COIMBATORE INSTITUTE OF TECHNOLOGY, COIMBATORE
(Govt.aided Autonomous Institution, Affiliated to Anna University, Chennai)
Coimbatore-641014, TAMIL NADU, INDIA
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

MSME-MICRO, SMALL & MEDIUM ENTERPRISES
THREE DAYS VIRTUAL TRAINING
(10th, 11th & 12th January 2022)

To A/c
Rajm 6/1/2022

DRONE TECHNOLOGY AND ITS APPLICATIONS

Date: 06.01.2022

SUBMITTED TO PRINCIPAL

PROGRAMME FINANCE PLAN

S.No	ITEM	CHARGE	TOTAL AMOUNT
1.	Actual Programme Fees for online mode	Rs.2360.00/ student	-
2.	Total number of students attending the programme	60	
3.	Student offer 50%	Rs.1180.00/student	Rs.70,800.00
4.	Institution Contribution(ECE Association)	Rs.590.00/student	Rs.35,400.00
5.	Student self-contribution	Rs.590.00/student	Rs.35,400.00

The approval and permission letter for the same are included, and payment can be made using NEFT, with instructions attached. We would like to request your permission to make an Institution contribution (ECE Association) of Rs.35,400.00 for MSME to ensure the program's success.

Rajm

Head of the Department

Dr.A.Rajeswari

COIMBATORE INSTITUTE OF TECHNOLOGY, COIMBATORE

(Govt.aided Autonomous Institution, Affiliated to Anna University, Chennai)

Coimbatore-641014, TAMIL NADU, INDIA

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

MSME-MICRO, SMALL & MEDIUM ENTERPRISES

THREE DAYS VIRTUAL TRAINING
(10th, 11th & 12th January 2022)

DRONE TECHNOLOGY AND ITS APPLICATIONS

Date: 06.01.2022

SUBMITTED TO PRINCIPAL

The attached list of 64 students is willing to attend MSME's three-day certified Six Sigma Yellow Belt training as part of the C2C scheme, which is in collaboration with our institute. The actual charge for the programme is Rs.1180.00, which the student must pay. We respectfully request that you grant the students permission to attend the programme with a 50% discount from our department's association fund.

Head of the Department

Dr.A.Rajeswari

COIMBATORE INSTITUTE OF TECHNOLOGY, COIMBATORE
(Govt.aided Autonomous Institution, Affiliated to Anna University, Chennai)
Coimbatore-641014, TAMIL NADU, INDIA
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Academic Year 2021-2022
II Year Section- I
Students List

S.NO	Register No	Name	Mail id	Mobile
1	20 04 001	AMEER HARRIS N	2004001ece@cit.edu.in	9363399821
2	20 04 002	ANAND MAHADEVAN.R	2004002ece@cit.edu.in	8667217617
3	20 04 004	ASHISH BUMB. G	2004004ece@cit.edu.in	8838515060
4	20 04 005	AVINSAHI KUMAR GIRI	2004005ece@cit.edu.in	9933278734
5	20 04 006	DEEPAK.G	2004006ece@cit.edu.in	9176803725
6	20 04 007	DINESH K	2004007ece@cit.edu.in	9488462860
7	20 04 008	GEETHALOSHINI D	2004008ece@cit.edu.in	6383982500
8	20 04 009	GOKUL .T	2004009ece@cit.edu.in	8667223194
9	20 04 010	HARINI M S	2004010ece@cit.edu.in	9791598518
10	20 04 011	HARISH M	2004011ece@cit.edu.in	9791643717
11	20 04 012	HEMESHWARDURAI.S.B.	2004012ece@cit.edu.in	8870203590
12	20 04 013	ILAKKIYA S	2004013ece@cit.edu.in	7708549518
13	20 04 014	JAYA HARRISH.M	2004014ece@cit.edu.in	9345314634
14	20 04 015	JOTHIESWARAN N	2004015ece@cit.edu.in	9487605230
15	20 04 016	KAVIYA S	2004016ece@cit.edu.in	8056988268
16	20 04 017	KEERTHIKA G	2004017ece@cit.edu.in	9384435831
17	20 04 018	KESAV.M.	2004018ece@cit.edu.in	9487961383
18	20 04 019	KESAVAA M K	2004019ece@cit.edu.in	8072060531
19	20 04 020	MIRDHURA K	2004020ece@cit.edu.in	9790470130
20	20 04 021	MOHAMMED SIDDIQUE A	2004021ece@cit.edu.in	8056659222
21	20 04 022	MOHANAPRIYA M	2004022ece@cit.edu.in	6374042852
22	20 04 023	MOHIT.M.K.	2004023ece@cit.edu.in	8610051050
23	20 04 024	MURALIKRISHNAN.S	2004024ece@cit.edu.in	9486756497
24	20 04 025	NITHINKUMAR.G.R	2004025ece@cit.edu.in	7358821377
25	20 04 026	PRADEEP KUMAR P	2004026ece@cit.edu.in	7708728585
26	20 04 027	PRIYARANJAN.U.S.	2004027ece@cit.edu.in	9500419948
27	20 04 028	ROHAN.R.	2004028ece@cit.edu.in	9474266777
28	20 04 029	ROHITH A	2004029ece@cit.edu.in	7812869811

1/11/2022

29	20 04 030	SANMATHI B	2004030ece@cit.edu.in	9488066399
30	20 04 031	SARAVANA PRASATH S	2004031ece@cit.edu.in	8300522157
31	20 04 032	SHREE PRAGATHEESH.G.	2004032ece@cit.edu.in	9444723279
32	20 04 033	SHRI RAM KARTHIC V	2004033ece@cit.edu.in	9994684996
33	20 04 035	SHUBHASHREE M	2004035ece@cit.edu.in	9385505289
34	20 04 036	SRUTHI.K	2004036ece@cit.edu.in	8903435121
35	20 04 037	SUGANITHISH.P.V.	2004037ece@cit.edu.in	6383906326
36	20 04 038	SUJITHA E	2004038ece@cit.edu.in	6380354347
37	20 04 039	SWETHA.R	2004039ece@cit.edu.in	9894190522
38	20 04 041	UDHAYAKUMAR.M	2004041ece@cit.edu.in	8870859696
39	20 04 042	VARSHA.R.	2004042ece@cit.edu.in	6379971251
40	20 04 043	VARSHINI S	2004043ece@cit.edu.in	8778340488
41	20 04 044	VETRIVEL .G	2004044ece@cit.edu.in	8072051519
42	20 04 045	VIGNESHWARAN M	2004045ece@cit.edu.in	8870889536
43	20 04 046	VIJAYKUMAR S	2004046ece@cit.edu.in	7604870841
44	20 04 047	VISHVA.M	2004047ece@cit.edu.in	7708505606
45	20 04 048	VISVAA R S	2004048ece@cit.edu.in	9487115807
46	20 04 049	VISWESWARA. S. M	2004049ece@cit.edu.in	6379086218
47	20 04 050	YUVAMITHUN.M.	2004050ece@cit.edu.in	9025889090
48	7176 21 04 201	ABDULKHADHAR A	71762104201@cit.edu.in	9597324552
49	7176 21 04 202	AJAY V	71762104202@cit.edu.in	7868945796
50	7176 21 04 203	AJITH KUMAR A	71762104203@cit.edu.in	9344131450
51	7176 21 04 204	ALAGAR S THARUN	71762104204@cit.edu.in	7200080556
52	7176 21 04 205	ATHIHARIKISHORE A	71762104205@cit.edu.in	8681891109
53	7176 21 04 206	DHAMODHARAN S	71762104206@cit.edu.in	9361499647
54	7176 21 04 207	DHANYA.C	71762104207@cit.edu.in	9600824853
55	7176 21 04 208	DHAYALAN R	71762104208@cit.edu.in	6385366621
56	7176 21 04 209	ESWAR V	71762104209@cit.edu.in	7397187945
57	7176 21 04 210	HARI PRAKASH P	71762104210@cit.edu.in	9344085551
58	7176 21 04 211	HARIBASKAR R	71762104211@cit.edu.in	6385881652
59	7176 21 04 212	LOGESH R	71762104212@cit.edu.in	8072235557
60	7176 21 04 213	MEGHESWARA S.M	71762104213@cit.edu.in	8508234440

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MSME-MICRO, SMALL & MEDIUM ENTERPRISES
THREE DAYS VIRTUAL TRAINING
(1st, 2rd & 4th April 2022)

DRONE DESIGN AND DEVELOPMENT

Date: 17.03.2022

SUBMITTED TO PRINCIPAL

PROGRAMME FINANCE PLAN

S.No	ITEM	CHARGE	TOTAL AMOUNT
1.	Actual Programme Fees for online mode	Rs.2360.00/ student	-
2.	Total number of students attending the programme	61	
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Coimbatore-641014, TAMIL NADU, INDIA
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Academic Year 2021-2022
II Year Section- II
Students List

