3CS10)

1. INDIA: Brief History of Indian Constitution, features, fundamental rights, duties, Directive Principles of state Policy History of Indian National Movement, Socio economic growth after independence,

2.SOCIETY: Social Groups- concepts and types, Socialization- concept and theory, Social Control; Concept, Social problems in contemporary India Concept and types.

3.THE FUNDAMENTALS OF ECONOMICS : Meaning definition and importance of economics, Central Economic Problems, Positive & Normative approaches, Economic systems, Socialism and Capitalism,

4.MICRO ECONOMICS: Consumer behavior, Law of demand and supply, Utility approach, Indifference curves. Elasticity of Demand & Supply and applications, Consumer surplus. Theory of production, production function, factors of production.

5.MACRO ECONOMICS: Concept relating to national product National income and its measurement, Simple Keynesian theory, Simple Multiplier, Money and banking- Meaning, Concept of International Trade, Determination of Exchange Rate, Balance of Payments Characteristics of Indian Economy.

IV Semester

BCS401-PRINCIPLES OF PROGRAMMING LANGUAGE (4CS1)

Teaching Hrs. **Exam Hrs.- 3**
L-3 T-0 P-0 **Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	PROGRAMMING LANGUAGES :INTRODUCTION	Programming Language: Definition, History, Features. Issue in Language Design: Structure and Operation of Computer, Language Paradigms. Efficiency, Regularity. Issues in Language Translation: Syntax, Semantics, Stages analysis and synthesis, Parse Tree.. **Lectures Req : 9**
II	DATA TYPES	Specification and Implementation of Elementary and Structured Data Types. Type equivalence, checking and conversion. Array, List, Structure, Union. **Lectures Req : 7**
III	SEQUENCE CONTROL	Sequence control with Expressions, Conditional Statements, Loops, Exception handling. Subprogram definition and activation, simple and recursive subprogram, subprogram environment. Parameter passing mechanism. **Lectures Req : 6**
IV	ABSTRACT DATA TYPES	Abstract Data type & Memory management, information hiding, encapsulation, type definition. Static and Stack-Based Storage management. Fixed and Variable size heap storage management. Garbage Collection **Lectures Req : 7**
V	PARALLEL PROGRAMMING	Parallel Programming: Introduction, parallel processing and programming language, Threads, semaphore, monitor, message passing. **Lectures Req : 8**

Total Lectures Req: 37

Reference Books:

1. **T. W. Pratt : Programming Languages Design & Complementation, Pearson Education Asia**

BCS402-MICROPROCESSOR AND INTERFACES (4CS2)

Teaching Hrs. **Exam Hrs.- 3**
L-3 T-0 P-0 **Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	Introduction to Micro Computer Systems	Microprocessors, microcontroller and microcomputer devices, Machine and assembly language, Bus concept. Architecture & Pinout of 8085. **Lectures Req :6**
II	Assembly Language and Programming in 8085	Instruction set, Program structures (sequential, conditional, iterative), Macros and subroutines, Stack, Counter and timing delay, interrupt structure and its programming. **Lectures Req :9**
III	Peripherals and their interfacing with 8085-I	Memory Interfacing, Interfacing I/O ports, Data transfer schemes (Synchronous, asynchronous, interrupt driven), Architecture & interfacing of PPI 8255, Data Converters and Timer 8254. **Lectures Req :6**
IV	Peripherals and their interfacing with 8085-II	Architecture & interfacing of- DMA controller 8257, interrupt Controller 8259A, USART 8251, Level Converters MC 1488 and MC 1489, Current loop, RS 232 C and RS 422 A. **Lectures Req :9**
V	Comparative study of 8085 A, 8086 and 8088	Comparative study of 8085 A, 8086 and 8088 (Pinout, internal architecture, timing diagrams), Instruction format and addressing modes – Data and Branch related. Features of Pentium processor, MMX and Dual core processor. Comparative study of 286, 386, Celeron & P3 **Lectures Req :6**

Total Lectures Req :42

Reference Books: 1. Microprocessor & Interface- R. Gaonkar
2. Microprocessor & Interface- Ray Bhoorehandi
3. Microprocessor & Interface- B. Ram
4. Microprocessor & Interface- D. Hall

BCS403-JAVA PROGRAMMING (4CS3)

Teaching Hrs. **Exam Hrs.- 3**

L-3 T-1 P- 0 **Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**Introduction Of Java**	Introduction to Java, Characteristics, OOP Concept in Java, Structure of Java Programming, Command Line Arguments in java, Java Virtual Machine & Byte Codes, Java Buzz Words **Lectures Req : 6**
II	**Class & Objects**	Data Types, Arrays, Control Structures and Operators in Java Concept of Classes & Objects, Methods, Constructor, Garbage Collection, returning and passing objects as parameter, Function Overloading, Finalize Methods **Lectures Req : 6**
III	**Inheritance & Package**	Concept of inheritance, Single and Multilevel inheritance, Extended Classes, Access Control, Usage of super, Overriding methods, Abstract classes, Using final with inheritance. Concept of Package, Java Built-in Package, User Defined Package **Lectures Req : 10**
IV	**Interface & Applet**	Concept of Interfaces, Declaration of Interface, Interface Implements, Extending Classes &Interface Applet Fundamentals, Applet v/s Application, Life Cycle of Applet, Applet Tag, and Using paint Method and drawing polygons. **Lectures Req : 8**
V	**String Handling & File Handling**	String , String constructors, special string operations, character extraction searching and comparing strings Java File Handling with Stream Classes **Lectures Req : 5**

Total Lectures Req :35

Reference Books:

1. **E. Balagurusamy : Java**
2. **Complete Reference Of Java : Herbert Shield**

BCS404-COMPUTER ARCHITECTURE (4CS4)

Teaching Hrs. **Exam Hrs.- 3**

L-3 T-0 P-0 **Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**Register Transfer Language:**	Data movement around registers. Data movement from/to memory, arithmetic and logic micro operations. Concept of bus and timing in register transfer. **Lectures Req : 7**
II	**Cpu Organisation:**	Addressing Modes, Instruction Format. CPU organization with large registers, stacks and handling of interrupts & subroutines Instruction pipelining **Lectures Req : 6**
III	**Arithmetic Algorithm:**	Array multiplier, Booth's algorithm. Addition subtraction for signed unsigned numbers and 2's complement numbers **Lectures Req : 6**
IV	**Microprogrammed Control Unit :**	Basic organization of micro-programmed controller, Horizontal & Vertical formats, Address sequencer **Lectures Req : 8**

V	**Memory Organisation:**	Concept of RAM/ROM, basic cell of RAM, Associative memory, Cache memory organization, Vertical memory organization. I/O ORGANISATION: Introduction to Peripherals & their interfacing. Strobe based and handshake-based communication, DMA based data transfer, I/O processor. **Lectures Req : 10**

Total Lectures Req :37

Reference Books:

1. **M. Morris Manno : Computer Systems Architecture, PHI**

BCS405-STATISTICS AND PROBABILITY THEORY (4CS5)

Teaching Hrs. **Exam Hrs.- 3**
L-3 T-1 P-0 **Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**Probability Theory**	Events, algebra of events, simple and compound events, mutually exclusive events, independent and dependent events, Probability: definition, adition theorem, multiplication theorm, conditional Probability, Bayes theorm, Bernoulli Trial. **Lectures Req : 8**
II	**Random Variables**	Discrete and continuous random variable, probability mass function and probability density function, discrete and continuous distribution function, probability generating function, expectation and moment generating functions; mean time to failure cumulants, cumulant generating function, relation between moments and comulants. **Lectures Req : 12**
III	**Discrete Discribution Function**	Discrete distribution function: Binomial and Bernoulli Distribution, Poisson Distribution their definition, mean, variance, moments, coefficients of kurtosis, continuous disribution function: Rectangular, Normal and Exponential Distribution, their definition, mean, variance, moments, coefficients of kurtosis, memory less property **Lectures Req : 10**
IV	**Queuing Theory**	Introduction, basic concepts, definitions and notations, pure birth process, pure death process, birth-death process, *MIMIl.:* oo/FCFS, MIM/N: DO/FCFS, *MIMl}:* N/FCFS, MIM/N: N/FCFS Queues **Lectures Req : 10**
V	**Discrete Parameter Markov Chains**	Markovian property, transition probability matrix. markov chains, discrete parameter birth death process, M/O/l queuing model. correlation and regression; correlation coefficient, rank correlation, linear regression, regression coefficient, relation between coefficient and regression coefficient, method of least squares, normal regression and correlation analysis **Lectures Req : 10**

Total Lectures Req: 50

Reference:

1: Statistics and Probability Theory: Jain & Rawat
2: Statistics and Probability Theory: Gokhroo & others.
3: Fundamentals of Statistics: Gupta & Kapoor
4: Statistics and Probanling theory: Mehta, Sharma, Vardanpublisher
5: Kapoor & Saxena: Statistics & Probability
6: J.E. Frend & R.E. Walpole: Mathematical statistics
7: Probability Theory: Shanums Outline series.

BCS406.1-MANAGEMENT INFORMATION SYSTEM (4CS6.1)

Teaching Hrs. **Exam Hrs.- 3**
L-3 T-0 P-0 **Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	Introduction:	MIS concept, Definition, role & Impact of MIS, Process of management, organization structure & behavior. **Lectures Req : 7**
II	Basic of Management Information System	Decision Making Process, Information concepts, Systems: Definition, Concepts, Types of system, Subsystems , System concepts applied to MIS **Lectures Req : 7**
III	Development of Management Information System:	Development of long range plans of the MIS, Classes of information, Determining the information requirement, Implementation & Information quality of MIS. **Lectures Req : 6**
IV	Application of Management Information system:	Application in manufacturing sector using for personal management, Financial management, Production Management, Material Management, Marketing Management Application in Service Sector. **Lectures Req : 6**
V	Enterprise Resource Planning (ERP):	EMS, ERP, Benefits implementation, EMS & MIS. Case Studies: Application of SAP technologies in manufacturing sector, Decision support system & its application. **Lectures Req : 8**

Total Lectures Req: 34

Reference Books:

1. **W.S. Jawadekar : Management Information System, TMH**
2. **Davis & Olson: Management Information System, TMH**

BCS406.2-INTELLECTUAL PROPERTY RIGHTS (4CS6.2)

Teaching Hrs. **Exam Hrs.- 3**
L-3 T-0 P-0 **Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	Basic Concepts of Intellectual Property:	Introduction to intellectual property rights, Intellectual property laws and the Internet, Trade Related Aspects of Intellectual Property Rights **Lectures Req : 6**
II	Patents:	Introduction to patent law and conditions for patentability, Procedure for obtaining patents, Rights of a patentee, Patent infringements, Biotechnology patents and patents on computer programs, Patents from an international perspective **Lectures Req : 8**
III	Trademark and Geographical Indications	: Statutory authorities and registration procedure, Rights conferred by registration, Licensing, assignment and transfer of trademark rights, Trademark infringement, Geographical Indication of Goods & Appellations of Origin **Lectures Req : 7**
IV	Copyright:	Registration procedure and copyright authorities, Assignment and transfer of copyright, Copyright infringement and exceptions to infringement, Software copyright **Lectures Req : 7**
V	Designs	: Introduction to the law on Industrial Designs, Registration and piracy, International perspective, Introduction to the law on semiconductor layout design, Registration, commercial exploitation and infringement **Lectures Req : 8**

Total Lectures Req :36

BCS406.3-OPEN SOURCE TECHNOLOGY (4CS6.3)

Teaching Hrs. **Exam Hrs.- 3**
L-3 T-0 P-0 **Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**OST overview:**	Evolution & development of OST and contemporary technologies, Factors leading to its growth. Open Source Initiative (OSI), Free Software Foundation and the GNU Project, principle and methodologies. Contexts of OST (India & international). Applications of open source (open source teaching and open source media) Risk Factors. Myths regarding open source **Lectures Req : 7**
II	**Software Freedom**	Philosophy of Software Freedom, Free Software, OSS, Closed software, Public Domain Software, Shared software, Shared source. Detail of few OSS like Open Audio, Video, 2d & 3d graphics software, system tools, office tools, Networking & internet, Security, Educational tools and Games. **Lectures Req : 8**
III	**Open Source Development**	OS Development Model, Starting and Maintaining an Open Source Project, Open Source Hardware, Open Source Design, Ongoing OS Projects (i.e. examples of few good upcoming software projects.) Case Study: - Linux, Wikipedia. **Lectures Req : 7**
IV	**Licenses and Patents:**	What Is A License, How to create your own Licenses? Important FOSS Licenses (Apache, BSD, GPL, LGPL), copyrights and copylefts, Patents **Lectures Req : 6**
V	**Impact On Other Areas**	Social and Financial impacts of open source technology, Economics of FOSS: Zero Marginal Cost, Incomegeneration opportunities, Problems with traditional commercial software, Internationalization, Open Source as a Business Strategy. **Lectures Req : 10**

Total Lectures Req :38

BCS407-WEB PROGRAMING-I LAB (4CS7)

1. Develop a static html page using style sheet to show your own profile.

Add a page to show 5 photos and

Add a page to show your academics in a table

Add a page containing 5 links to your favorite website

Add navigational links to all above pages (add menu).

2. Update your homepage, by creating few html file (e.g. header, footer, left-sidebar, right), in these file you will put all html code to be shown on every page.

3. Use Cascading Style Sheets to format your all pages in a common format.

4. Create programs using Java-Script.

BCS408-MICROPROCESSORS LAB (4CS8)

1. Study of hardware, functions, memory, and operations of 8085 kit.
2. Program to perform integer addition (two and three numbers 8 bit)
3. Program to perform multiplication (two 8 bit numbers).
4. Program to perform division (two 8 bit numbers).
5. Transfer of a block data in memory to another place in memory in same and reverse order.
6. Swapping of two block data in memory.
7. Addition of 10 numbers using array.
8. To find largest no. from an array.

9. Sorting of array (ascending, descending order).

10. Print Fibonacci sequence. (15 elements)

11. To perform multibyte addition.

12. To perform multibyte subtraction.

BCS409 OBJECT ORIENTED PROGRAMMING LAB (4CS9)

C++ Programs:-

1. Programs based on inheritance property.

2. Programs of operator overloading (complex number arithmetic, polar coordinates).

3. Programs using friend functions.

4. Programs on various matrix operations.

5. Stack operations using OOPs concepts.

JAVA Programs:-

7. To implemention of Package using Java Program

8. To implement . Interface using Java Program

9. To implement. Inheritance using Java Program

10. To implement Calculator using Applet

11. To implement Java Program Using Command Line Argument

BCS410-COMPUTER ARCHITECTURE LAB (4CS10)

This lab will be based on assembly programming on of RISC processor simulator SPIM. SPIM simulator is available at site

http://pages.cs.wisc.edu/~larus/spim.html.

SPIM exercises

1. Read an integer from the keyboard and print it out if (n => n_min AND n <= n_max).

2. Read an integer from the keyboard and print out the following as per switch-case statement

Switch (n)

{ n <= 10 print "not a lot"

n == 12 print "a dozen"

n == 13 print "a baker's dozen"

n == 20 print "a score"

n >= 100 print "lots and lots"

n != 42 print "integer"

otherwise print "you have the answer!"}

3. Read a string from the keyboard and count the number of letters. Use the equivalent of following for loop to count number of chars. **for (s1=0; str[s1] != '\n'; ++s1)**

4. Print out a line of characters using simple procedure call.

5. Print out a triangle of characters using recursive procedure call.

6. Print factorial of a number using recursion.

7. Print reverse string after reading from keyboard.

8. Print a string after swapping case of each letter.

9. Print an integer in binary and hex.

10. Implement bubble sort algorithm.

11. Print Pascal Triangle of base size 12.

12. Evaluate and print Ackerman function.

V Semester

BCS501-SOFTWARE ENGINEERING (5CS1)

Teaching Hrs. **Exam Hrs.- 3**
L-3 T-0 P-0 **Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**System Devlopment And Analysis-I**	System concept, System Characteristics, types of system, Problems in system Development, System Level project Planning, System Development Life cycle (SDLC), system analysis, modeling the architecture, system specification, The Role of the Systems Analyst, tools of structured analysis: data flow diagram, data dictionary,decision tree and structured engish, Feasibility Study: Economic Feasibility, Technical Feasibility, Behavioral Feasibility. **Lecture:7**
II	**System Design And Implementation-Ii**	Process of design: logical & physical design, design methodologies, the IPO charts, Input/Output and Forms Design, system testing and quality assurance, H/W / S/W Selection and Maintenance: The Computer Industry, S/W Industry, A Procedure for H/W / S/W Selection, Major Phases in Selection, Criteria for S/W Selection. **Lecture:6**
III	**S/W Project Development**	Software Project Management: Objectives, Resources and their estimation, LOC and FP estimation, effort estimation, COCOMO estimation model, software project scheduling, SWDLC models ,software engineering approaches. **Lecture:7**
IV	**S/W Design**	Software Design: Design fundamentals, Effective modular design: Data architectural and procedural design, design documentation. **Lecture:7**
V	**Ooa & Ood**	Object Oriented Analysis: Object oriented Analysis Modeling, Data modeling. Object Oriented Design: OOD concepts and methods class and object definitions, refining operations. Class and object relationships, object modularization, Introduction to Unified Modeling Language. **Lecture:8**

Total Lectures Req.: 35

Reference Books:

1. **Roger S. Pressman : A Practioners Approach, TMH**
2. **Pankaj Jalote : Software Engineering**
3. **Systems Analysis and Design (E. M. Awad)**
4. **Grady Booch, James Rumbaugh, Ivar Jacobson : The Unified Modeling Language User Guide, Pearson Education.**

BCS502-SYSTEM SOFTWARE Engg. (5CS2)

Teaching Hrs. **Exam Hrs.- 3**

L-3 T-0 P-0 **Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**Overview:**	Comparison of machine language, assembly language and high level languages, External and internal representation of instructions and data. Data allocation structures, search structures and addressing modes. Activities and system software for program generation, translation and execution. object code/executable code files. **Lectures Req : 7**
II	**Assemblers:**	Assembly language specification. Machine dependent and independent features of assembler. Classification of assemblers. Pass structure of assemblers **Lectures Req : 6**
III	**Loader and Linkers**	: Functions and classification. Machine dependent and independent features of loaders, Design of bootstrap, absolute and relocatable loaders, Design of linker. Case study of MS-DOS linker. **Lectures Req : 6**

IV	**Macro processors:**	Macro definition, call and expansion. Macro processor algorithm and data structure. Machine independent features (parameters, unique labels, conditional expansion, nesting and recursion).Pass structure and Design of microprocessor and macro assembler. **Lectures Req : 9**
V	**High level language processor:**	HLL specification: Grammars and parse trees, expression and precedence. Lexical analysis: Classification of tokens, scanning methods, character recognition, lexical ambiguity. Syntactic analysis: Operator precedence parsing, recursive descent parsing. Symbol Table Management: Data structure for symbol table, basic functions for symbols, overflow technique, block structure in symbol table. **Lectures Req : 8**

Total Lectures Req : 36

Reference Books:

1. D.M. Dhamdhere : System Programming & Operating Systems, Tata Mc Graw Hill

BCS503-DATABASE MANAGEMENT SYSTEMS (5CS3)

Teaching Hrs. **Exam Hrs.- 3**
L-3 T-0 P-0 **Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**Introduction To Database Systems:**	Overview and History of DBMS. File System vs DBMS .Advantage of DBMS Describing and Storing Data in a DBMS. Queries in DBMS. Transaction management and Structure of a DBMS. **Lectures Req : 5**
II	**Entity Relationship Model:**	Overview of Data Design Entities, Attributes and Entity Sets, Relationship and Relationship Sets. Features of the ER Model-Key Constraints, Participation Constraints, Weak Entities, Class Hierarchies, Aggregation, Conceptual Data Base, Design with ER Model-Entity vs Attribute, Entity vs Relationship Binary vs Ternary Relationship and Aggregation vs ternary Relationship Conceptual Design for a Large Enterprise. **Lectures Req : 10**
III	**Relationship Algebra And Calculus:**	Relationship Algebra Selection and Projection, Set Operations, Renaming, Joints, Division, Relation Calculus. **Lectures Req : 6**
IV	**Sql Queries Programming And Triggers:**	The Forms of a Basic SQL Query, Union, Intersection and Except, Nested Queries , Correlated Nested Queries, Set-Comparison Operations, Aggregate Operators, Null Values and Embedded SQL, Dynamic SQL, ODBC and JDBC, Triggers and Active Databases. **Lectures Req : 6**
V	**Schema Refinement And Normal Forms:**	Introductions to Schema Refinement, Functional Dependencies, Boyce-Codd Normal Forms, Third Normal Form, Normalization-Decomposition into BCNF Decomposition into 3-NF. **Lectures Req : 6**

Total Lectures Req :33

Reference Books:

1. Silverschatz Korth and Sudarshan : Data Base Systems Concepts 4th ed. , TMH

BCS504-COMPUTER GRAPHICS & MULTIMEDIA (5CS4)

Teaching Hrs. **Exam Hrs.- 3**
L-3 T-0 P-0 **Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topic	Contents of the subject
I	**Introduction to Computer**	Introduction to Raster scan displays, Storage tube displays, refreshing, flicking, interlacing, color monitors, display processors resolution. Scan conversion

	Graphics	techniques, image representation, line drawing, simple DDA, Bresenham's Algorithm, Circle drawing, general method, symmetric DDA, Bresenham's Algorithm, curves, parametric function, Beizier Method, Bspline Method.Filled Area Primitives, Homogeneous Coordinates. **Lectures Req:12**
II	**Geometric Transformations**	2D & 3D Co-ordinate system, Translation, Rotation, Scaling, Reflection Inverse transformation, Composite transformation, world coordinate system, screen coordinate system, parallel and perspective projection, Representation of 3D object on 2D screen. **Lectures Req: 8**
III	**Visibility and Rendering**	Point Clipping. Line Clipping Algorithms, Polygon Clipping algorithms, Introduction to Hidden Surface elimination, Basic illumination model, diffuse reflection, specular reflection, phong shading, Gourand shading ray tracing, color models like RGB, YIQ, CMY, HSV etc. **Lectures Req: 8**
IV	**Introduction to Multimedia, Music and Animation.**	Multimedia Information, Multimedia Objects, Multimedia in business and Work. Multimedia Building Blocks Text, Sound MIDI, Digital Audio. Basic concepts, Computer-based Animation, H 261, DVI. **Lectures Req: 6**
V	**Image, Video and Synchronization**	JPEG Compression, Zig Zag Coding, Content based retrieval for text and images, Video Compression, MPEG standards, MHEG, Video Conferencing, Multimedia Broadcast Services, recent development in Multimedia. Intra and Inter object synchronization, Live and Synthetic synchronization, Lip synchronization requirements. **Lectures Req: 6**

Total Lectures Req: 40

Reference Books:

1. **J.Foley, A. Van dam, S.Feiner,J.Hughes :Computer Graphics Principles and Practice. Addison Wesley.**
2. **D.Hearn and Baker: Computer Graphics PHI.**
3. **D.Rogers and Adams: Mathematical Elements of computer Graphics McGraw Hill.**
4. **Ralf Steinmetz & Klara Nahrstedt - Multimedia: computing, Communication & Applications, Pearson Education Asia.**
5. **Prabhat K.Andleigh-Multimedia System Design,Prentice Hall, Kiran Thaukrar**

BCS505-ADVANCED JAVA (5CS5)

Teaching Hrs. **Exam Hrs.- 3**
L-3 T-0 P-0 **Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**Swings & Exception Handling**	Introduction to Swings Components of Swings & Layout, Concept of Inner & Outer class Exception Handling:Try & Catch,throw, nested catch, throws ,finally ,Multiple Catch , Uncaught Exceptions .Introduction To HTML: HTML tags & Components. **Lectures Req : 7**
II	**Event Handling & Multithreading**	Concept of Event Handling, Deligation model, Events, Event Source, Event Listner, Event Listner Interface, Event Classes, handling mouse & keyboard events. Concept of Multithreading, Thread priorities, Synchronisation, Thread class & Runnable interface, Creating a Thread: using Thread class & Runnable Interface, Interthread Communication. **Lectures Req : 8**
III	**Servlets**	Introduction to J2EE, Servlets: Characterstics of servlets, Servlet & Applets, Life cycle of servlets, servlets architecture, request & response interface, servlet configuration interface. **Lectures Req : 7**