S.NO	Register No	Name	Mail id	Mobile
1	2004051	A.C.AASHICA	2004051ece@cit.edu.in	9498000213
2	2004052	R ABBIJEET	2004052ece@cit.edu.in	7904917235
3	2004053	M ABDULLA IBAK	2004053ece@cit.edu.in	9042104278
4	2004054	R ADHAVAN	2004054ece@cit.edu.in	7010689684
5	2004055	ADITYA POONIA	2004055ece@cit.edu.in	8900925200
6	2004056	AISHWARYA.N	2004056ece@cit.edu.in	7708953335
7	2004057	AJEEBHA SHALIHAL M	2004057ece@cit.edu.in	6385223213
8	2004058	ARVINDH S	2004058ece@cit.edu.in	9025008820
9	2004060	CHINMAYA MAHADEV M N	2004060ece@cit.edu.in	7397627157
10	2004061	DEVADHARSENI S	2004061ece@cit.edu.in	8778789699
11	2004062	DHAMODHARAN P.D	2004062ece@cit.edu.in	6381911608
12	2004063	A DHIRANESH	2004063ece@cit.edu.in	9566370730
13	2004064	DHIVYA SRIMATHI.K	2004064ece@cit.edu.in	9786338845
14	2004065	GUKAN TK	2004065ece@cit.edu.in	8248367403
15	2004066	HARIPRAKASH S R	2004066ece@cit.edu.in	9655066133
16	2004067	LAKSHMANAN N	2004067ece@cit.edu.in	8300215753
17	2004068	S M LOGESH RAJ	2004068ece@cit.edu.in	8778948044
18	2004069	LOHIT M	2004069ece@cit.edu.in	9361033401
19	2004070	MAITHREYE S R	2004070ece@cit.edu.in	9600733428
20	2004071	MEENA PRIYADHARSINI.V	2004071ece@cit.edu.in	9025036822
21	2004072	K.MEERA KRISHNAN	2004072ece@cit.edu.in	6374738729
22	2004074	NARESH GAUTAM S	2004074ece@cit.edu.in	7339507422
23	2004075	NAVEEN KUMAR R	2004075ece@cit.edu.in	7708962363
24	2004076	NEERAJA. S	2004076ece@cit.edu.in	9025739569
25	2004077	PAVITHRA P	2004077ece@cit.edu.in	6379484676
26	2004078	PRASATH.D	2004078ece@cit.edu.in	8526311036
27	2004079	P PRATHEEK	2004079ece@cit.edu.in	8778590184

28	2004080	PREETHI.R	2004080ece@cit.edu.in	7558187447
29	2004081	RAHUL.M	2004081ece@cit.edu.in	9600226451
30	2004082	RAJADURAI	2004082ece@cit.edu.in	6382660575
31	2004083	RAJESH S	2004083ece@cit.edu.in	9150720497
32	2004084	N ROGITH	2004084ece@cit.edu.in	9442369537
33	2004085	ROHITH P	2004085ece@cit.edu.in	9385372950
34	2004086	SHIVANANTH A	2004086ece@cit.edu.in	7339661798
35	2004087	SHREYAA VISWANATHAN	2004087ece@cit.edu.in	9361159653
36	2004088	SHRUTHILAYA S	2004088ece@cit.edu.in	9629551221
37	2004089	SUGAN C	2004089ece@cit.edu.in	6382759431
38	2004090	SUGENDHIRAN K	2004090ece@cit.edu.in	8754276403
39	2004091	SUJAN S K	2004091ece@cit.edu.in	9843272727
40	2004092	SURUTHIKA S	2004092ece@cit.edu.in	6369110040
41	2004093	S SWETHA	2004093ece@cit.edu.in	6381145375
42	2004095	S.THARUN	2004095ece@cit.edu.i5	6305380365
43	2004096	TIRAVID.M	2004096ece@cit.edu.in	8248430478
44	2004097	VAMSI KRISHNA D	2004097ece@cit.edu.in	9487260978
45	2004098	VIGNESH K S	2004098ece@cit.edu.in	9842906716
46	2004099	VINESH S R	2004099ece@cit.edu.in	7339694002
47	2004100	VISHNU P G	2004100ece@cit.edu.in	6383023729
48	71762104214	MUBARAK HUSSAIN S	71762104214@cit.edu.in	9384344103
49	71762104215	MUNILAKSHMI. T	71762104215@cit.edu.in	9789591704
50	71762104216	RADHIKALA R	71762104216@cit.edu.in	9442658404
51	71762104217	RAGAVENDIRA.J.B	71762104217@cit.edu.in	8248879323
52	71762104218	SAKTHI JANANI A A	71762104218@cit.edu.in	8072416355
53	71762104219	SANTHOSH S	71762104219@cit.edu.in	9344630838
54	71762104220	SHANKAR T.M	71762104220@cit.edu.in	9360066057
55	71762104221	SRI REVANTH P	71762104221@cit.edu.in	9344493031
56	71762104222	SRIDHAR T	71762104222@cit.edu.in	9080367628
57	71762104223	TAMIL SELVAN S	71762104223@cit.edu.in	8523968600
58	71762104224	THIRUPPATHI C	71762104224@cit.edu.in	9843698944
59	71762104225	VIGNESHWARAN.G.	71762104225@cit.edu.in	6369668643
60	71762104226	MAHENDRA BOOPATHI S	71762104226@cit.edu.in	6379976361
61	71762104227	NANDHAKUMAR	71762104227@cit.edu.in	9566700263

PLACEMENT AND TRAINING CELL

COIMBATORE INSTITUTE OF TECHNOLOGY

COIMBATORE-641014, TAMILNADU, INDIA.

Phone : +91-422-2575020
Fax : +91-422-2575020

Email : placement@cit.edu.in
Website: www.cit.edu.in

Date: 11.08.2022

CIRCULAR

Placement training (Aptitude skills) for the first year BE CSE, B.Tech IT & B.Tech AI & DS (second semester) students has been scheduled from 25/08/2022- 27/08/2022 (three days – 18 hours) through offline mode,,

The Placement training program is mandatory for all the students. The Department Placement faculty coordinators are requested to instruct the students at attend without fail. Attendance must be updated in the UMS portal for all the three days by the respective faculty.

Principal

COIMBATORE INSTITUTE OF TECHNOLOGY

(Government Aided Autonomous Institution)
(Affiliated to Anna University, Chennai & Approved by AICTE, New Delhi)
Established in 1956, A unit of V. Rangasamy Naidu Educational Trust
CIVIL AERODROME POST, COIMBATORE - 641 014, TAMILNADU, INDIA

CORRESPONDENT
Thiru S. RAJIV RANGASAMI M.Sc., MBA (USA)

PRINCIPAL IN-CHARGE
Dr. A. RAJESWARI M.E., Ph.D.,

CIRCULAR **Date: 24.03.2022**

As a part of Placement Training AY 2022 for our Third Year BE/B.Tech and M.Sc students, it is planned to conduct ~~an~~ placement training program as per the following Schedule:

Date	Department	Section	Total number of students	FN Session 9.30am-12.30 pm	Afternoon session 1.30pm-4.30pm
28.03.2022 – 02.04.2022 (Phase I = 6 days)	CSE	I	65	Aptitude	Technical
	CSE	II	65	Aptitude	Technical
	B.Tech IT	I	65	Aptitude	Technical
	M.SS	I	59	Aptitude	Technical
	M.DCS	I	56	Technical	Aptitude
	M.DS	I	60	Technical	Aptitude
	ECE	I	65	Technical	Aptitude
	ECE	II	64	Technical	Aptitude

All the Department Placement Coordinators are requested to make all arrangements in the Department laboratories to conduct the Technical part of the training program and Aptitude in the respective class room and instruct the students to attend the placement training program compulsorily.

The Department Placement coordinators are requested to post the placement training attendance in the UMS portal.

Placement Training Coordinator

Principal I/C

Copy To:

All Head of the Departments

Tel : 0422 - 2574071, 2574072,
Fax : 0422 - 2573187 www.cit.edu.in

From
Dr.M.Poongothai
Department Placement Coordinator
Department of ECE
Coimbatore Institute of Technology
Coimbatore-641014

To placement Training

Through
The HoD
Department of ECE
Coimbatore Institute of Technology
Coimbatore-641014

11/3/22

To
The Principal
Coimbatore Institute of Technology
Coimbatore-641014

Respected Mam

Sub: Request for sanction of funds for training program on Quantitative Aptitude for Engineers/ Verbal Aptitude for Engineers for second year ECE students -Reg.

We have planned to conduct Quantitative and verbal Aptitude training program for second year ECE students from 15th to 17th March 2022 through Byts services India Ltd. The total amount for the three days training program is (Rs 500/- x 121 students) is Rs 71,390.00. We request you to kindly sanction the fund required for conducting this program.

Thanking you

Yours sincerely

PoongDP

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Established in 1956, A unit of V. Rangasamy Naidu Educational Trust
CIVIL AERODROME POST, COIMBATORE - 641 014, TAMILNADU, INDIA

CORRESPONDENT
Thiru S. RAJIV RANGASAMI M.Sc., MBA (USA)

PRINCIPAL
Dr. A. RAJESWARI M.E., Ph.D.,

25.10.2022

CIRCULAR - 3

Coimbatore Institute of Technology is delighted to welcome the first year B.E/B.Tech students for the academic year 2022-23. CIT is conducting a two week Student Induction Program (SIP) from 26th October 2022 to 08th November 2022. The Induction Program starts with an Orientation Program on the first day (26.10.2022).

The following faculty members are assigned duty as per the first year time table for smooth conduction of the programme.

DEAN STUDENT AFFAIRS

PRINCIPAL

Tel : 0422 - 2574071, 2574072,
Fax : 0422 - 2573187 www.cit.edu.in

COIMBATORE INSTITUTE OF TECHNOLOGY

(Government Aided Autonomous Institution Affiliated to Anna University, Chennai)

COIMBATORE - 641 014, TAMILNADU, INDIA

DIAMOND JUBILEE

(1956 - 2016)

DEPARTMENT OF COMPUTING

M.Sc. (DECISION AND COMPUTING SCIENCES)

Curriculum and Syllabi

Under Choice Based Credit System

(For the students admitted during 2017 - 2018 and onwards)

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COIMBATORE INSTITUTE OF TECHNOLOGY

(Government Aided Autonomous Institution Affiliated to Anna University, Chennai)

VISION AND MISSION OF THE INSTITUTE

VISION

The Institute strives to "inculcate a sound knowledge in engineering along with realized social responsibilities to enable its students to combat the current and impending challenges faced by our country and to extend their expertise to the global arena".

MISSION

The mission of CIT is to "impart high quality education and training to its students to make them world - class engineers with a foresight to the changes and problems, and pioneers to offer innovative solutions to benefit the nation and the world at large".

DEPARTMENT OF COMPUTING
COIMBATORE INSTITUTE OF TECHNOLOGY

VISION AND MISSION OF DEPARTMENT OF COMPUTING

VISION

Department of Computing endeavors to make the students, world class software engineers, data scientists and decision makers with prudence of pioneering the solutions to the challenges of the nation and the world.

MISSION

The Mission of Department of Computing is

M1 : To impart sound conceptual knowledge along with intensive practical training and real time industry/ research project exposure to the students.

M2 : To provide a learning ambience to enhance innovations, problem solving skills, leadership qualities, team-spirit and ethical responsibilities.

M3 : To establish Industry Institute Interaction program to provide exposure of latest tools and technologies used in the IT organizations and enhance the entrepreneurship skills.

COIMBATORE INSTITUTE OF TECHNOLOGY

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DEPARTMENT OF COMPUTING

M.Sc. DECISION AND COMPUTING SCIENCES

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1 **Expertise in Decision Making :** Evolve as decision scientists with an in-depth knowledge of multiple business domains across all functional areas.

PEO2 **Expertise in Software Development :** Be competent to develop software products by strategic blending of computing technology and management expertise that facilitate informed decision making.

PEO3 **Leadership and Lifelong Learning :** Demonstrate leadership qualities through acquisition of intrapreneurship and entrepreneurship traits and engage in active contribution to society through innovative solutions of global impact.

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DEPARTMENT OF COMPUTING

M.Sc. DECISION AND COMPUTING SCIENCES

PROGRAMME OUTCOMES

PO1 : Apply mathematical and statistical modelling for analysis of business problems that aid management to make data driven decisions.

PO2 : Perform quantitative and qualitative data analytics in functional areas of business like marketing, human resource management, finance, etc.

PO3 : Visualize and infer meaningful insights to facilitate strategic and operational decisions.

PO4 : Apply foundations of business management blended with computing science to address issues in decision-making.

PO5 : Develop smart enterprise applications applying software engineering principles and business domain knowledge.

PO6 : Design and develop software products and services for strategic decision making, business analytics and intelligence.

PO7 : Align and utilize information technology infrastructure, analytics and decision-making skills effectively to realize the organization's goals.

PO8 : Contribute and collaborate effectively in any role in multi-disciplinary teams.

PO9 : Recognize professional, social and ethical values imbibed in the business and technical environments.

PO10 : Engage in lifelong learning to be empowered with management expertise and by structured adoption of technological advancements.

PO11 : Aspire to be an intrapreneur/entrepreneur by transforming the idea into successful business venture with due consideration to financial, technical and management aspects.

COIMBATORE INSTITUTE OF TECHNOLOGY

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DEPARTMENT OF COMPUTING

M.Sc. DECISION AND COMPUTING SCIENCES

Curriculum from the Academic Year 2017 - 2018 onwards

Semester I

Course Code	Course Name	L	T	P	C	Category
	THEORY					
17MDC11	Technical English	3	0	0	3	HS
17MDC12	Applied Algebra and Calculus	3	2	0	4	BS
17MDC13	Basic Statistical Methods	3	2	0	4	BS
17MDC14	Human Behavior	3	0	0	3	PC
17MDC15	Programming in C	3	0	0	3	PC
	PRACTICALS					
17MDC16	Computing Laboratory I (Algebra, Calculus and Statistics in SciLab and Excel)	0	0	4	2	PC
17MDC17	Programming Laboratory in C	0	0	4	2	PC
17MDC18	English Language Laboratory	0	0	2	1	EEC / HS
	Total Credits				**22**	

Semester II

Course Code	Course Name	L	T	P	C	Category
	THEORY					
	Language Elective	3	0	0	3	HS
17MDC21	Probability and Applications	3	2	0	4	BS
17MDC22	Principles of Management	4	0	0	4	PC
17MDC23	Web Technology	3	0	0	3	PC
17MDC24	Data Structures and Algorithms	3	0	0	3	PC
	PRACTICALS					
17MDC25	Computing Laboratory II (Probability in Excel and SciLab)	0	0	4	2	PC
17MDC26	Web Technology Laboratory	0	0	4	2	PC
17MDC27	Data Structures Laboratory using Python	0	0	4	2	PC
	Total Credits				**23**	

Semester III

Course Code	Course Name	L	T	P	C	Category
	THEORY					
17MDC31	Applied Statistics for Business Decisions	3	2	0	4	BS
17MDC32	Financial Analysis and Reporting	4	0	0	4	PC
17MDC33	Computer Systems	3	0	0	3	PC
17MDC34	Database Management Systems	3	0	0	3	PC
17MDC35	Object Oriented Programming	3	0	0	3	PC
	PRACTICALS					
17MDC36	Business Statistics Laboratory using R	0	0	4	2	PC
17MDC37	Business Database Design Laboratory	0	0	4	2	PC
17MDC38	Object Oriented Programming Laboratory using Java	0	0	4	2	PC
	Total Credits				**23**	

Semester IV

Course Code	Course Name	L	T	P	C	Category
	THEORY					
17MDC41	Predictive Analytics	3	0	0	3	BS
17MDC42	Operations Research for Business	3	2	0	4	BS
17MDC43	Corporate Finance	3	0	0	3	PC
17MDC44	Production and Operations Management	3	0	0	3	PC
17MDC45	Computer Networks	3	0	0	3	PC
	PRACTICALS					
17MDC46	Predictive Analytics Laboratory	0	0	4	2	PC
17MDC47	Business Process Optimization Laboratory (OR & POM)	0	0	4	2	PC
17MDC48	Financial Analysis Laboratory (Spreadsheets and Python)	0	0	4	2	PC
17MDC49	Managerial Communication Skills*					EEC
	Total Credits				**22**	

Semester V

Course Code	Course Name	L	T	P	C	Category
	THEORY					
17MDC51	Organisational Behavior	3	0	0	3	PC
17MDC52	Digital Marketing	3	0	0	3	PC
17MDC53	Software Engineering	3	0	0	3	PC
17MDC54	Enterprise Resource Planning	3	0	0	3	PC
	Elective I	3	0	0	3	PE
	PRACTICALS					
17MDC55	Human Resources System Development Laboratory (Python,R studio)	0	0	4	2	PC
17MDC56	Digital Marketing Design Laboratory (R Studio, Visualisation, Graphical)	0	0	4	2	PC
17MDC57	Enterprise Application Development Laboratory (J2EE)	0	0	4	2	PC
17MDC58	Personality Development*					EEC
	Total Credits				**21**	

Semester VI

Course Code	Course Name	L	T	P	C	Category
	THEORY					
17MDC61	Economic Foundations of Business	3	0	0	3	PC
17MDC62	Computational Intelligence	3	0	0	3	PC
17MDC63	Mobile and Cloud Computing	3	0	0	3	PC
17MDC64	Data Warehousing and Mining	3	0	0	3	PC
	Elective - II	3	0	0	3	PE
	PRACTICALS					
17MDC65	Mobile and Cloud Application Development Laboratory	0	0	4	2	PC
17MDC66	Data Mining Laboratory	0	0	4	2	PC
	Elective Laboratory - I	0	0	4	2	EEC
	Total Credits				**21**	

Semester VII

Course Code	Course Name	L	T	P	C	Category
17MDC71	Project Work and Viva Voce-I	0	0	0	18	EEC
	Total Credits				**18**	

Semester VIII

Course Code	Course Name	L	T	P	C	Category
	THEORY					
17MDC81	Modeling and Simulation	3	0	0	3	PC
17MDC82	Decision Support Systems	3	0	0	3	PC
17MDC83	Game Theory and Decision Analysis	3	0	0	3	PC
	Elective - III	3	0	0	3	PE
	Elective - IV	3	0	0	3	PE
	PRACTICALS					
17MDC84	Business Intelligence Laboratory	0	0	4	2	PC
17MDC85	Decision Analysis Laboratory (Game Theory)	0	0	4	2	EEC
17MDC86	Entrepreneurship Development*					EEC
	Elective - Laboratory II	0	0	4	2	PC
	Total Credits				**21**	

Semester IX

Course Code	Course Name	L	T	P	C	Category
	THEORY					
17MDC91	Principles of Information Security	3	0	0	3	PC
17MDC92	Project Management	3	0	0	3	PC
17MDC93	Human Computer Interface and Interaction	3	0	0	3	PC
	Elective - V	3	0	0	3	PE
	Elective - VI	3	0	0	3	PE
	PRACTICALS					
17MDC94	Human Computer Interface and Interaction Laboratory	0	0	4	2	PC
17MDC95	Minor Project - Decision Tool Development	0	0	8	4	EEC
17MDC96	Business Ethics *					EEC
	Total Credits				**21**	