IV	**JDBC**	Introduction to JDBC ,Introduction to data base connectivity, features of JDBC API, JDBC drivers, JDBC application architecture, step to connect the application data base, servlet & JDBC . **Lectures Req : 7**
V	**JSP**	Introduction to JSP,JSP directories, JSP actions ,JSP & JAVA Beans, JSP & Data base connectivity, Error Handling with JSP ,JSP & HTML. **Lectures Req : 7**

Total Lectures Req: 36

Reference Books:

1. **Herbert Schildt: JAVA 2 - The Complete Reference, TMH, Delhi**
2. **Deitel: How to Program JAVA, PHI**
3. **U.K. Chakraborty and D.G. Dastidar: Software and Systems – An Introduction, Wheeler Publishing, Delhi.**
4. **Joseph O'Neil and Herb Schildt: Teach Yourself JAVA, TMH, Delhi.**

BCS506.1-LOGICAL AND FUNCTIONAL PROGRAMMING (5CS6.1)

Teaching Hrs. **Exam Hrs. - 3**
L-3 T-0 P- 0 **Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**Propositions**	Fully parenthesized propositions, Evaluation of constant propositions, Evaluation of proposition in a state. Precedence rules for operators, Tautologies, Propositions a sets of states and Transforming English to prepositional form. **Lectures Req 8**
II	**Reasoning Using Equivalence Transformations**	: The laws of equivalence, rules of substitution and transitivity, formal system of axioms and Inference rules. NATURAL DEDUCTION SYSTEM: Introduction to deductive proofs, Inference rules, proofs and sub-proofs, adding flexibility to the natural deduction system and developing natural deduction system proofs. **Lectures Req : 8**
III	**Predicates:**	Extending the range of a state, Quantification, Free and Bound Identifiers, Textual substitution, Quantification over other ranges and some theorems about textual substitution and states. **Lectures Req : 8**
IV	**Logic Programming**	Introduction to prepositional and predicate calculus, First-order predicate calculus, Format logical systems, PROLOG programming-Facts, Rules and queries, Implementations, Applications, Strengths and Weaknesses. **Lectures Req : 8**
V	**Functional Programming:**	Introduction to lambda calculus-Syntax and semantics, Computability and correctness. Features of Functional Languages-Composition of functions, Functions as first-class Objects, no side effects and clean semantics, LISP Programming-Data types and structures, Scheme dialect, primitive functions, functions for constructing functions and functional forms. Applications of functional languages and comparison of functional and imperative languages. **Lectures Req : 8**

Total Lectures Req :40

BCS506.2-INFORMATION THEORY & CODING (5CS6.2)

Teaching Hrs. **Exam Hrs. - 3**
L-3 T-0 P- 0 **Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**Elements Of Information Theory**	Measure of information, average information, entropy, information rate. Communication channel, discrete and continuous channel. **Lectures Req 8**

II	**Shannon**	Hartley theorem and its implications. Channel capacity, Gaussian channel and bandwidth-S/N tradeoff. **Lectures Req : 8**
III	**Introduction of Coding**	types of errors, types of codes, error control coding, methods of controlling errors. **Lectures Req : 8**
IV	**Linear Block and Binary Cyclic Codes**	matrix decryption of linear block codes, error detection and error correction capabilities of linear block codes. Hamming codes, structure of cyclic codes, encoding using an (n-k) bit shift register syndrome calculation, its error detection & correction, special classes of cyclic codes bch code. **Lectures Req : 8**
V	**Burst and Convolution Codes**	burst and random error correcting codes, encoders for convolution codes. Decoders for convolution codes. **Lectures Req : 8**

Total Lectures Req :40

Reference Books: 1. Analog & Digital Communication- Schaum's outlive series
2. Communication Sys.- K. Shaunugur
3. Analog & Digital Comm.- B. P. Lathi
4. Principles of Communication- SR Taub-Schilling

BCS506.3-ADVANCED DATA STRUCTURES (5CS6.3)

Teaching Hrs. **Exam Hrs.- 3**
L-3 T-0 P- 0 **Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**Advanced Trees**	: Definition**s** Operations on Weight Balanced Trees (Huffman Trees), 2-3 Trees and Red- Black Trees. Augmenting Red-Black Trees to Dynamic Order Statistics and Interval Tree Applications. Operations on Disjoint sets and its union-find problem Implementing Sets. Dictionaries, Priority Queues and Concatenable Queues using 2-3 Trees. **Lectures Req : 10**
II	**Mergeable Heaps:**	Mergeable Heap Operations, Binomial Trees Implementing Binomial Heaps and its Operations, 2-3-4. Trees and 2-3-4 Heaps. Amortization analysis and Potential Function of Fibonacci Heap Implementing Fibonacci Heap. SORTING NETWORK**:** Comparison network, zero-one principle, bitonic sorting and merging network sorter. **Lectures Req : 10**
III	**Graph Theory Definitions:**	Definitions of Isomorphic Components. Circuits, Fundamental Circuits, Cut-sets. Cut-Vertices Planer and Dual graphs, Spanning Trees, Kuratovski's two Graphs **Lectures Req : 6**
IV	**Graph Theory Algorithms:**	Algorithms for Connectedness, Finding all Spanning Trees in a Weighted Graph and Planarity Testing, Breadth First and Depth First Search, Topological Sort, Strongly Connected Components and Articulation Point. Single Min-Cut Max-Flow theorem of Network Flows. Ford-Fulkerson Max Flow Algorithms **Lectures Req : 10**
V	**Number Theoritic Algorithm:**	Number theoretic notation, Division theorem, GCD recursion, Modular arithmetic, Solving Linear equation, Chinese remainder theorem, power of an element, RSA public key Crypto system, primality Testing and Integer Factorization **Lectures Req : 9**

Total Lectures Req :45

Reference Books:
1. **Narsingh Deo : Graph Theory, PHI**
2. **Coreman : Tree Structure & Number Theoritic Algorithm**

BCS507- SYSTEM DESIGN LAB (UML) (5 CS 7)

1. Introduction to UML: Importance of modeling, principles of modeling, object Oriented modeling, conceptual model of the UML, Architecture, Software Development Life Cycle.
2. Basic Structural Modeling: Classes, Relationships,Class & Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams.
3. Basic Behavioral Modeling-I: Interactions, Interaction Diagrams(sequence diagram).
4..Basic Behavioral Modeling-II: Use cases, Use case Diagrams, Activity Diagrams.
5. Advanced Behavioral Modeling: Events and signals, state machines, state chart diagrams.
6. Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams.
NOTE: Students can prepare case study on atm, online systems, library management, bank management etc.

BCS508-Advanced Prog. Lab (JAVA Lab) (5CS8)

1. Write a servlet program to display the contents of a text file residing on the server machine in the display window of yours browser.

2. An Ms- Access database is stored on yours server .the database has only one table with fields: **S.no. Name Age Address** write a servlet program to print the list of names with age less than 20 and greater than 10. the list appear on the client browser's display window.

3. Write a java program which perform addition,deletion and updation records from database using jdbc.

4. An image file is stored in the sever machine as a jpeg file . write a servlet program to display this image in the browers display window.

5. Write a servlet program to find out if any cookie are included in yours servlet request .if cookies are added printout thier names and values in the client brower's display window.

6. Write a servlet program to add records to the database .data is received into a data entry from created by HTML document.

7. Write a jsp program which show the include and forward directives using any example.

8. Write a jsp program which maintane the database using HTML document(also include add ,delete and update option).

BCS509-DATABASE MANAGEMENT LAB (5CS9)

Student can use MySql (preferred open source DBMS) or any other Commercial DBMS tool (MS-Access / ORACLE) at backend and C++ (preferred) VB/JAVA at front end.

1. (a) Write a C++ program to store students records (roll no, name, father name) of a class using file handling.(Using C++ and File handling).

(b) Re-write program 1, using any DBMS and any compatible language.(C++/MySQL) (VB and MS-Access)

2. Database creation/ deletion, table creation/ deletion.

(a) Write a program to take a string as input from user. Create a database of same name. Now ask user to input two more string, create two tables of these names in above database.

(b) Write a program, which ask user to enter database name and table name to delete. If database exist and table exist then delete that table.

3. Write a program, which ask user to enter a valid SQL query and display the result of that query.

4. Write a program in C++ to parse the user entered query and check the validity of query.

(Only SELECT query with WHERE clause)

5 - 6. Create a database db1, having two tables t1 (id, name, age) and t2 (id, subject, marks).

(a) Write a query to display name and age of given id (id should be asked as input).

(b) Write a query to display average age of all students.

(c) Write a query to display mark-sheet of any student (whose id is given as input).

(d) Display list of all students sorted by the total marks in all subjects.

7 - 8. Design a Loan Approval and Repayment System to handle Customer's Application for Loan and handle loan repayments by depositing installments and reducing balances.

9 -10. Design a Video Library Management System for managing issue and return of Video tapes/CD and manage customer's queries.

BCS510-GRAPHICS & MULTIMEDIA LAB (5CS10)

1. Implementation of line generation using slope's method, DDA and Bresenham's algorithms.
2. Implementation of circle generation using Mid-point method and Bresenham's algorithm.
3. Implementation of ellipse generation using Mid-point method.
4. Implementation of polygon filling using Flood-fill, Boundary-fill and Scan-line algorithms.
5. Programs to produce a single pixel produce a pre specified pattern with features like changing background color, foreground color, resizing of window, repositioning of window must be demonstrated.
6. Programs to draw composite objects containing circles & lines, drawing lines thicker than one pixel, you can take shapes like a cart, car etc.
7. Programs to demonstrate text generation e.g. simple fonts, graphical fonts, and scalable fonts.
8. Programs to demonstrate clipping algorithms eg. program to clip a (i) line and (ii) polygon using Cohen-Sutherland Clipping algorithm(s), clipping lines, circles against a rectangular clip area.

Programs to demonstrate presentation of geometrical objects e.g. circle and rectangle with audio description i.e. size, color of boundary and interior etc. played synchronously one after another

M. Tech. V Semester

MCS103 - ADVANCED DATABASE MANAGEMENT SYSTEM(1MCS03)

Teaching Hrs. **Exam Hrs.- 3**
L-4 T-2 **TOTAL-100 Marks**

Overview of DBMS, Transaction Management, concurrency control , failure recovery.

Introduction to distributed data base management systems Semantic Database Models and Systems, Relational Extensions: Design Techniques, Extension Techniques.

Object / Relational Systems: Open ODB, Interface, OSQL, Adapter, Case Study of an ORDBMS, Related Development, Current Product Scenario.

Object-Oriented Database Systems : Standard for OODBMS, Products and Applications: ODM – Standards, ODMG, Smalltalk Binding, SQL.

User Defined ADT in SQL, Routines, ADT Subtypes and Inheritance, Tables, Procedural Facilities, Other Type Constructions, GenericADT Packages, Language Bindings.

Suggested reference materials:

1. C S R Prabhu,"Object Oriented Data Base Systems" approaches and Architectures, PHI,
2. F. H. Lochousky, DC Tsichritzis"DBMS" NewYork Academic Press.
3. F. H. Lochousky, DC Tsichritzis"Data Models" PHI.
4. C.J.DATE "Introduction to Data Base to Management System" Addison Wesley.
5. N. Goodman, V. Hadzilacos "Concurrency Control and Recovery in Data Base System" Addison Wesley

MCS104 – SOFTWARE PROJECT MANAGEMENT (1MCS04)

Teaching Hrs. **Exam Hrs.- 3**
L-4 T-2 **TOTAL-100 Marks**

Introduction to Software Project Management (SPM) :- Importance of SPM. Plans, methods and methodologies, setting objectives. Traditional / Modern SPM practices.