Semester X

Course Code	Course Name	L	T	P	C	Category
17MDC101	Project Work and Viva Voce- II	0	0	0	18	EEC
	Total Credits				**18**	
	Grand Total of Credits				**210**	

*Pass is required

PROFESSIONAL ELECTIVES - THEORY COURSES

Course Code	Course Name	L	T	P	C	Category
	MANAGEMENT STREAM					
	Finance					
17MDCE01	Security Analysis and Portfolio Management	3	0	0	3	PE
17MDCE02	Equity Valuation	3	0	0	3	PE
17MDCE03	Derivatives and Risk Management	3	0	0	3	PE
17MDCE04	Credit Risk Analytics and Management	3	0	0	3	PE
	Marketing					
17MDCE11	Consumer Behavior	3	0	0	3	PE
17MDCE12	Services Marketing	3	0	0	3	PE
17MDCE13	Customer Relationship Management	3	0	0	3	PE
17MDCE14	Brand Management	3	0	0	3	PE
	Human Resources					
17MDCE21	Strategic Human Resource Management	3	0	0	3	PE
17MDCE22	Organisational Development	3	0	0	3	PE
17MDCE23	Performance Management	3	0	0	3	PE
17MDCE24	Compensation Management	3	0	0	3	PE
	Operations & Logistics					
17MDCE31	Total Quality Management	3	0	0	3	PE
17MDCE32	Logistics Strategy and Planning	3	0	0	3	PE
17MDCE33	Supply Chain Management	3	0	0	3	PE
17MDCE34	Warehouse and Distribution Management	3	0	0	3	PE
	General Management					
17MDCE41	Business Environment	3	0	0	3	PE
17MDCE42	Legal Aspects of Business	3	0	0	3	PE
17MDCE43	Information Technology for Managers	3	0	0	3	PE
17MDCE44	Direct and Indirect Tax	3	0	0	3	PE
17MDCE45	Technology and Innovation Management	3	0	0	3	PE
17MDCE46	Business Process Management	3	0	0	3	PE
	COMPUTER SCIENCE STREAM					
	Data Analytics					
15MSSE34	Machine Learning	3	0	0	3	PE
16MDSE53	Big Data Architecture	3	0	0	3	PE
16MDSE2	Web Mining	3	0	0	3	PE
16MDS83	Data Visualization	3	0	0	3	PE
16MDSE6	Information Security Analytics	3	0	0	3	PE
16MDSE20	Data Centric Computing	3	0	0	3	PE
16MDSE8	Bio-Informatics	3	0	0	3	PE
16MDSE3	Social Network Analysis	3	0	0	3	PE

PROFESSIONAL ELECTIVES - THEORY COURSES

Course Code	Course Name	L	T	P	C	Category
16MDSE4	Geographical Information Analysis	3	0	0	3	PE
16MDSE11	Econometric Analysis	3	0	0	3	PE
16MDS92	Deep Learning	3	0	0	3	PE
	Distributed and Network Systems					
15MSSE19	SOA and Web Services	3	0	0	3	PE
15MSSE35	BlockChain Technology	3	0	0	3	PE
15MSSE17	Internetworking Protocols	3	0	0	3	PE
17MDCE51	Distributed Systems	3	0	0	3	PE
	Software Systems					
15MSSE09	Graphics and Multimedia Technologies	3	0	0	3	PE
15MSS63	Software Testing and Quality Assurance	3	0	0	3	PE
16MDSE7	Image Processing	3	0	0	3	PE
15MSSE06	Software Requirements Engineering	3	0	0	3	PE
15MSSE07	Software Reliability	3	0	0	3	PE
15MSSE08	Open Source Software Development	3	0	0	3	PE
16MDSE25	Software Architecture and Design Patterns	3	0	0	3	PE
15MSSE24	Real Time Systems	3	0	0	3	PE
15MSSE25	Analysis and Design of Real Time Systems	3	0	0	3	PE
15MSSE27	Computer vision	3	0	0	3	PE
15MSSE14	Design Thinking	3	0	0	3	PE
15MSSE36	Advanced Web Technology	3	0	0	3	PE

PROFESSIONAL ELECTIVES - LABORATORY COURSES

Course Code	Course Name	L	T	P	C	Category
17MDCEL1	Minor Project in Business / Data Analytics	0	0	4	2	PE
17MDCEL2	Modeling and Simulation Laboratory	0	0	4	2	PE
15MSSL08	Image Processing Laboratory	0	0	4	2	PE
15MSSL03	Graphics and Multimedia Laboratory	0	0	4	2	PE
15MSSL13	Advanced Web Technology Laboratory	0	0	4	2	PE
16MDS55	Machine Learning Laboratory	0	0	4	2	PE
16MDS56	Big Data Modeling Laboratory	0	0	4	2	PE
16MDS85	Data Visualization Laboratory	0	0	4	2	PE
16MDS94	Deep Learning Laboratory	0	0	4	2	PE
15MSS65	Software Testing Laboratory	0	0	4	2	PE
16MDSEL2	Web Mining Laboratory	0	0	4	2	PE

LANGUAGE ELECTIVE

Course Code	Course Name	L	T	P	C	Category
16MDSLE01	Professional English	3	0	0	3	HS
16FY22F	Basic French	3	0	0	3	HS
16FY22G	Basic German	3	0	0	3	HS

* Pass is required

\# FC - Foundation Course, PC - Professional Core, PE - Professional Elective, EEC - Employability Enhancement Course.

NOTE :

- Equal weightage for Decision Science and Computer Science is given in the design of the curriculum, which complement each other to address the industry needs.
- Students of this Programme can specialize in Decision Science and/or Computing Science by choosing interested elective courses given under different streams.

17MDC11 - TECHNICAL ENGLISH

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given a technical paragraph identify the topic sentence, infer meanings, lexical and contextual items, and find the supporting points and transitional tags*
- *Given a communication context, specify the barriers to listening and deduce solutions to overcome the barriers. Given short conversations and monologues for listening, specify appropriate responses and construct a summary.*
- *For a given topic, introduce ideas, give opinions and justify your stance. For a given topic, argue for or against the topic for 5 minutes. Plan and prepare a 15 minute presentation using visual aids and deliver a power point presentation for a given technical topic.*
- *For a given topic, write an argumentative, descriptive, biographical or autobiographical essay. Interpret the given technical graphical representation and compose passage. Summarize and paraphrase technical texts in about 200 to 300 words.*
- *Apply the rules of grammar viz, tenses prepositions, subject-verb agreement, adjectives, direct indirect speech and use appropriate patterns in a given sentence.*

FOCUS ON LANGUAGE

Synonyms - Antonyms - Forms of Words - One Word Substitutes - Word Formation - Contextual Meanings - Tenses - Prepositions - Subject-verb Agreement - Adjectives - Sequence Words - Wh-Questions - Direct Indirect Speech- Adverbs - Abbreviations and Acronyms. **(9)**

READING

Predicting the Content - Skimming the Text - Understanding the Gist -Topic Sentence and its Role - Scanning - Inferring Meanings: Lexical and Contextual - Note-Making - Interpreting Graphics in Technical Writing - Sequencing of Sentences - Reading Comprehension - Dictionary Skills - Itinerary. **(9)**

WRITING

Filling Forms - Descriptive Writing - Autobiographical & Biographical Writing - Paragraph Writing - Academic Writing - Tweets - Paraphrasing - Channel Conversion - Essay Writing: Argumentative Writing - Poster Making - Instructions - Dialogue Writing - Informal Letters. **(9)**

LISTENING

Importance of Listening & Empathy in Communication - Reasons for Poor Listening - Traits of a Good Listener - Listening Mode - Note Taking - Listening to Short Dialogues - Listening to Long Conversations. **(8)**

SPEAKING

Describing Places - Giving Opinions - Narration - Introducing Ideas - Justifying Opinions - Formal Conversations - Telephonic Skill - Debating - Apologizing - Extempore - Effective Presentation Strategies - Planning - Outlining & Structuring - Nuances of Delivery - Controlling Nervousness & Stage Fright - Visual Aids in Presentation - Applications of MS Power Point. **(10)**

TOTAL: 45

TEXT BOOK

1. *Dr.K.Elango, "Resonance", Cambridge University Press, New Delhi, 2013.*

EXTENSIVE READING

1. *Dr.A.P.J.Abdul Kalam "India 2020" - Vision for the Millennium - Brooks/Cole Publishing Company, 2002. (Only Essay Questions)*

REFERENCE BOOKS

1. *Meenakshi Raman, Sangeeta Sharma, "Technical Communication - English Skills for Engineers", Oxford University Press, New Delhi, 2012.*
2. *Simon Sweeney, "English for Business Communication", Cambridge University Press, 2010.*
3. *Nagaraj Geetha, "A Course in Grammar and Composition", Cambridge University Press, 2012.*
4. *Samson T, "Innovate with English", Cambridge University Press, 2012.*
5. *Mark Ibbotson. "Cambridge English for Engineering" Cambridge University Press, 2012.*
6. *B. Sai Lakshmi. "Poly Skills- A Course in Communication and Life Skills" Cambridge University Press, 2012.*

17MDC12- APPLIED ALGEBRA AND CALCULUS

L	T	P	C
3	2	0	4

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Familiar with the basic concepts in financial mathematics and application of numerical methods in solving equations occurring in business modeling.*
- *Able to understand and apply matrix methods to solve real world problems.*
- *Able to understand and apply differential calculus to solve optimization problems in Economics and Business.*
- *Able to understand and apply integral calculus to solve real world problems in economics and finance.*
- *Having good understanding of empirical modeling.*

ALGEBRA

SEQUENCES AND SERIES : Arithmetic, geometric and harmonic sequences-Finite and infinite series. Convergence and divergence of infinite series-Simple examples-nthterm test for divergence and p-series convergence. Applications of series in financial mathematics: Simple and Compound Interest-Nominal and Effective Interest Rates-Continuous Compounding -Future Value and Present Value-Annuities- Ordinary Annuity: Future and Present Value, Annuity Payment, Principal Sum, Period and Interest Rate, Annuity Due, Deferred Annuity and Perpetuity. **(6)**

SOLUTION OF EQUATIONS : Algebraic and transcendental equations - Bisection Method and Newton Raphson method-Real World Applications of Newton Raphson Method: Finding the Break Even Point of a Firm and finding the interest rates of Annuities. **(4)**

MATRICES AND VECTOR SPACES: MATRICES: The Inverse of a Matrix-Properties and Algorithm to find the Inverse of a Matrix: Gauss Jordan Method- Solving a system of Linear Equations Using Matrix Inverse. Eigen values and Eigen vectors - Cayley Hamilton theorem (without proof)- Application to find the inverse and higher powers of a matrix - Diagonalization - Quadratic forms - Orthogonal reduction to Canonical form. Applications of Matrices: The Leontief Input Output Model in Economics, Leslie's Population Growth Model, Homogeneous Coordinates and their applications to Computer Graphics.

VECTOR SPACES: Vector spaces and Subspaces Linear dependence and independence of vectors- Linear transformations-Linearly independent sets and Bases-Dimension of a vector space **(14)**

CALCULUS

Differential Calculus : Definition of limit and derivative of a function. Applications to marginal analysis in Business and Economics, Relative Rate of Change and Elasticity of Demand- Maxima and Minima of function of single variables -Applications to Optimization of area and perimeter, Relation between Average Cost and Marginal Cost, Maximizing Revenue and Profit and Inventory Control. Functions of Several Variables-Partial Derivatives- Homogeneous functions and Euler's Theorem-Optimization of functions of two variables-Constrained Optimization using Lagrange Multipliers

Integral Calculus : Integration as a process of Summation-Application of Area between two curves to find the Net Excess Profit-Application to study Lorenz Curves in Economics-Calculation of present value of an income stream using definite integrals. **Special Functions:** Beta and Gamma Functions- Double and triple integrals - Applications: Area - Volume. **(13)**

EXPERIMENTAL DATA ANALYSIS : Curve fitting: Least Square Method. Interpolation: Newton's method - Lagrange's method. **Numerical Differentiation:** Application to Maxima and Minima of functions. **Numerical Integration:** Trapezoidal rule- Simpson's 1/3rd rule. Applications to real world problems and finding area, volume and Numerical Solutions of Ordinary Differential Equations: Taylor's Series - Runge Kutta Fourth order methods - Milne's Predictor - Corrector Method. **(8)**

TOTAL : 45

TEXT BOOKS

1. *Ahmad Nazri Wahidudin, "Financial Mathematics and Its Applications", Ventus Publishing ApS, ISBN 978-87-7681-928-6, 2011.*
2. *David C Lay "Linear Algebra and its Applications", Fourth edition Pearson 2012.*
3. *R.A.Barnett, M.R.Ziegler and K.E.Bylen, Calculus for Business, Economics, Life Sciences and Social Sciences, 12th Edition, Prentice Hall, 2011.*
4. *L.D.Hoffman and G.L.Bradley, Calculus for Business, Economics and the Social and Life Sciences, 10th Edition, McGraw Hill, Higher Education, 2010.*

REFERENCE BOOKS

1. *Kandasamy, P.et al., "Engineering Mathematics", Volume - I & II (8th Fully Revised Edition), "S. Chand & Co, 2008. Kandasamy .P et al., "Numerical Methods", (for first year), (First Revised Edition) Tata McGraw Hill Publishing company Ltd., 2008.(para 5)*
2. *Veerarajan T, "Engineering Mathematics (For First Year)", (first revised edition), Tata McGraw Hill Publishing company Ltd, 2008.*
3. *Venkataraman. M.K., "Engineering Mathematics", (First year), The National Publishing Company, 2008.*

17MDC13 - BASIC STATISTICAL METHODS

L	T	P	C
3	2	0	4

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Achieve good skills in presentation and summarization of data using statistical tool*
- *Apply basic concepts in probability theory to data and derive useful measures for easy interpretation of the probability structure of data*
- *Gain knowledge in sampling and various methods of sampling from population data*
- *Understand the meaning of association between two variables and use regression analysis in prediction.*

DEFINITION OF STATISTICS

Data -Qualitative and quantitative - Measurement of data -Nominal and Ordinal - Raw data and grouped data - Primary and secondary data - Methods of collection -Classification of data - Tabulation -frequency distribution and various diagrammatic and graphical representations of data. **(7)**

SUMMARY STATISTICS

Measures of Central Tendency-arithmetic mean, median, mode, geometric mean and harmonic mean Merits and demerits-Relationship between mean, median and mode-Relationship AM, GM and HM, computation of the measures for grouped and ungrouped data-weighted arithmetic Measures of dispersion-range, mean deviation and standard deviation - coefficient of variation and its use- quartiles and inter quartile range-quintiles deciles and percentiles- moving averages -Skewness and Kurtosis and their uses. **(8)**

PROBABILITY

Deterministic and random experiments -Definition of sample space and events- classical and axiomatic definitions- Properties of probability- addition theorem- conditional probability and multiplication theorem of probability- Definition of independent events - Random variables and their probability distributions-Discrete and continuous random variables Probability mass function and cumulative distribution functions -definition - Mathematical expectation-mean and variance - Mean and variances of linear combination of random variables - Chebyshev's theorem- -Important discrete distributions-Discrete Uniform Distribution, Binomial, Poisson, -Continuous distributions: probability density functions and cumulative probability distributions-Normal distribution and its properties and applications. **(15)**

SAMPLING

Population and sample- sampling and its need -sampling vs complete enumeration -parameter and statistics-Probability sampling and -random sampling- simple random sampling, lottery method and random number table method- stratified random sampling-sampling distribution and standard error of a statistic. **(7)**

CORRELATION AND REGRESSION

Definition of correlation - Scatter plot -Karl Pearson's correlation coefficient its properties- Definition of Regression - Simple regression-Regression of x on y and y on x-Rank Correlation-Spearman's Rank Correlation Coefficient **(8)**

TOTAL : 45

TEXT BOOK

1. *S.C. Gupta, " Fundamentals of Statistics", 7th and Enlarged Edition, Himalaya publishing, Delhi, 2014.*

REFERENCE BOOK

1. *D M Levine T C Krehbiel and M L Berensen, "Business Statistics: A First Course", Pearson Education, Delhi, India, 2003.*
2. *Ronald E.Walpole, Raymond H. Myers, Sharon L. Myers and Keying Ye, Probability and Statistics for Engineers and Scientists. (2002), 7th Edition, Pearson Education, Inc., Delhi, India*

17MDC14 - HUMAN BEHAVIOUR

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given an organizational environment, identify the importance of Human Behaviour and its impact.*
- *Engage in a comprehensive review of major theories and traits used in human personality psychology and apply them for given problem scenarios.*
- *Understand the role played by values and attitude in the workplace and analyze individual human behaviour in the workplace as influenced by Perception.*
- *Evaluate the role of motivation in determining employee behaviour in the organization, and apply the techniques to suggest tools of motivation for a given business environment.*
- *With solid understanding of human behaviour in the workplace from an individual, group and organizational. perspective, evaluate problem scenarios and suggest solutions to problems relating to motivation, personality, perception, values and attitude.*

UNDERSTANDING HHUMAN BEHAVIOUR

Understanding Human Behaviour - Classification of Human Behaviour - Nature of people in organization - Models of Human Behaviour : Psychoanalytic Model, Existential Model, Behavioristic Model,Cognitive Model - Implications of Human Behaviour on the organization - Case Study **(9)**

PERSONALITY

Personality - Determinants: Heredity and environmental linkage - Development Approach: Argyris's Maturity-Immaturity Continuum - Personality Traits: Social Traits, Personal Conception Traits, Emotional Adjustment Traits - Personality Theories : Erikson's eight life stages, Passages Theory, Maturation Theory - Case Study **(9)**

VALUES AND ATTITUDES

Values: Sources - Types of Values - Allport's six value categories - Patterns and trends in values. Attitudes: Cognitive Component - Affective Component - Behaviour Component -Attitudes and Behaviour - Attitudes and Cognitive consistency. Socialisation influence on Personality Values and Attitudes - Case Study **(9)**

PERCEPTION

Perception - Perception Process - Factors influencing perception process - Stages of the Perceptual Process - Response to Perceptual Process - Perceptual distortion: Stereotypes or Prototypes, Halo Effects, Selective Perception, Projection, Contrast Effects, Self-fulfilling Prophecy - Managing perceptual process - Attribution theory - Case Study **(9)**

MOTIVATION

Motivation - Reinforcement, Content and Process Theories- - Classical and Operant conditioning - Reinforcement Strategies - Theories of Motivation : Hierarchy of Need theory, ERG theory, Acquired Needs theory, Two Factor Theory, Equity Theory, Expectation Theory - Case Study **(9)**