An overview of Project Planning:- Step wise project planning. Selection, identification, analysis, effort estimation, risk and resource allocation.

Activity Planning:- Objectives of activity planning, project schedules and activities. Sequencing, networking, planning models, critical path analysis.

Risk Management:- Categories of risk, framework for dealing with risk. Risk identification, assessment, planning and management.

Resource Allocation:- Nature of resources, identification and scheduling of resources, cost and scheduling sequences.

Software Quality:- Software quality in project planning and its importance. Product & process metrics, quality management systems. Process capability models, techniques for enhancing software quality.

Managing Contracts:- Types of contracts, stages in contract placement, terms of contracts and its management, acceptance.

Overview of PRINCE 2 (Project in Controlled Environments) & Project Management Tools.

Suggested reference materials:

1. Bob Hughes, Mike Cotterell, Rajib Mall, "Software Project Management", Tata Mc Graw Hill. (5th Edition)

2. Roger Pressman, Software Engineering A Practitioner‟s Approach, Tata Mc Graw-Hill Series in Computer Science (6th Edition)

3. Pankaj Jalote, An Integrated Approach to Software Engineering, (Third Edition), Narosa publication

VI Semester

BCS601-OPERATING SYSTEMS (6CS1)

Teaching Hrs. **Exam Hrs.- 3**
L-3 T-0 P-0 **Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**Introduction**	Introduction to Operating Systems, Operating system services, multiprogramming, time-sharing system, storage structures, system calls, multiprocessor system. Basic concepts of CPU scheduling, Scheduling criteria, Scheduling algorithms, algorithm evaluation, multiple processor scheduling, real time scheduling I/0 devices organization, I/0 devices organization, I/0 devices organization, I/0 buffering. **Lectures Req : 4**

II	**Process & Threads**	Process concept, process scheduling, operations on processes, threads, inter-process communication, precedence graphs, critical section problem, semaphores, classical problems of synchronization. Deadlock problem, deadlock characterization, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock, Methods for deadlock handling. **Lectures Req : 10**
III	**Memory Management**	Concepts of memory management, logical and physical address space, swapping, contiguous and non-contiguous allocation, paging, segmentation, and paging combined with segmentation **Lectures Req : 6**
IV	**Virtual Memory**	Concepts of virtual memory, demand paging, page replacement algorithms, allocation of frames, thrashing, demand segmentation. Security threads protection intruders-Viruses-trusted system **Lectures Req : 14**
V	**File System**	Disk scheduling, file concepts, file access methods, allocation methods, directory systems, file protection, introduction to distributed systems and parallel processing case study **Lectures Req : 6**

Reference Books:
1. Galvin / Silberschtz : Operating Systems Concepts, TMH

BCS602-COMPUTER NETWORKS (6CS2)

Teaching Hrs. **Exam Hrs. - 3**
L-3 T-0 P-0 **Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**Introduction**	Network: LAN, MAN, WAN, Internet, Intranet, Extranet, Network Topology, Transmission media: Twisted pair, UTP cables, Coaxial and optical fiber cables, wireless, microwave, Transmission mode : Simplex, half duplex ,full duplex, Network devices (Gateway, Bridges, Router, Hub, Switches), OSI and TCP/IP (Introduction) protocol Architecture. **Lectures Req : 6**
II	**Data Link Layer**	Data link layer design issue: Services provided to network layer, framing, error control, flow control. Error detection & correction code (CRC, Hamming, Parity), data link protocols (stop & wait, sliding window), introduction to HDLC. Medium access layer: Multiple access protocol, Aloha, CSMA, collision free protocol. IEEE standards: 802.3, 802.4, 802.5, 802.11. **Lectures Req : 7**
III	**Network Layer**	Switching Techniques (Packet Circuit, Massage), Network service model, Routing principles. Link State routing Algorithm, A distant Vector routing & OSPF algorithm, Broadcast Routing, Multicast Routing, Flooding, IP Protocol, IP Addresses, Subnets, IPV6 & IPV4 Packet format, **Lectures Req : 8**
IV	**Transport Layer:**	Transport Layer Service and Principles, Multiplexing and Demultiplexing applications, connectionless Transport. UDP Segment structure and UDP Checksum. Connection Oriented Transport TCP Connection and Segment Structure, Sequence Numbers and acknowledgement numbers, Telnet, Round trip time and timeout. TCP connection management. **Lectures Req : 7**
V	**Application Layer:**	Protocol and Service Provided by application layer, transport protocols. The world wide web. HTTP, Message formats, User Server Interaction and Web caches. FTP commands and replies. Electronic Mail, SMTP, Mail Message Formats and MIME and Mail Access Protocols DNS The internet's directory service DNS records and Message **Lectures Req : 6**

Total Lectures Req : 34

Reference Books:
1. **J.F. Kurose & K.W. Rose : Computer Networking, Pearson Education Asia**
2. **Tanenbaum: Computer Networks**

3. **Forouzan: Computer Networks**

BCS603-DESIGN & ANALYSIS OF ALGORITHMS (6CS3)

Teaching Hrs. **Exam Hrs.- 3**
L-3 T-1 P-0 **Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**Background**	Review of Algorithm Complexity and Order Notations and Sorting Methods. DIVIDE AND CONQUER METHOD: Binary Search, Merge Sort, Quick sort and strassen's matrix multiplication algorithms. GREEDY METHOD: Knapsack Problem, Job Sequencing, Optimal Merge Patterns and Minimal Spanning Trees. **Lectures Req : 9**
II	**Dynamic Programming**	Matrix Chain Multiplication. Longest Common Subsequence and 0/1 Knapsack Problem. BRANCH AND BOUND: Traveling Salesman Problem and Lower Bound Theory. Backtracking Algorithms and queens problem. **Lectures Req : 9**
III	**Pattern Matching Algorithms**	Naïve and Rabin Karp string matching algorithms, KMP Matcher and Boyer Moore Algorithms. ASSIGNMENT PROBLEMS: Formulation of Assignment and Quadratic Assignment Problem. **Lectures Req : 9**
IV	**Randomized Algorithms**	Las Vegas algorithms, Monte Carlo algorithms, randomized algorithm for Min-Cut, randomized algorithm for 2-SAT. Problem definition of Multicommodity flow, Flow shop scheduling and Network capacity assignment problems **Lectures Req : 9**
V	**Problem Classes Np, Np-Hard And Np-Complete**	Definitions of P, NP-Hard and NP-Complete Problems. Decision Problems. Cook's Theorem. Proving NP-Complete Problems - Satisfiability problem and Vertex Cover Problem. Approximation Algorithms for Vertex Cover and Set Cover Problem **Lectures Req : 9**

Total Lectures Req :45

Reference Books:

1. **Robert & Cormen : Introduction to Algorithms, Prentice Hall of India**

BCS604-EMBEDDED SYSTEMS (6CS4)

Teaching Hrs. **Exam Hrs. - 3**
L-3 T-1 P-0 **Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**Overview of Embedded System**	Embedded System, Categories and Requirements of Embedded Systems, Challenges and Issues in Embedded Software Development, Applications of Embedded Systems in Consumer Electronics, Control System, Biomedical Systems, Handheld computers, Communication devices. **Lectures Req :6**
II	**Embedded Hardware & Software Development Environment**	Hardware Architecture, Micro- Controller Architecture, Communication Interface Standards, Embedded System Development Process, Embedded Operating systems, Types of Embedded Operating systems. **Lectures Req :9**

III	**8051 Microcontroller**	Difference between microprocessor and microcontroller. 8 bit, 16 bit and 32 bit microcontroller, 8051 microcontroller, pin diagram, I/o pins and ports of 8051. **Lectures Req :6**
IV	**Assembly language programming 8051**	Data transfer instruction, arithmetic instructions, logical instructions, branching instructions, byte level and bit level instructions, call and ret instructions, addressing modes of 8051, programming and debugging, port programming. **Lectures Req :9**
V	**Inter facing of peripherals**	Serial I/o inter face, parallel I/o inter face, analog and digital inter face, key board inter face, memory inter face, LCD inter face, stepper motor inter face, RS 232, USB. **Lectures Req :6**

Total Lectures Req :42

Reference Books:
1. **Embedded System- Mazidi**
2. **Embedded System- Sundaram RMD**
3. **Embedded System- Neha Maheshwari**

BCS605-THEORY OF COMPUTATION (6CS5)

Teaching Hrs. **Exam Hrs.- 3**
L-3 T-1 P-0 **Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**Finite Automata & Regular Expression:**	Basic Concepts of finite state system, Deterministic and non-deterministic finite automation and designing regular expressions, relationship between regular expression & Finite automata minimization of finite automation mealy & Moore Machines **Lectures Req : 8**
II	**Regular Sets of Regular Grammars:**	Basic Definition of Formal Language and Grammars. Regular Sets and Regular Grammars, closure proportion of regular sets, Pumping lemma for regular sets, decision Algorithms for regular sets, Myhell_Nerod Theory & Organization of Finite Automata **Lectures Req : 8**
III	**Context Free Languages& Pushdown Automata:**	Context Free Grammars – Derivations and Languages – Relationship between derivation and derivation trees – ambiguity – simplification of CEG – Greiback Normal form – Chomsky normal forms – Problems related to CNF and GNF Pushdown Automata: Definitions – Moves – Instantaneous descriptions – Deterministic pushdown automata – Pushdown automata and CFL - pumping lemma for CFL - Applications of pumping Lemma **Lectures Req : 10**
IV	**Turing Machines:**	Turing machines – Computable Languages and functions – Turing Machine constructions – Storage in finite control – multiple tracks – checking of symbols – subroutines – two way infinite tape. Undecidability: Properties of recursive and Recursively enumerable languages – Universal Turing Machines as an undecidable problem – Universal Languages – Rice's Theorems. **Lectures Req : 10**
V	**Linear bounded Automata Context Sensitive Language:**	Chomsky Hierarchy of Languages and automata, Basic Definition& descriptions of Theory & Organization of Linear bounded Automata Properties of context-sensitive languages. **Lectures Req : 8**

Total Lectures Req :44

Reference Books:
1. **K.L.P. Mishra : Introduction to Language and Computation, Pearson Education Asia**

BCS606.1-DIGITAL SIGNAL PROCESSING (6CS6.1)

Teaching Hrs. **Exam Hrs.- 3**
L-3 T-0 P-0 **Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**Flow Graph and Matrix Representation of Digital Filters**	Signal flow graph representation of digital network, matrix representation, basic network structures for IIR and FIR systems, Telligen's theorem for digital filters and its applications. **Lectures Req : 8**
II	**Digital filter Design Techniques**	Design of IIR and FIR digital filters, computer aided design of IIR and FIR filters, comparison of IIR and FIR digital filters. **Lectures Req : 8**
III	**Computation of the Discrete Fourier Transform**	Goertzel algorithm, FT algorithms, decimation in time and frequency, FFFT algorithm for N a composite number, Chirp Z transforms (CZT). **Lectures Req : 10**
IV	**Discrete Random Signals**	Discrete time random process, averages spectrum representations of infinite energy signals, response of linear system to random signals. **Lectures Req : 10**
V	**Power Spectrum Estimation**	Basic principles of spectrum estimation, estimates of the auto covariance, power spectrum, cross covariance and cross spectrum. **Lectures Req : 8**

Total Lectures Req: 44

BCS606.2-.Net Technologies (6CS6.2)

Teaching Hrs. **Exam Hrs.-3**
L-3 T-0 P-0 **Marks Theory Exam.-80 Term Test-20 Total -100**