TOTAL : 45

TEXT BOOK

1. *John .R. Schermerhorn, James. G. Hunt and Richard. N. Osorn, 'Organizational Behaviour', Wiley Publication, 7th Edition.*

REFERENCE BOOKS

1. *B. Narayan and Bharati Sharma, "Behavioral Science in Management" Omsons Publications, New Delhi, 1993.*
2. *Harlow/Hamke, Behaviour in Organizations Text, Readings and Cases, Little, Brown and Company, 1975.*

3. *Stephen P. Robbins, Organizational Behaviour, Concepts, Controversies and Applications, Prentice Hall of India Private Limited, New Delhi, 1985.*
4. *K. Aswathappa, Organizational Behaviour Text, Cases and Games Himalaya Publishing House, Mumbai, Sixth Edition, 2005.*
5. *J. W. Newstrom, Organizational Behaviour Human Behaviour at Work, Tata McGraw Hill Publishing Company Limited, New Delhi, 12th Edition, 2007.*

17MDC15 - PROGRAMMING IN C

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Recognize the role of computers and programming languages in solving the real world problems.*
- *Use the suitable data type among Arrays, Pointers, Strings, Structure, Union and Files to store and manipulate data*
- *Analyze the given problem statement, divide it into modules and represent them using functions in C*
- *Develop a C program for a given problem statement by using the necessary program structure, data types and constructs to generate the correct output*
- *Develop a C program to handle persistent data for a given problem statement*

INTRODUCTION

Introduction to Computers-Computer Characteristics- Hardware vs Software- Developing a Program- Software Development Life Cycle- Structured Programming- Modes of Operation- Types of Programming Languages- Introduction to C- Desirable Program Characteristics **(6)**

BASIC CONSTRUCTS

Introductory Concepts - Introduction to C programming - Operators and Expressions - Data Input and Output - Control Statements - Macros **(6)**

FUNCTIONS AND STORAGE CLASSES

Overview - Defining and Accessing a Function - Prototypes - Passing Arguments - Recursion.

Storage classes - Automatic, External and Static Variables - Multifile Programs.

FUNCTIONS AND STORAGE CLASSES

Overview - Defining and Accessing a Function - Prototypes - Passing Arguments - Recursion.

Storage classes - Automatic, External and Static Variables - Multifile Programs. **(8)**

ARRAYS, STRINGS AND POINTERS

Defining and Processing an Array - Passing Arrays to Functions - Multidimensional Arrays.

Defining a String - Null Character - Initialization - Reading and Writing - Processing - Character Arithmetic - Searching and Sorting.

Pointer Fundamentals - Declarations - Passing Pointers - Pointers and Arrays - Dynamic Memory Allocation - Operations on Pointers - Arrays of Pointers. **(14)**

STRUCTURES AND UNIONS, FILE HANDLING

Defining and Processing Structures - Typedef - Structures and Pointers - Passing Structures to Functions - Unions.

Data File Handling - Binary File Handling - Random Access. **(11)**

TOTAL : 45

TEXT BOOKS

1. *Schaum's outline series, "Programming with C", Tata McGraw Hill Publication, 2nd Edition, 2010.*

REFERENCE BOOKS

1. *Herbert Schildt, "C- The Complete Reference", McGraw Hill, 4th edition, 2009.*
2. *Kernighan B.W. and Ritchie D.M., "C Programming Language (ANSI C)", Pearson Education, 2004.*

3. *Herbert Schildt, Jean Paul Tremblay, Richard B Bunt, "Introduction to Computer Science - An Algorithmic Approach", McGraw Hill, 2nd Edition, 1985.*
4. *Terrence W Pratt, "Programming language - Design and Implementation", Prentice Hall of India, 4th Edition, 2001.*
5. *Yaswanth Kanithkar, "Let Us C", Pearson edition,*

17MDC16 - COMPUTING LABORATORY I

L	T	P	C
0	0	4	2

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : PRACTICALS

COURSE OUTCOME

- *Be able to learn SciLab programming to perform problems in matrix algebra.*
- *Gain knowledge in writing script files in SciLab to perform numerical interpolation.*
- *Be able to develop skill in MS-Excel for diagrammatic representation and summarization of data.*
- *Be able to understand probability distributions and bivariate data analysis using MS-Excel programs*

CONCEPTS TO BE COVERED

1. SciLab Fundamentals
2. Algebraic operations on matrices, Transpose of a matrix, Determinants, inverse of a matrix,
3. Solving System of linear equations and consistency,
4. Row reduced echelon form and normal form.
5. Eigen values, Eigen vectors, Rank of a matrix.
6. Solving algebraic and system of equations.
7. Estimating numerical values for given data by means of interpolation
8. Perform data manipulation and financial functions using excel
9. Perform graphical and diagrammatic representation of statistical data, like bar diagram, pie, histogram and line diagram
10. Construct the pivotal tables and apply statistical functions to calculate the descriptive statistics
11. Practice the theory behind the descriptive statistics, like measures of central tendency, dispersion, skewness and kurtosis
12. Apply and Implement the theory of probability in various applications
13. Simple probability and random sampling
14. Practicing the simple correlation and regression techniques.

17MDC17 - PROGRAMMING LABORATORY IN C

L	T	P	C
0	0	4	2

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Gives a problem, solve by devising an algorithm and converting it into C program*
- *Develop C programs with necessary data types to represent the data and manipulate them using appropriate operators and built-in functions*
- *Develop C programs with appropriate control structures to implement decision making*
- *Develop reusable and efficient solutions using functions and/or recursive functions in C*
- *Develop C programs to create and access the files for handling the persistent data*

CONCEPTS TO BE COVERED

1. Simple programs to understand the concepts of data types.
2. Writing programs to get familiarity on using conditional, control and repetition statements.
3. Defining and creating one and two dimensional arrays- Matrix operations
4. Solving Systems of Linear Equations
5. Working with pointers.
6. Functions - call by value and call by reference
7. String manipulations.
8. Solving Recursive problems
9. Solving iterative problems - Trigonometric series evaluation.
10. Use dynamic memory allocation functions for storage allocation.
11. Defining and handling structures, array of structures, structure pointers, union and enumeration type.
12. Defining functions with structure.
13. Application Programs using file operations.

17MDC18 - ENGLISH LANGUAGE LABORATORY

L	T	P	C
0	0	2	1

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *For a given 2 to5 minutes speaking activity like Extempore and Debate, produce language structures accurately and fluently.*
- *Construct dialogues for a given social scenario and interpret the given graphic information and write creative paragraphs.*
- *For a given technical topic, prepare a power point presentation for 15 minutes.*
- *Given short conversations and monologues for listening, specify appropriate responses and construct a summary.*
- *Given a technical paragraph for reading, specify correct responses by identifying the topic sentence, inferring meanings, lexical and contextual items, and finding the supporting points and transitional tags.*

LIST OF EXPERIMENTS:

1. Speech Sounds
2. Word Vocabulary
3. Reading Comprehension
4. Listening Practice- I
5. Dialogue Writing
6. Conversational Exercise - I
7. Focus on Language
8. Creative Writing
9. Conversational Exercise - II
10. Listening Practice - II

16MDSLE01 - PROFESSIONAL ENGLISH

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Apply the rules of the grammar viz Confusing words, Verbs, Gerunds, Infinitives, Cause and Effect and use appropriate patterns in a given sentence or a passage.*
- *Given a passage or a technical topic, prepare a mind map, make notes and summarize.*
- *Given a Business Communication scenario, prepare Reports, Memos, Instructions, Minutes of the meeting, Emails & Business letters using appropriate format.*
- *Given a communication context, specify the type and barrier to listening provide solutions and justify. Given short conversations and monologues for listening, specify appropriate responses and construct a summary.*
- *For a given HR topic, generate valid points for and against the topic and present them with group behaviour. For any job requirement plan and prepare for a 20 minute Mock Interview.*

FOCUS ON LANGUAGE

Scientific Terminology - Homonyms - Homophones - Formal Vocabulary - Confusing Words - Idiomatic Expressions - Collocations - Regular and Irregular Verbs - Gerund - Voice - Infinitive - Modal Verbs - Phrasal Verbs - If Conditionals - Cause and Effect - Numerical Adjectival Phrases - Conjunctions - Clauses - Definitions - SMS Language. **(11)**

READING

Summarizing - SQ3R Reading Technique - Note Making: Outline/Linear Method- Sentence Method - Schematic Method - Understanding Discourse Coherence - Non-Verbal Signals - Cloze Comprehension - Mind Mapping **(7)**

WRITING

Business Letters - Article Writing - Review of a Newspaper Report - Emails - Report Writing - Recommendations - Vacancy Advertisements - Resume - Meetings: Agenda and Minutes of the Meeting - Writing Book Reviews - Memorandum - Essay Writing **(11)**

LISTENING

Types of Listening- Barriers to Effective Listening- Intensive Listening - Listening to Podcast, Negotiation, Job Interviews, Group Discussions and Filling Gaps **(7)**

SPEAKING

Interviews: Objectives of Interviews - Types of Interviews - Group Discussions - Organizational GD - GD as a Part of Selection Process - Role Play - Negotiation. **(9)**

TOTAL : 45

TEXT BOOK

1. *Dr.K.Elango, "Resonance", Cambridge University Press, New Delhi, 2013.*

REFERENCE BOOKS

1. *Meenakshi Raman, Sangeeta Sharma, "Technical Communication - English Skills for Engineers", Oxford University Press, New Delhi, 2012.*
2. *Nagaraj Geetha, "A Course in Grammar and composition", Cambridge University Press, 2012*
3. *Samson T, "Innovate with English", Cambridge University Press, 2012.*
4. *Mark Ibbotson. "Cambridge English for Engineering" Cambridge University Press, 2012.*
5. *B. Sai Lakshmi. "Poly Skills- A Course in Communication and Life Skills" Cambridge University Press, 2012.*

16FY22G - BASIC GERMAN

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

EINFUHRUNG

BegrUung - Name - Vorname - Familienname - Anrede **(7)**

THEMA

Hallo !Wiegeht's?
Begegnungen
Guten Tag, ichsuche…,
ImSupermarkt
Arbeit und Freizeit
Familie und Haushalt **(10)**

GRAMMATIK-I

Position des Verbs :Aussage, W - Frage und
Ja/Nein - Frage; Artikel die der das.
W - Frage; Konjugation in Prasens;
Nominativ :bestimmter, unbestimmter und negative Artikel
Akkusativ :unbestimmterundnegativerArtikel
Adjektive :Akkusativ-Erganzung **(18)**

GRAMMATIK-II

ArtikelalsPronomen
Dative - Erganzung :Personalpronomen und Ortsangaben;
Imperativ
Modalverben; Ortsangaben; Richtungsangaben;
Zeitangaben; Ordinalzahlen
Possessiv - Artikel; trennbare und nichttrennbareVerben;
Wechselprapositionen **(10)**

TOTAL : 45

TEXT BOOK

Studio d A1: Kurs - und Ubungsbuch, (Deutsch alsFremdsprache) CornelsenVerlag.

REFERENCE BOOK

Tangarmaktuell1 :Kursbuch + Arbeitsbuch, (Deutsch alsFremdsprache) Max HueberVerlag

16FY22 F - BASIC FRENCH

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Comprehend the fundamentals and Grammatical Patterns of French Language.*
- *Acquire the basic Writing and Speaking Skills.*
- *Develop an understanding of French practices and perspectives.*

INTRODUCTION:

UNITÉ-1: Faire connaissance - inviter et répondre à une invitation - décrire les personnes- articles définis et indéfinis - genre etnombre des noms et des adjectifs- interrogation et négation - conjugaison du présent. Paris monuments et lieux publics - la vie de quatreparisiens de professions différentes. **(12)**

UNITÉ-2 : Exprimer l' ordre et l'obligation demander et commander - evaluer et apprécier- féliciter et remercier - articles partitifs -adjectifsdémonstratifs et possessifsprépositions et adverbes de quantité et de l'imperatifverbespronominaux - unerégiondeFrance la Bourgogne - vie quotidienne à la compagne. **(12)**

UNITÉ-3 : Raconter et rapporter - donner son avis - se plaindre et réprimander - expliquer et justifier - pronomscompléments - futurproche - passé composé et imparfait. Plusieursrégions de France - différentsuniverssociaux. **(11)**

UNITÉ-4 : Demander l'autorisation - interdire - formuler des projects - discuter et débattre. Pronoms<en> et < y > - pronomsrelatifs et superlatifs - conjugaison du futur - présentcontinu et passé récent.La vie administrative et régionale - problems economiques et écologiques - traditions et modernité. **(10)**

Total : 45

TEXT BOOK :

1. *Le Nouveau Sans Frontières - Philippe Dominique, Jacky Girardet, Michèle Verdelhan.*

REFERENCE BOOKS :

1. *Dondo Modern French Course ---Mathurin Dondo*
2. *Modern French Grammar---Margaret Lang and Isabelle Perez.*

17MDC21 - PROBABILITY AND APPLICATIONS

L	T	P	C
3	2	0	4

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Apply various discrete and continuous probability distributions to data and derive useful inferences.*
- *Apply moment generating functions in understanding various properties of random variables*
- *Get good understanding of properties of estimators of population parameters*
- *Become familiar with various methods in statistical inference and he can independently apply many statistical tests to make inferences on the properties of both discrete and continuous types of data*
- *Get a basic knowledge on Bayesian inference.*

PROBABILITY DISTRIBUTIONS

Discrete: Geometric, Negative binomial distributions and Hypergeometric distributions. Continuous: uniform, exponential, gamma, Beta, Chi-square log normal distributions and Weibull distributions and their properties. **(8)**

FUNCTIONS OF RANDOM VARIABLES

Moments and Moment Generating functions of important distributions-Transformations of Variables and finding their distributions -method of direct transformation and method of moment generating functions- - Joint and Marginal Probability mass functions(for discrete) and density functions(for continuous). Conditional probability distributions-conditional mean and variance-Independence of random variables. **(15)**

ESTIMATION

Estimation of parameters using method of moments-Maximum Likelihood Point Estimation(MLE) -Properties of estimators-Unbiasedness, minimum variance, efficience and sufficience-Mean Square Error-Asymptotic properties-consistency-Fisher Information and Cramer-Rao's Inequality - Interval Estimation. **(7)**

SAMPLING AND TESTS OF HYPOTHESIS

Derivation of sampling distribution of mean and S2- t-distribution and F-distribution-Central limit theorems- Test of significance - Basic concepts - null hypothesis - alternative hypothesis - level of significance - Standard error and its importance - steps in testing-One and two tailed tests-The use of p-values for Decision making - Large sample tests and Small sample tests for : Single sample: Testing on a single mean with variance known and variance unknown-Two samples-tests on means -One sample test on a single proportion-two sample tests of two proportions-Goodness of Fit tests, One and two sample tests concerning variances-Tests of independence for categorical data, tests foe homogeneity. **(10)**

INTRODUCTION TO BAYESIAN ESTIMATION

Baye's Theorem and its applications -Prior and posterior distributions-Optimal Decisions using loss function--Estimation: Bayesian versus classical- Simple applications **(5)**

Total : 45

TEXT BOOK

1. *Ronald E.Walpole, Raymond H. Myers, Sharon L. Myers and Keying Ye, "Probability and Statistics for Engineers and Scientists", Pearson Education, Inc., 7th Edition, Delhi, India, 2002.*

REFERENCE BOOKS

1. *S.C.Gupta and V.K.Kappoor, "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, 10th Revised Edition, New Delhi, 2002.*
2. *S.C. Gupta,"Fundamentals of Statistics", 7th and Enlarged Edition, Himalaya publishing, Delhi, 2014.*
3. *Anthony O'Hagan, Bryan R. Luce, "A primer on Bayesian Statistics in Health Economics and Outcomes Research", MEDTAP International Inc, 2003.*

17MDC22 - PRINCIPLES OF MANAGEMENT

L	T	P	C
4	0	0	4

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Understand and appreciate the necessity and importance of effective management for the success of any activity*
- *Apply the planning, organizing and control processes to solve problems in a given business scenario*
- *Apply the techniques learnt in process of staffing, performance appraisal and training and identify solutions for a problem scenario*
- *Describe various theories related to the management in general and understand the management decision making process in particular.*
- *Gather and analyze both qualitative and quantitative information from a business scenario, to isolate issues and formulate best control methods.*

INTRODUCTION TO MANAGEMENT

Management - Evolution of Management Thought - Approaches to Management - Management in a Global Scenario - Social Responsibility of Managers - Ethics in Managing - Functions of Managers. Case Study. **(10)**

PLANNING

Planning - Types - Steps - Objectives - Strategic Planning Process - Core Competency - Kinds of Strategies and Policies - Forecasting - Rational Decision Making. Case Study. **(10)**

ORGANIZING

Formal and Informal Organization - Structure and Process of Organizing - Span of Management - Reengineering -Organization Structure - Departmentation - Authority - Decentralization - Delegation - Line and Staff - Organizational Effectiveness. Case Study. **(10)**

STAFFING

Staffing - Definition - HRM - Job Analysis - Organizational Culture - Staff Life Cycle - Selection - Performance Appraisal - Rewards - Learning and Development - Change Management - Organization Development - The Learning Organization Case Study. **(10)**

DIRECTING

Motivation - Theories of Motivation - Job Enrichment - Leadership - Definition -Approaches - Styles. Groups, Committees and Teams - Group Decision Making. Communication - Process - Flow of Communication in Organization - Barriers to Communication, Case Study **(10)**

CONTROLLING

Control Process - Feedback and Feedforward - Financial Control - Budgeting - Metrics - Balanced Scorecard - Analytics - Information Systems - Productivity - Quality Control, Case Study **(10)**

Total : 60

TEXT BOOK :

1. *Harold Koontz, Heinz Weihrich, "Essentials of Management", Tata McGraw Hill, 9th Edition, 2007.*

REFERENCES :

1. *Andrew J. Dubrin, Essentials of Management, Thomson Southwestern, 9th edition, 2012.*
2. *Samuel C. Certo and TervisCerto, Modern management: concepts and skills, Pearson Education, 12th edition, 2012.*
3. *Stephen P. Robbins and Mary Coulter, Management, Prentice Hall of India, 10th edition*
4. *Harold Koontz and Heinz Weihrich, Essentials of management: An International & Leadership Perspective, 9th edition, Tata McGraw-Hill Education, 2012.*
5. *Charles W.L Hill and Steven L McShane, 'Principles of Management, McGraw Hill Education, Special Indian Edition, 2007.*
6. *J.N.Chandan, Management Theory & Practice*
7. *K.Aswathapa, Essential of Business Administration, Himalaya Publishing House*