Units	Topics	CONTENT OF SYLLABUS
I	**Introduction to .NET Framework**	Genesis of .Net – Features of .Net - .Net binaries Microsoft Intermediate Language – Meta Data - .Net types and .net name spaces – Common Language Runtime – Common Type System – Common Language Specification - .Net Applications using command line compiler and visual studio .net IDE. **Lectures Req : 6**
II	**Introduction to VB.NET**	Variables,Comments,Constants,Keywords,DataTypes,Control Statements, Conditional Statements, If Statement, Select Case Statement,Loops-The For Loop,The while Loop, The do...Loop, The for Each Loop, Arrays, Option Explicit, Option Strict,Exception handling. **Lectures Req : 8**
III	**Programming with VB.NET**	Introducing Windows Forms, Implementing Class Library Object in VB.NET,Introduction and Implementing Inheritance in VB.NET,Designing a Form using Windows Forms Designer Window, Exploring the Forms Designer generated code, Using Application Class and Message Class, Setting and Adding Properties to a Windows Form, Event Handling In Visual Basic .NET ,Building graphical interface elements, Adding Controls, Common Controls and Handling Control Events, Dialog Boxes in Visual Basic .NET ,Common Windows Forms Controls Section, Creating Menu and Menu Items, Creating Multiple-Document Interface (MDI) **Lectures Req :10**
IV	**Ado .NET**	Basics of ADO .NET – Changes from ADO – Data Table – Data Views – Data Set – Data Relation Type – ADO .NET Managed Providers – OLEDB and SQL Managed Providers – OleDb Data Adapter Type. **Lectures Req :6**
V	**Basics of ASP .NET**	Introducing ASP .NET – Creating and deploying ASP .NET applications Web forms – Web controls, working with events, Validation controls, Navigation from one form to another. **Lectures Req : 6**

Total Lectures Req : 36

Reference Books:
1 .Black Book –Visual Basic Dot Net
2. Murach's Visual Basic 2010

BCS606.3-MICROWAVE AND SATELLITE COMMUNICATION (6CS6.3)

Teaching Hrs. **Exam Hrs.- 3**
L-3 T-0 P-0 **Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**Microwave Transmission System**	General representation of E M field in terms of TEM, TE and TM components, Uniform guide structures, rectangular wave guides, Circular Wave guides, Solution in terms of various modes, Properties of propagating and evanescent modes, Dominant modes, Normalized model voltages and currents, Power flow and energy storage in modes frequency range of operation for single mode working, effect of higher order modes, Strip line and micro strip lines-general properties, Comparison of coaxial, Micro strip and rectangular wave guides in terms of band width, power handling capacity, economical consideration etc **Lectures Req :6**
II	**Origin and brief history of satellite communication**	Elements of a satellite communication link; Current status of satellite communication. Orbital Mechanism and Launching of Satellite*:* Equation of orbit, Describing the orbit, Location the satellite in the orbit, Locating the satellite with respect to earth, Orbital elements, Look angle determination, Elevation and Azimuth calculation, Geostationary and other orbits, Orbital perturbations, Orbit determination, Mechanics of launching a synchronous satellite, Selecting a launch vehicle. **Lectures Req :9**
III	**Space Craft: Satellite subsystems**	. Space Craft: Satellite subsystems, Altitude and Orbit Control (AOCS), Telemetry, Tracking and Command (TT&C). Communication subsystems, Transponders, Spacecraft antennas, Frequency re-use antennas. **Lectures Req :6**
IV	**Satellite Channel and Link Design**	Basic transmission theory, Noise temperature, Calculation of system noise temperature, Noise figure, G/T ratio of earth stations, Design of down links and uplinks using C/N ratio, FM improvement factor for multi-channel signals, Link Design for FDM/FM, TV signals and Digital Signals. **Lectures Req :9**
V	**Earth Station Technology**	.Earth station design, Basic antenna theory, antenna noise temperature; Tracking; Design of small earth station antennas, Low noise amplifiers, High power amplifiers, FDM and TDM systems. **Lectures Req :6**

Total Lectures Req :42

BCS607-SHELL PROGRAMMING LAB (6CS7)

1. Practice commands: cp, mv, rm, ln, ls, who, echo, cat, mkdir, rmdir. Wildcards (?, *) ,

I/O redirection (<, >, >>), pipelines (|)

2. Practice commands: xargs, alias, set-unset, setenv-unsetenv, export, source, ps, job, kill.

3. Practice commands: head, tail, cut, paste, sed, grep, sort, uniq, find , locate, chmod.

4. Writing a simple shell script to echo who is logged in.

5. Write a shell script to display only executable files in a given directory.

6. Write a shell script to sort a list of file either in alphabetic order or largest file first according to user response.

7. Write a shell script to count the lines. Words and characters in its input (Note : Don't use wc).

8. Write a shell script to print end of a glossary file in reverse order using array. (Hint: use awk tail).

9. Modify cal command to accept more than one month (e.g. $cal Oct, Nov,)(Hint : use alias too)

10. Write a shell script to check whether Ram logged in, continue checking every 60 seconds until success.

BCS608-NETWORK LAB (6CS8)

1. The lab is to be conducted in Perl programming language, Perl works on all platforms (including windows)
2. Write few basic programs of Perl.

a. A Hello World Program

b. Write a program to add to 10 numbers.

c. Write a program of reading input from the keyboard and displaying them on monitor.

d. Write a program to take two strings as input and compare them

3. To understand advance constructs of Perl

e. Write a program to create a list of your course (all theory courses in current semester) using array and print them.

f. Write a program to accept ten number, store it into a hash table (Perl have itself) and when asked by user tell him that number exists or not. (do not store duplicate numbers)

g. Write a program to compute the number of lines in a file.

4. Find the IP address of a host or turn an IP address into a name.
5. Connect to an FTP server and get or put files. Automate the one-time transfer of many files to download the file everyday, which have changed since yesterday. (use Net:FTP)
6. Write a program to send mail. The programs should monitor system resources like disk space and notify admin by mail when disk space becomes dangerously low. (use Net:mail)
7. Fetch mail from a POP3 server (use Net:pop3)
8. Find out who owns a domain (use Net:whois , Whois is a service provided by domain name registration authorities to identify owners of domain names)
9. Test whether a machine is alive. machine can be specified using IP address or domain name of machine.
10. You have a URL that fetch its content from a Perl script, convert it to ASCII text (by stripping html tags) and display it. 11. Writing a TCP Client, Writing a TCP Server and Communicate some data over TCP

BCS609-.NET LAB (6CS9)

1. WAP to create arithmetic calculator
2. WAP to create a user interface for fare management in taxi system.
3. WAP to create a program for a restaurant managment(combo box,list etc.)
4. WAP to create a notepad using menu driven programming.
5. WAP to create a component that represents a pizza making machine .This will create and manage instances of a pizza class and expose a collection of pizza's also it will implement member events that inform the containing component when a pizza is ready.
6. Create a fraction class that models a fractional number.Implement properties that represent the numerator and the denominator.Also implement methods to reduce the fraction and convert the instance of the fraction class to a string or double.

7. Create different kinds of data access into our application also read data from a database with a DataReader ,use a DataAdapter to fill a DataSet to update your database.
8. Create a custom control for a timer .This control will display the current time on the form in a graphically rich format.You have to write code to render the control,add logic to implement the functionality,add code to the constructor to set the initial properties and then test the control.
9. Create the translator application,containing a Web Form and a Class module.Create an instance of an object,save that instance in Session State and use Session state and viewState from the web form.

BCS610-MICROCONTROLLER LAB (Using Ed sim and 8051 development board) (6CS10)

1. Write a program to add two 8 bit numbers.
2. Write a program to add an array of 8 numbers using loop.
3. Write a program to find largest of 3 numbers.
4. Write a program to find smallest of 3 numbers.
5. Write a program to transfer block of bytes from 1 block of memory to another block of memory in same order.
6. Write a program to transfer block of bytes from 1 block of memory to another block of memory in reverse order.
7. Write a program to transfer only odd bytes from block of bytes.
8. Write a program to transfer only even bytes from block of bytes.
9. Interface LCD with 8051 and send text message on it.
10. Interface LED with 8051 and glow in different modes.
11. Interface matrix key board with 8051.

M. Tech. Semester

MCS202 – ADVANCED COMPUTER NETWORKS (2MCS02)

Teaching Hrs. **Exam Hrs.- 3**
L-4 T-2 **TOTAL-100 Marks**

Flow and Congestion Control-Flow and Congestion Control: Window and Rate Based Schemes, Decbit, TCP, ATM ABR, hopby-hop schemes.

Quality of Service :-Quality of Service: in ATM, IETF integrated services model, Differentiated Services Model.

Flow Identification:-Flow Identification: Packet Classifiers and Filters Scheduling.

Network Management:-Network Management: ASN, SNMP, CMIP. Issues in the management of large network.

Multicast:-Multicast: IGMP, PIM, DVMRP. Mobility: IP.

Suggested reference materials:

1. Computer Networks: a top-down approach featuring Internet, J F. Kurose & Keith W. Ross
2. Heuring – Computer system Design and Architecture, Pearson Education.
3. Computer Networks: Frozen

MCS204– INFORMATION RETRIEVAL (2E01)

Teaching Hrs. **Exam Hrs.- 3**
L-4 T-2 **TOTAL-100 Marks**

.
Introduction, Information retrieval V/S Retrieval, logical view of documents, retrieval process.

Basic models for IR and their formal characterization Probabilistic,Bayesian, and Dempster Shafer approaches.Retrieval Evaluation, query languages.

Text operations – document clustering, compressions and various compression models.Indexing and searching – brute-force, Knuth-Morris-Pratt, Boyer-Moore, pattern matching IR.

basic idea of parallel and distributed, Searching web, search engines, browsings and met searches, searching through hyperlinks.

User interfaces and visualizations, Information access process, query specifications, relevance judgments.

Searching web, search engines, browsings and met searches, searching through hyperlinks.

Suggested reference materials:

1. Modern Information Retrieval, Baeza-yates & Riberio-neto

VII Semester

BCS701-COMPILER CONSTRUCTION (7CS1)

Teaching Hrs. **Exam Hrs.- 3**
L-3 T-1 P-0 **Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**Introduction**	Compiler, Translator, Interpreter definition, Phase of compiler introduction to one pass & Multipass compilers, Bootstrapping, Review of Finite automata lexical analyzer, Input, buffering, Recognition of tokens, Idea about LEX: A lexical analyzer generator, Error handling **Lectures Req : 8**

II	**Parsing Techniques**	Review of CFG Ambiguity of grammars, Introduction to parsing. Bottom up parsing Top down parsing techniques, Shift reduce parsing, Operator precedence parsing, Recursive descent parsing predictive parsers. LL grammars & passers error handling of LL parser. LR parsers, Construction of SLR, Conical LR & LALR parsing tables, parsing with ambiguous grammar **Lectures Req : 8**
III	**Syntax & Type checker**	Syntax directed definitions; Construction of syntax trees, L-attributed definitions, Top down translation. Specification of a type checker, Intermediate code forms using postfix notation and three address code, Representing TAC using triples and quadruples, Translation of assignment statement. Boolean expression and control structures **Lectures Req : 9**
IV	**Storage & Symbol Tables**	Storage organization, Storage allocation, Strategies, Activation records, Accessing local and non local names in a block structured language, Parameters passing, Symbol table organization, Data structures used in symbol tables. **Lectures Req : 5**
V	**DAG**	Definition of basic block control flow graphs, DAG representation of basic block, Advantages of DAG, Sources of optimization, Loop optimization, Idea about global data flow analysis, Loop invariant computation, Peephole optimization, Issues in design of code generator, A simple code generator, Code generation from DAG **Lectures Req : 8**

Total Lectures Req :38

Reference Books:

1. **D.M. Dhamadhere : Compiler Construction, Macmillan**
2. **Alfred. V Aho Jeffry D. Alhman : Principle of Complier Design. Narosa Publishing House**

BCS702- DATA MININIG AND WAREHOUSING(7CS2)

Teaching Hr **Exam Hrs.- 3**
L-3 T-1 P-0 **Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**Introduction**	Overview, Motivation(for Data Mining),Data Mining-Definition & Functionalities, Data Processing, Form of Data Preprocessing, Data Cleaning: Missing Values, Noisy Data, (Binning, Clustering, Regression, Computer and Human inspection), Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation **Lectures Req : 8**
II	**Concept Description:-**	Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Graph Displays of Basic Statistical class Description, Mining Association Rules in Large Databases, Association rule mining, mining Single-Dimensional Boolean Association rules from Transactional Databases– Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases and Mining Multi- Dimensional Association rules from Relational Databases **Lectures Req : 9**
III	**Classification & Prediction**	Issues regarding Classification and prediction, Decision tree, Bayesian Classification, Classification by Back propagation, Multilayer feed-forward Neural Network, Back propagation Algorithm, Classification methods K-nearest neighbor classifiers, Genetic Algorithm. Cluster Analysis: Data types in cluster analysis, Categories of clustering methods, Partitioning methods. Hierarchical Clustering-CURE and Chameleon. Density Based Methods-DBSCAN, OPTICS. **Lectures Req : 9**

IV	**Data Warehousing:**	Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting. **Lectures Req : 8**
V	**Left overs**	Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse. **Lectures Req : 8**

Total Lectures Req: 42

Reference Books:

1. **Rob Mattison : Web Warehousing and Knowledge Management, TMH**

BCS 703- ADVANCED LOGIC SYSTEM (7CS3)

Teaching Hrs: **Exam Hrs.: -3**
L-3, T-0, P-0 **Marks Theory Exam – 80 Term test – 20 Total - 100**

Units	Topics	CONTENT OF SYLLABUS
I	Modern Digital System	Modern digital systems, Complexity in microelectronic circuit design, Moore's Law, Full & Semi custom designs, CAD flow for ASIC & FPGA. Synthesis & Optimization. **Lectures Req:7**
II	Boolean functions & State diagrams	Boolean functions & their representations – cofactors, unate, derivatives, consensus & smoothing. Binary Decision Diagrams (BDD), OBDD & ROBDD algorithm. State diagram, data flow & sequencing graphs. Compilation & Behavioral optimization. **Lectures Req:7**
III	Hardware Modelling	Circuit specification for Architectural Synthesis , Temporal Domain Scheduling ,Spatial Domain Binding ,Hierarchical Models & Synchronization Problem. Area & performance Estimation. **Lectures Req:7**
IV	Scheduling Algorithms	Scheduling algorithms : Unconstrained ASAP, Latency constrained ALAP, Timing constrained, Relative, Relative under timing constraints, Multiprocessor & HU's, Heuristic: List minimum resource & minimum latency. **Lectures Req:7**
V	VHDL	Introduction to VHDL: data types, operators, objects & classes. VHDL codes for basic building blocks: Half Adder , Full Adder , Multiplexers , Encoders , Decoders, Filp Flops , Registers & Counters **Lectures Req:7**

Total Lectures Req: 35

Reference Books:

1. Giovanni De Micheli : Synthesis & Optimization of Digital Circuits
2. J. Bhasker : VHDL Primer
3. Douglas Perry : VHDL programming by examples.

BCS704-ARTIFICIAL INTELLIGENCE (7CS4)

Teaching hrs. **Exam Hrs.-3 Hrs.**
L-3 T-0 P-0 **Marks Theory Exam.-80 Term Test-20 Total - 100**

Units	Topics	CONTENTS OF SYLLABUS
I	**Introduction to Artificial Intelligence:**	Meaning and definition of artificial intelligence, Various types of production systems, Characteristics of production systems, Study and comparison of breadth first search and depth first search. Techniques,

		other Search Techniques like hill Climbing, Best first Search. A* algorithm, AO* algorithms etc, and various types of control strategies. **Lectures Req: 10**
II	**Knowledge:**	Knowledge Representation, Problems in representing knowledge, knowledge representation using propositional and predicate logic, comparison of propositional and predicate logic, Resolution, refutation, deduction, theorem proving, inferencing, monotonic and non-monotonic reasoning. **Lectures Req: 10**
III	**Reasoning:**	Probabilistic reasoning, Baye's theorem, semantic networks scripts schemas, frames, conceptual dependency and fuzzy logic, forward and backward reasoning **Lectures Req: 6**
IV	**Game Playing:**	Game playing techniques like minimax procedure, alpha-beta cut-offs etc, planning, Study of the block world problem in robotics, Introduction to understanding and natural languages processing. **Lectures Req: 8**
V	**Learning:**	Introduction to learning, Various techniques used in learning, introduction to neural networks, applications of neural networks, common sense, reasoning, some example of expert systems. **Lectures Req: 6**

Total lectures req: 40

Reference Books :

1. **E.Rich,K Knight-Artificial Intelligence,Tata McGraw Hills.**
2. **S.Russell,P.Norving-Artificial Intelligence-A Modern Approach,Pearson Education,Asia.**
3. **Thomas Dean-Artificial Intelligence-Theory & Practice,Pearson Education,Asia.**
4. **Alison Caursey - The Essence of Artificial Intelligence, Pearson Education, Asia**

BCS705-ADVANCED SOFTWARE ENGINEERING (7CS5

Teaching Hrs. **Exam Hrs.- 3**
L-3 T-0 P-0 **Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**Software Configuration Management (Scm)**	SCM Process, Objects in Software configuration, Version control, Change control, Configuration audit, Status reporting, SCM standards, Risk analysis-risk identification, risk projection, risk assessment, risk mitigation & monitoring. **Lecture:5**
II	**Software Quality Assurance(Sqa)**	Software quality, Quality Concepts, quality attributes, Quality Movement, software quality metrics, SQA Activities and Formal Approaches to SQA, Formal technical reviews. **Lecture:5**
III	**Software Testing And Debugging**	Software Testing Fundamentals .Text Case Design ,White –Box Testing, Basis Path testing, Control Structure Testing, Black Box Testing and Testing for Specialized Environments, Architectures and Applications. Program Error, Debugging Process (Information Gathering, Fault Isolation, Fault Confirmation, Documentation, Fixing fault,Testing) Debugging Example. **Lecture:10**
IV	**Web Engineering**	Attributes of Web-Based Applications. Process, Modeling activity, Analysis modeling for WebApps, Design- functional, information & interaction, testing WebApps- content,navigation, configuration, and performance testing.

		Lecture:7
V	**Project Management**	Project Management for special classes of software projects:Using CASE tools, CBSE, Re-engineering, forward engineering, client/server software engineering, outsourcing, Software project management standards. **Lecture:8**

Total Lectures Req.: 35

Reference Books:
1. Roger S. Pressman : A Practioners Approach, TMH
2. Somani & Kanawat : Software Engineering

BCS706.1-SERVICE ORIENTED ARCHITECHURE (7CS6.1)

Teaching Hrs. **Exam Hrs.- 3**
L-3 T-0 P-0 **Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**SOA Fundamentals:**	Defining SOA, Business Value of SOA, Evolution of SOA, SOA characteristics, concept of a service in SOA, misperceptions about SOA, Basic SOA architecture, infrastructure services, Enterprise Service Bus (ESB), SOA Enterprise Software models, IBM On Demand operating environment
II	**Web services Technologies:**	XML technologies – XML, DTD, XSD, XSLT, XQuery, XPath Web services technologies - Web services and SOA, WSDL, SOAP, UDDI WS Standards (WS-*) - Web services and Serviceoriented enterprise (SOE), WS-Coordination and WS-Transaction, Business Process Execution Language for Web Services (BPEL4WS), WS-Security and the Web services security specifications, WS-Reliable Messaging, WSPolicy, WS-Attachments
III	**SOA Planning and Analysis:**	Stages of the SOA lifecycle, SOA Delivery Strategies, service-oriented analysis, Capture and assess business and IT issues and drivers, determining non-functional requirements (e.g., technical constraints, business constraints, runtime qualities, non-runtime qualities), business centric SOA and its benefits, Service modeling, Basic modeling building blocks, service models for legacy application integration and enterprise integration, Enterprise solution assets(ESA)
IV	**SOA Design and implementation:**	service-oriented design process, design activities, determine services and tasks based on business process model, choosing appropriate standards, articulate architecture, mapping business processes to technology, designing service integration environment (e.g., ESB, registry), Tools available for appropriate designing, implementing SOA, security implementation, implementation of integration patterns, services enablement, quality assurance
V	**Managing SOA Environment:**	Distributing service management and monitoring concepts, operational management challenges, Service-level agreement considerations, SOA governance (SLA, roles and responsibilities, policies, critical success factors, and metrics), QoS compliance in SOA governance, role of ESB in SOA governance, impact of changes to services in the SOA lifecycle.

BCS706.2-SOFT COMPUTING (7CS6.2)

Teaching Hrs. **Exam Hrs.- 3**
L-3 T-0 P-0 **Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS

I	**Introduction to intelligent systems and soft computing**	Introduction Intelligent systems, Machine intelligence meaning of intelligence Dynamics of Intelligence Intelligent machines Knowledge-based systems Architectures of knowledge-based Systems Production systems Reasoning strategies Conflict resolution methods Frame-based systems Blackboard systems Object-oriented programming Expert systems Development of an expert system Knowledge engineering Applications Knowledge representation and processing Semantic networks Crisp logic Crisp sets Correspondence between sets and logic, Logic processing (reasoning and inference Laws of logic Rules of inference Propositional calculus and predicate calculus Soft computing Fuzzy logic Neural networks Genetic algorithms Probabilistic reasoning Approximation and intelligence Technology needs
II	**Fundamentals of fuzzy logic systems**	Introduction Background Evolution of fuzzy logic Popular applications Stages of development of an intelligent product Use of fuzzy logic in expert systems Fuzzy sets Membership function Symbolic representation Fuzzy logic operations Complement (negation, NOT) Union (disjunction, OR) Intersection (conjunction, AND Basic laws of fuzzy logic.
III	**Fuzzy logic control**	Introduction Background Basics of fuzzy control Steps of fuzzy logic control Composition using individual rules Defuzzification Centroid method Mean of maxima method Threshold methods Comparison of the defuzzification methods Fuzzification Singleton method Triangular function method Gaussian function method Discrete case of fuzzification Fuzzy control architectures Hierarchical fuzzy systems Hierarchical model Feedback/filter modules Functional/control modules Effect of information processing Effect of signal combination on fuzziness Decision table approach for a fuzzy tuner Properties of fuzzy control Fuzzy controller requirements Completeness Continuity Consistency Rule validity Rule interaction Rule base decoupling Decision-making through a coupled rule base Decision-making through an uncoupled rule Equivalence condition Robustness and stability
IV	**Fundamentals of artificial neural networks**	Introduction learning and acquisition of knowledge Symbolic learning Numerical learning Features of artificial neural networks Neural network topologies the feed forward topology The recurrent topology neural network activation functions neural network learning algorithms Supervised learning Unsupervised learning Reinforcement learning Fundamentals of connectionist modeling McCulloch–Pitts models
V	**Major classes of neural networks**	Introduction The multilayer perceptron Topology Back propagation learning algorithm Momentum Applications and limitations of MLP Radial basis function networks Topology Learning algorithm for RBF Applications Kohonen's self-organizing network Topology Learning algorithm The Hopfield network learning algorithm Applications of Hopfield networks.

Reference Books:-
1) Soft Computing and Intelligent Systems Design Theory, Tools and Applications
Author:- Fakhreddine O. Karray and Clarence de Silva
Publication- Pearson education (Addison wisely)

BCS706.3-REAL TIME SYSTEMS (7CS6.3)

Teaching Hrs. **Exam Hrs.-3**
L-3 T-0 P-0 **Marks Theory Exam.-80 Term Test-20 Total 100**

Units	Topics	CONTENT OF SYLLABUS
I	**Introduction:**	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. **Lectures Req : 12**
II	**Real Time**	Common Approaches to Real Time Scheduling: Clock Driven Approach,

	Scheduling:	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. **Lectures Req : 9**
III	**Resources Access Control**	: Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive 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. **Lectures Req : 6**
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. **Lectures Req : 9**
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. **Lectures Req : 9**

Total Lectures Req : 45

Reference Books :

1. **W.S.Liu-Real-Time Systems,Pearson Education Asia.**
2. **Raymond A.Buhr-Introduction to Real-Time Systems,Pearson education Asia.**
3. **Alan Burns-Real-Time Systems and Programming Languages, Pearson Education**

BCS707-COMPILER DESIGN LAB (7CS7)

1. Develop a lexical analyzer to recognize a few patterns in PASCAL and C.

a. (ex: identifiers, constants, comments, operators etc.)

2. Write a program to parse using Brute force technique of Top down parsing.
3. Develop on LL (1) parser (Construct parse table also).
4. Develop an operator precedence parser (Construct parse table also)
5. Develop a recursive descent parser.
6. Write a program for generating for various intermediate code forms

a. i) Three address code ii) Polish notation

7. Write a program to simulate Heap storage allocation strategy
8. Generate Lexical analyzer using LEX
9. Generate YACC specification for a few syntactic categories.
10. Given any intermediate code form implement code optimization techniques

BCS708-DATA MINING AND WAREHOUSING LAB (7CS8)

1. The objective of the lab exercises is to use data mining techniques to use standard databases available to understand DM processes using any DM tool)

2. Gain insight for running pre- defined decision trees and explore results using MS OLAP Analytics.

3. Using IBM OLAP Miner – Understand the use of data mining for evaluating the content of multidimensional cubes.

4. Using Teradata Warehouse Miner – Create mining models that are executed in SQL.

(Portal work : The objective of this lab exercises is to integrate pre-built reports into a portal application)

5. Publish and analyze a business intelligence portal.

Metadata & ETL Lab: The objective of this lab exercises is to implement metadata import agents to pull metadata from leading business intelligence tools and populate a metadata repository. To understand ETL processes

6. Import metadata from specific business intelligence tools and populate a meta data repository.

7**. Publish metadata stored in the repository.**

8. Load data from heterogeneous sources including text files into a pre-defined warehouse schema. Case study

9. Design a data mart from scratch to store the credit history of customers of a bank. Use this credit profiling to process future loan applications.

10. Design and build a Data Warehouse using bottom up approach titled 'Citizen Information System'.

BCS709-ADVANCED LOGIC SYSTEM LAB (7CS9)

Write VHDL Codes for:

1. All gates with all Modeling.
2. Half adder, subtractor
3. Full adder, subtractor
4. Mux 4x1 using
    - With select
    - When else
    - Case
    - If then else
5. Decoder 2X4
6. Function implementation using Muxes & Decoder.
7. BCD to 7 segment decoder.
8. Binary to gray code converter
9. 4 bit adder.
10. D latch
11. D F/F with async reset.
12. J F/F with sync reset.
13. J K F/F.
14. 4 bit shift register.
15. 8 bit parallel access shift register.

TOOLS :

Xilinx Synthesis Tools/ Synopsis Tools/ Cadence Tools/ Model SIM may be used.

M. Tech. Semester

MCS101-THEORY OF FORMAL LANGUAGES (1MCS01)

Teaching Hrs. **Exam Hrs.- 3**
L-4 T-2 **TOTAL-100 Marks**

Formal languages and their related automata, Turing machines, type-0 languages, linear bounded automata and CSLs. Time and tape bounded Turing machines, time and space bounds for recognizing CFLs.

Turing Computability: number theoretic computations by Turing machines and indexing. Axiomatic systems, their soundness and completeness.

Recursive function theory: primitive recursive functions and primitive recursive predicates. Ackermann's function, recursive and general recursive functions.

Computability and decidability: computable functions, computable sets, decision problems. Fixpoint theory of programs, functions and functionals, verification methods, Lambda calculus and applications.

Suggested reference materials:

1. K. L. P Mishra, N. Chandrasekaran, Theory of Computer Science, PHI
2. Peter Linz, Formal Languages and Automata, Narosa Publication.
3. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, Introduction to Automata Theory, Languages, and Computation, Pearson Education Asia.
4. John Martin, Introduction to Languages and The Theory of Computation, Tata McGraw Hill.
5. Deniel I. A. Cohen, Introduction to Computer Theory, Wiley Publication.

MCS102 - ADVANCED OPEARTING SYSTEMS (1MCS02)

Teaching Hrs. **Exam Hrs.- 3**
L-4 T-2 **TOTAL-100 Marks**

Distributed Operating System: Issues, limitation, causal and total ordering.

Logical clocks, mutual exclusion classification and algorithms.

Deadlock model, detection, prevention, avoidance, resolution, centralized and distributed detection algorithms.

Distributed file system architecture, design issues, memory coherence, granularity, page replacement. Distributed scheduling

Load distribution, stability, load sharing, task migration

Suggested reference materials:

1. Galvin / Silberschtz : Operating Systems Concepts, TMH
2. Distributed operating System :Tanenbaum
3. Distributed operating systems: concepts and design: Pradeep Kumar Sinha
4. Distributed systems: concepts and design: George Coulouris, Tim kindberg

VIII Semester

BCS801-INFORMATION SYSTEM AND SECURITIES (8CS1)

Teaching Hrs. **Exam Hrs.- 3**
L-3 T-0 P- 0 **Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**Introduction:**	security attacks, services and mechanism, introduction to cryptography. Conventional Encryption: Conventional encryption model, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stereography, stream and block ciphers. Modern Block Ciphers: Block ciphers principals, Shannon's theory of confusion and diffusion, fiestal structure, data encryption standard(DES), strength of DES, differential and linear crypt analysis of

		DES, block cipher modes of operations, triple DES, IDEA encryption and decryption, strength of IDEA, confidentiality using conventional encryption, traffic confidentiality, key distribution, random number generation. **Lectures Req 10**
II	**Various Algorithms**	Introduction to graph, ring and field, prime and relative prime numbers, modular arithmetic, Fermat's and Euler's theorem, primality testing, Euclid's Algorithm, Chinese Remainder theorem, discrete logarithms. Principals of public key crypto systems, RSA algorithm, security of RSA, key management, Diffle-Hellman key exchange algorithm, introductory idea of Elliptic curve cryptography, Elganel encryption **Lectures Req : 10**
III	**Message Authentication &Hash Function**	Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions and MACS, MD5 message digest algorithm, Secure hash algorithm(SHA). Digital Signatures: Digital Signatures, authentication protocols, digital signature standards (DSS), proof of digital signature algorithm. **Lectures Req : 8**
IV	**Authentication Application**	Kerberos and X.509, directory authentication service, electronic mail security-pretty good privacy (PGP), S/MIME **Lectures Req : 6**
V	**Ip Security**	Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Web Security: Secure socket layer and transport layer security, secure electronic transaction (SET). System Security: Intruders, Viruses and related threads, firewall design principals, trusted systems. **Lectures Req : 6**

Total Lectures Req :40

Reference Books:

1. **Cryptography and Network Security, Principle and practice William Stallings - Fourth edition**
2. **Cryptography and Network Security- Behrouz A. Forouzan – Mc Graw Hill.**
3. **Cryptography And Network Security- Atul Kahate - Mc Graw Hill**

BCS802-Mobile Computing (8CS2)

Teaching Hrs **Exam Hrs.- 3**

L-3 T-0 P-0 **Marks Theory Exam- 80 Term Test-20 TOTAL -100**

Units	**Topic**	**CONTENT OF SYLLABUS**
I	**Mobile computing Mobility management**	Mobile computing: Definitions, adaptability issues Mobile computing: (transparency, Environmental Constraints, application aware adaptation), mechanisms for adaptation and incorporating adaptations. Mobility management: mobility management, location Mobility management: management principle and techniques, Energy efficient network protocols, PCS location management Scheme, Energy efficient indexing on air and algorithm. **Lectures Req :7**
II	**Data dissemination and management**	Data dissemination and management: challenges, Data dissemination, bandwidth allocation for publishing, broadcast disk scheduling, mobile cache maintenance schemes, Mobile Web Caching. Introduction to mobile middleware, Middleware for application development: adaptation. Mobile Agents- introduction, mobile agent computing, model, technologies, application to DBMS, Mobile Agent Security and Fault Tolerance using Distributed Transactions, Reliable Agent Transfer, Architecture of a Secure Agent System, Network Security Testing Using Mobile Agents, Network Security Testing Using

		Mobile Agents. **Lectures Req :8**
III	**Service Discovery Middleware**	Service Discovery Middleware: Service Discovery & s Service Discovery Middleware: tandardization Methods (Universally Unique Identifiers, Textual Description & using interfaces), unicast Discovery, Multicast Discovery & advertisement, service catalogs, Garbage Collection, Eventing, security. Universal Plug and Play, Jini, Salutation. **Lectures Req :8**
IV	**Pervasive computing**	Pervasive computing: Pervasive computing: puting: Introduction, Principles–Decentralization, Diversification, Connectivity, Simplicity, Pervasive Information Technology, Mobile Devices – Classification, Characteristics, Limitations, Smart Identification – Smart Card, Smart Label, Smart Tokens, Smart Sensors and Actuators, Smart Home. **Lectures Req :8**
V	**Mobile Application Languages Mobile Operating Systems**	Mobile Application Languages-XML, Java, J2ME, and Java Card Introduction XML JAVA Java 2 Micro Edition(J2ME) Java Card. Mobile Operating Systems Operating SystemPalm OSWindows CESymbian OSLinux for Mobile Devices. **Lectures Req :6**

Total Lectures Req :37

Reference Books :
1.Mobile Computing by Raj Kamal
2. Mobile communications JochenSchiller , Pearson
3. Frank Adelstein, Sandeep Gupta, Golden Richard III, Loren Schwiebert, Fundamentals of Mobile and Pervasive Computing, TMH.
4. Principles of mobile computing Hansmann&Merk., Springer
5. 802.11 wireless networks Matthew S.Gast, O'REILLY.

BCS803-ADVANCED COMPUTER TECHNOLOGY (8CS3)

Teaching Hrs. **Exam Hrs. - 3**
L-3 T-1 P-0 **Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**Introduction:**	Parallel Computing, Parallel Computer Model, Program and Network Properties, Parallel Architectural Classification Schemes, Flynn's & Feng's Classification, Performance Metrics and Measures, Speedup Performance Laws: Multiprocessor System and Interconnection Networks. **Lectures Req: 7**
II	**Pipelining And Memory Hierarchy:**	Basic and Intermediate Concepts ,Instruction Set Principle; ILP: Basics, Exploiting ILP, Limits on ILP; Linear and Nonlinear Pipeline Processors; Super Scalar and Super Pipeline Design; Memory Hierarchy Design: Advanced Optimization of Cache Performance, Memory Technology and Optimization ,Cache Coherence and Synchronization Mechanisms. **Lectures Req: 8**
III	**Thread And Process Level Parallel Architecture:**	Introduction to MIMD Architecture, Multithreaded Architectures, Distributed Memory MIMD Architectures, Shared Memory MIMD Architecture, Clustering, Instruction Level Data Parallel Architecture, SIMD Architecture, Fine Grained and Coarse Grained SIMD Architecture, Vector Architectures **Lectures Req: 7**
IV	**Open Source Technology Overview**	Evolution & development of OST and contemporary technologies, Factors leading to its growth. Open Source Initiative (OSI), Free Software Foundation and the GNU Project, principle and methodologies. Contexts of OST (India & international). Risk Factors. Myths regarding open source. **Lectures Req: 8**
V	**Features Of Open Source**	Licenses and Patents: What Is A License, How to create your own Licenses? Important FOSS Licenses (Apache,BSD, GPL, LGPL), copyrights and copy lefts,

	Technology	Patents, Starting and Maintaining an Open Source Project, Open Source Hardware, Open Source Design, Economics of FOSS: Zero Marginal Cost. **Lectures Req: 8**

Total Lecture Req.:38

Reference Books :

1. **Hawang & Briggs : Computer Architecture & Parallel Processing, TMH**
2. **R.K. Somani & Stuti Saxena : Open Source Technology, CBC**

BCS804.1-DISTRIBUTED SYSTEMS (8CS4.1)

Teaching Hrs. L-3 T-0 P-0 — **Exam Hrs.-3 Marks Theory Exam.-80 Term Test-20 Total 100**

Units	Topics	CONTENT OF SYLLABUS
I	**Characterization Of Distributed Systems:**	Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. System Models: Architectural models, Fundamental Models TheoreticalFoundation for Distributed System: Limitation of Distributed system, absence of global clock,,Logical clocks, Lamport's & vectors logical clocks, Causal ordering of messages, global state, termination. 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. **Lectures Req : 9**
II	**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. 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. **Lectures Req : 10**
III	**Distributed Objects And Remote Invocation**:	Communication between distributed objects, Remote procedure call, Events and notifications, Java RMI case study. CORBA CASE STUDY: CORBA RMI, CORBA services.SECURITY: Overview of security techniques, Cryptographic algorithms, Digital signatures Cryptography pragmatics, Case studies: Needham Schroeder, Kerberos, SSL & Millicent. **Lectures Req : 9**
IV	**Transactions And Concurrency Control**:	Transactions, Nested transactions, Locks, OptimisticConcurrency control, Timestamp ordering, Comparison of methods for concurrency control. DISTRIBUTEDTRANSACTIONS: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control indistributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and groupcommunication, Fault - tolerant services, highly available services, Transactions with replicated data. **Lectures Req : 9**
V	**Distributed-Shared Memory:**	Introduction to distributed-shared Memory (DSM)-message passing versus DSM, Implementation approaches to DSM. Design and implementation issues-structure and synchronization model**.** **Lectures Req : 6**

Total Lectures Req : 43

Reference Books:

1. **George Coulouris-Distributed Systems Concepts and Design, 3rd ed., Pearson Education Asia.**
2. **A.S. Tanenbaum-Distributed Systems Principles and Paradigms,Prentice Hall of India.**
3. **Darrel Ince-Developing Distributed and E-Commerce Applications,Addition Wesley.**

BCS804.2-IMAGE PROCESSING (8CS4.2)

Teaching Hrs. L-3 T- 0 P-0 — **Exam Hrs.- 3 Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**Introduction and Fundamentals:**	Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization. Image Enhancement in Spatial Domain: Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing – Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian **Lectures Req : 9**
II	**Image Enhancement in Frequency Domain:**	Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Low pass Filters; Sharpening Frequency Domain Filters – Gaussian High pass Filters; Homomorphic Filtering. Image Restoration: A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Band pass Filters; Minimum Meansquare Error Restoration. **Lectures Req : 9**
III	**Color Image Processing:**	Color Fundamentals, Color Models, Converting Colors to different models, Color Transformation, Smoothing and Sharpening, Color Segmentation. Morphological Image Processing: Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening **Lectures Req : 9**
IV	**Registration:**	Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth. Segmentation: Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection **Lectures Req : 9**
V	**Feature Extraction:**	Representation, Topological Attributes, Geometric Attributes. Description: Boundary-based Description, Region-based Description, Relationship. Object Recognition: Deterministic Methods, Clustering, Statistical Classification, Syntactic Recognition, Tree Search, Graph Matching. **Lectures Req : 9**

Total Lectures Req :45

BCS804.3-NATURAL LANGUAGE PROCESSING (8CS4.3)

Teaching Hrs. **Exam Hrs.- 3**
L-3 T-0 P-0 **Marks Theory Exam- 80 Term Test-20 TOTAL-100**

Units	Topics	CONTENTS OF SYLLABUS
I	**Introduction To Nlp**	Introduction to Natural Language Understanding: The study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English syntax.

		Lectures Req : 9
II	**Semantics**	Introduction to semantics and knowledge representation, Some applications like machine translation, database interface **Lectures Req : 6**
III	**Parsing**	Grammars and Parsing: Grammars and sentence Structure, Top-Down and Bottom-Up Parsers, Transition Network Grammars, Top-Down Chart Parsing. Feature Systems and Augmented Grammars: Basic Feature system for English, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks. **Lectures Req : 8**
IV	**Grammers**	Grammars for Natural Language: Auxiliary Verbs and Verb Phrases, Movement Phenomenon in Language, Handling questions in Context-Free Grammars. Human preferences in Parsing, Encoding uncertainty, Deterministic Parser **Lectures Req : 8**
V	**Ambiguity Resolution**	Ambiguity Resolution: Statistical Methods, Probabilistic Language Processing, Estimating Probabilities, Part-of- Speech tagging, Obtaining Lexical Probabilities, Probabilistic Context-Free Grammars, Best First Parsing. Semantics and Logical Form, Word senses and Ambiguity, Encoding Ambiguity in Logical Form **Lectures Req : 10**

Total Lectures Req : 41

BCS805-INFORMATION SYSTEM AND SECURITIES LAB (8CS5)

List of Projects are as follows (Implement any one)

1. Shopping cart project using ADO.NET: This sample project has all basic features required for a shopping cart web site including Login, Registration, Add to Cart, Checkout etc. A good ASP.NET learning project using C#, ASP.NET, SQL Server.
2. Personal Assistant: This is a small project for managing personal details. Current version of this project support Address Book feature - Add, Edit and Manage contacts and addresses using VB.NET.
3. Address Book: This is a small project for managing contact details. This is a C# version of the 'Personal Assistant' project.
4. School Management System: This is a project for managing education institutes using C#.
5. Library Management System: This is an academic project for students using Java.
6. spider Alerts & Web services: This project communicates with web services and downloads Alerts from the web server using Java & XML.
7. Patient Information System: This software can be used to keep track of the patients' information and treatment details in a hospital or clinic. Some of the advanced features include patient consulting, lab information, billing etc using JSP, Servlet & JDBC.
8. Web based Address Book: This application can be used to keep track of your contacts/addresses. N Tier architecture is used to separate data layer, business layer and UI layers.

BCS806-Artificial Intelligence System Lab (8CS6)

1. Turbo Prolog features and format.
2. Write a program using variables in prolog.

3. Write a program for usage of rules in prolog.
4. Write a program for using Input, Output and fail predicates in prolog.
5. Write program for studying Usage of Arithmetic operators in prolog.
6. Write program to study usage of Cut, Not, Fail predicates in prolog.
7. Write program to study usage of Recursion in prolog.
8. Write programs to study usage of Logical, Arithmetic ,String operators in Prolog.
9. Write a program for studying usage of Compound Object and List in prolog.
10. Write a program for studying usage of Dynamic Database in prolog
11. Write a program to implement DFS.
12. Write a program to implement BFS.
13. Write a program to implement Traveling Salesman Problem.
14. Write a program to implement Simulated Annealing Algorithm.
15. Write a program to implement 8 puzzle problem.
16. Write a program to implement Tower of Hanoi problem.
17. Write a program to implement A* Algorithm.
18. Write a program to implement Hill Climbing Algorithm

BCS807-ADVANCE WEB LAB (8CS7)

1. Introduction to Php, creating & uploading scripting.
2. Make a registration page in Php.
3. Apply java script validation on this registration page.
4. Insert registration information in the database table using insert query & Registration page.
5. Create a Home page & fit the registration page on this newly created page.
6. Create a member login page, which will be open when user get successfully login. Maintain session states.
7. Perform edit profile operation using update query.

M. Tech SEMESTER

MCS201-ADVANCED DATA STRUCTURES (2MCS01)

Teaching Hrs. **Exam Hrs.- 3**
L-4 T-2 **TOTAL-100 Marks**

Advanced data structures: self-adjustment, persistence and multidimensional trees.
Randomized algorithms: Use of probabilistic inequalities in analysis & applications.
Geometric algorithms: Point location, convex hulls and Voronoi diagrams, Arrangements.
Graph algorithms: Matching and Flows.
Approximation algorithms: Use of Linear programming and primal dual, local search heuristics.
Parallel algorithms: Basic techniques for sorting, searching,merging, list ranking in PRAMs and Interconnection networks.

Suggested reference materials:

1. Cormen, Leiserson, Rivest, Stein “Intoduction to Algorithms”, McGraw Hill.
2. Michael T. Goodrich, Roberto Tamassia, Algorithm Design, Wiley Student Edition
3. Motwani and Raghavan "Randomized Algorithms", Cambridge University Press
4. Aho, Hopcraft, Ullman, “The Design and Analysis of Computer Algorithms”, Addison Wesley
5. Horowitz, Sahni, “Fundamentals of Computer Algorithm”, Galgotia

Mehlhorn "Data Structures and Algorithms: 1, Searching and Sorting", Springer

MCS203–INFORMATION PROTECTION AND COMPUTER SECURITY (2MCS03)

Teaching Hrs. **Exam Hrs.- 3**
L-4 T-2 **TOTAL-100 Marks**
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Introduction:-Introductions: Basic objectives of cryptography, secret-key and public-key cryptograph, one way and trapdoor one-way functions, cryptanalysis, attack models, classical cryptography.

Block ciphers and Stream ciphers: -Block ciphers: Modes of operation, DFS and its variants, RCS, IDEA, SAFER, FEAL, Blowfish, AES, liner and differential cryptanalysis.
Stream ciphers: Stream ciphers based on liner feedback shift registers, SEAL, unconditional security.

Public- key parameters and Intractable problems:--Public- key parameters: Modular arithmetic, god, primality testing, Chinese remainder theorem, modular square roots, finite fields.

Intractable problems: Integer factorization problem, RSA problem, modular square root problem, discrete logarithm problem, Diffie- Hellman problem, known algorithms for solving the intractable problems.

Public-key encryption and Key exchange :-Public-key encryption: RSA, Rabin and EIGamal schemes, side channel attacks.Key exchange: Diffie-Hellman and MQV algorithms.

Digital signatures and Entity authentication-Digital signatures: RSA, DAD and NR signature schemes, blind and undeniable signatures.

Entity authentication: Passwords, challenge-response algorithms, zero-knowledge protocols.

Suggested reference materials:

1. **Cryptography & Network Security, William Stallings**
2. **Data Communications & Network Atul Kahate**
3. **Cryptography & Network Security 2E Forouzan**

IX SEMESTER

MCS301–FAULT TOLERANT COMPUTING (3MCS01)

Teaching Hrs. **Exam Hrs.- 3**

L-4 T-2 **TOTAL-100 Marks**

Dependability concepts: Dependable system, techniques for achieving dependability, dependability measure, fault, error, failure, and classification of faults and failures.

Fault Tolerance Strategies: Fault detection, masking, containment, location, reconfiguration, and recovery.

Fault Tolerant Design Techniques: Hardware redundancy, software redundancy, time redundancy, and information redundancy.

Dependable communication: Dependable channels, survivable networks, fault-tolerant routing. Fault recovery, Stable storage and RAID architectures, and Data replication and resiliency.

Tolerance in Distributed System: Byzantine General Problem, consensus protocols, check pointing .**Fault Tolerance interconnection networks:** Analysis of fault tolerant hardware and software architectures. Case studies of fault tolerant multiprocessor and distributed systems

Suggested reference materials:

1. Israel Koren, C. Mani. Krishna, Fault Tolerant Systems, Elsevier.
2. P. Jalote, "Fault Tolerance in Distributed Systems" Prentice-Hall Inc. 1994,
3. D. K. Pradhan ",Fault-Tolerant Computing, Theory and Techniques", Prentice-Hall, 1998,
4. Los Alamitos, CA, "Fault-Tolerant Computing, Theory and Techniques and application", IEEE Computer Society Press.

MCS 302. DESIGN OF EMBEDDED SYSTEMS (3E03)

Teaching Hrs. **Exam Hrs.- 3**
L-4 T-2 **TOTAL-100 Marks**

Embedded Computing Requirements: Characteristics and applications of embedded systems; Components of Embedded Systems; challenges in Embedded System Design and design process; Formalism for system design.
Embedded Processors: RISC vs. CISC architectures; ARM processor – processor architecture and memory organization, instruction set, data operations and flow control; SHARC processor – memory organization, data operations and flow control, parallelism within instructions; Input and output devices, supervisor mode, exception and traps; Memory system, pipelining and superscalar execution.
Embedded Computing Platform: CPU Bus – Bus protocols, DMA, system bus configurations, ARM bus; Timers and counters, A/D and D/A converters, Keyboards, LEDs, displays and touch screens; Design examples.
Embedded Software Analysis and Design: Software design pattern for Embedded Systems; Model programs – data flow graphs and control/data flow graphs; Assembly and linking; Compilation techniques; Analysis and optimization of execution time, energy, power and program size.
Embedded System Accelerators: Processor accelerators, accelerated system design.

Suggested reference materials:
1. Computer as Components by Wayne Wolf published by Elsevier Inc
2. ARM System Developer's Guide by Andrew S. Loss published by Elsevier Inc
3. Embedded System Design by Steve Heath published by Elsevier Inc
4. Embedded System design: A unified hardware/software Introduction by Frank Vahid & Tony Givagi published by John Wiley & Sons Inc

X SEMESTER

- **Dissertation**