17MDC23 - WEB TECHNOLOGY

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Describe the need for Internet Platform and its benefits over other technologies*
- *Demonstrate techniques for improving the accessibility of an HTML and XHTML document involving a variety of element types, including hyperlinks, images, lists, tables, and forms with CSS properties*
- *Employ Java Script for client side programming that uses a regular expression to validate form entry and processing*
- *Develop XML applications with DTD and style sheets that span various enterprises including Government, Industry, Academia and Society*
- *Establish PHP server side programming skills to work with form data, regular expressions, exception handling, validate data, cookies, sessions and to build interactive, data-driven sites*

INTRODUCTION

History of Internet and World Wide Web - W3C - Web Browser Basics - Internet Accounts - shell, PPP, SLIP. Web Server: HTTP Transactions - Multitier Application Architecture - Client and Server side Scripting - Accessing web server - server types - Requesting document under web. **(7)**

HTML

Basic HTML Tags - contents of header section - page formatting tags, text formatting tags -Links - Lists - Image - Tables - Complex tables - Frames - Nested frames - Forms. **(7)**

XHTML and CSS

Introduction to XHTML - Difference between HTML and XHTML - Headings - Linking - Images - Lists - Tables - Forms - Meta elements. CSS : Inline, Embedded, External Style sheets - Positioning - Backgrounds - Element Dimensions - Box model and Text flow **(7)**

JAVA Script & DHTML

Introduction- Memory Concepts, Arithmetic, Decision Making, Control Structures - Functions - Arrays - Objects - Math, String, Date, Boolean and Number. DHTML: Object Model and Collections - Event Models - Filters and Transitions **(8)**

XML

Introduction - File Structure - XML Namespaces - XML Document Type Definition - XML Schema - need for schema - W3C Schema Documents - Extended Style sheet - Parsers - DOM and SAX parsers. **(8)**

PHP

Introduction - PHP basics- String processing and Regular expressions - Form Processing and Business logic - Connecting to a database - Cookies - Dynamic content. **(8)**

Total : 45

TEXT BOOKS

1. *P.J. Deitel, H.M Deitel, "Internet and World Wide Web How To Program", 4th edition, Pearson Education, 2011. (Para I - V)*
2. *Margaret Levine Young, "Internet: The Complete Reference", Millenium Edition. (Para I)*

REFERENCE BOOKS

1. *Christopher Schmitt, "CSS Cookbook", Third Edition, 2009.*
2. *Vikram Vaswani "PHP Programming Solutions", Tata McGraw-Hill, 2007.*

17MDC24 - DATA STRUCTURES AND ALGORITHMS

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC15

ASSESSMENT : THEORY

COURSE OUTCOME

- *Design and implement abstract data types such as array, linked list, stack, queue, and tree to solve real world problems.*
- *Select and use suitable data structures for problem solving and programming.*
- *Ability to design substantial and complex data structures for a given real-life problem.*
- *Evaluate algorithms and data structures in terms of time and space complexity of basic operations.*
- *Compare and evaluate the searching and sorting techniques based on complexity measures.*

INTRODUCTION TO DATA STRUCTURES

Primitive data structures - ADT- Arrays: Arrays as ADT, one dimensional array, two dimensional array, multidimensional array, representation-sparse matrix. **(6)**

STACK

Definition - stack as ADT - sequential representation - operations, Applications: conversion & evaluation of expression.

Recursion: Definition, properties, examples.

QUEUE

Definition - queue as ADT, sequential representation - operations - circular queue - priority queue. Applications: Categorizing data and Queue Simulation **(11)**

LINKED LISTS

Definition - operations - linked representation of stacks & queue - circular lists - operations - doubly linked list - Application: addition of polynomial. **(9)**

TREES

Terminologies - binary tree: operations, traversals, representation - threaded binary tree - properties. **(6)**

ALGORITHMS

Analysis: Algorithms: Algorithms as a technology, Insertions Sort, Analyzing algorithms, Designing algorithms - Growth of functions.

Sorting & Searching: Bubble sort - quick sort - radix sort - Searching: linear search, binary search. **(13)**

Total : 45

TEXT BOOKS

1. *Yedidyah Langsam, Moshe.J.Augenstein, Aaron.M.Tenenbaum, "Data structures using C & C++", PHI Publications, 2nd Edition, 2006. (Para I - Para IV)*
2. *Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivert, Clifford Stein, "Introduction to Algorithms", PHI Publications, 2nd Edition, 2004.(Para V)*

REFERENCE BOOKS

1. *Ellis Horowitz & Sartaj Sahni, "Fundamentals of Data Structures", Galgotia Publications, 1983.*
2. *Richard F. Gilbery, Behrouz A.Forouzan, "Data structures - A Pseudo code Approach with C", Thomson Asia Pvt. Ltd, 2002.*
3. *Krishnamoorthy.R, "Data Structures using C", Mc Graw-Hill Education (India) Pvt. Ltd, 2010.*

17MDC25 - COMPUTING LABORATORY II

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICALS

COURSE OUTCOME

- *Will be able to apply various techniques of integration in finding line integrals and double integrals.*
- *Will be able to solve differential equations using SciLab.*
- *Able to understand various probability distributions and their properties using programs in SciLab and MS-Excel*

CONCEPTS TO BE COVERED

Implement the following using SCI Lab and MS-Excel

1. Extreme Value of functions-finding local extrema
2. Numerical differentiation based on Newton's formula, Lagrange's formula.
3. Functions of several variables--Hessian matrix-Expansions and extreme values- Constrained extrema using Lagrange's multiplier method-applications
4. Numerical integration-Trapezoidal and Simpson's 1/3 rules.
5. Solution of Ordinary Differential Equations,
6. Discrete and Continuous probability distributions
7. Joint Probability Distributions
8. Estimation of population parameters
9. Statistical Hypothesis testing- Large Sample tests
10. Statistical Hypothesis testing - Small Sample tests
11. Bayesian Data Analysis

TEXT BOOKS/REFERENCES

1. *K.N.Berk and P.Carey, Data Analysis with Microsoft Excel, Brooks/Cole, USA,2010*
2. *Gilberto E.Urroz, Matrices and Linear Algebra with SCILAB, http://www.tf.uns.ac.rs/~omorr/radovan_omorjan_003_prII/s_examples/Scilab/Gilberto/scilab5a.pdf*
3. *Graeme Chandler and Stephen Roberts, Scilab Tutorials for Computational Science, http://paginapessoal.utfpr.edu.br/previero/calculo-numerico-ma64a-em41-e-em42/informacoes-da-disciplina/Scilab_Tutorials.pdf*

17MDC26 - WEB TECHNOLOGY LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
17MDC23

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Create or convert the existing web sites with better and generic style properties for the entire websites*
- *Develop static and dynamic web pages and enhance the pages using CSS properties*
- *Employ dynamic XML for client side data storage, construct processing codes for client and server side*
- *Design and add functionalities to web pages on client and server side with cookies, regular expressions, database connectivity and ActiveX controls*
- *Construct new designs with emerging internet technologies*

CONCEPTS TO BE COVERED

1. HTML programs with basic tags, formatting tags, tables, images, lists and frames
2. Interactive pages using anchors, image maps and forms
3. XHTML representation of web pages.
4. Cascading Style Sheets - Dynamic properties for individual, group and random elements
5. JScript Programs for Simple Arithmetic, String processing, Arrays, built in and user defined functions, client side validations
6. XML - Database, DTD, XSD, XSL representation
7. PHP - simple programs for embedding html and php, Arrays, String Processing
8. Server side Validations, Cookies, Database Connectivity.

17MDC27- DATA STRUCTURES LABORATORY USING PYTHON

L	T	P	C
0	0	4	2

PRE-REQUISITES
17MDC15

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Choose appropriate data structure for a specified application and implement using Python.*
- *Demonstrate the abstract properties of various data structures such as stacks, queues, lists and trees in real world applications.*
- *Familiar, trace and code recursive methods and compare with iterative methods.*
- *Implement and compare the complexities of various sorting algorithms including bubble sort, heap sort and quick sort.*
- *Demonstrate understanding of linear and binary search algorithms.*

CONCEPTS TO BE COVERED

I. Implement simple programs in Python
II. Implement the following concepts
1. Applications of 2D, 3D arrays.
2. Evaluation of expression using stack.
3. Recursion - Towers of Hanoi, Ackermann's function, Fibonacci series.
4. Implementation of basic queue operations, priority queue, circular queue.
5. Implementation of self referential structures (FIFO, LIFO).
6. Applications of circular linked list.
7. Applications of doubly linked list.
8. Traversals of binary tree.
9. Traversals of graph.
10. Implementation of sorting and searching techniques.

17MDC31 - APPLIED STATISTICS FOR BUSINESS DECISIONS

L	T	P	C
3	2	0	4

PRE-REQUISITES
17MDC13, 17MDC21

ASSESSMENT : THEORY

COURSE OUTCOME

- *Apply and compute using Various Index Numbers used in Economics and Business*
- *Apply Statistical methods and Decision Analysis tools to analyze data from time series and Business.*
- *Prepare Control Charts for variables and attributes using data from economics*
- *Analyze Data from Statistical Experiments using appropriate Statistical Design of Experiment like CRD,RBD,LSDetc*
- *Analyze Data using Non-parametric methods*

INDEX NUMBERS

Definition, characteristics and uses of Index Numbers-Types of Index Numbers-Price, quantity and value indices- Simple and weighted aggregate index numbers -Laspeyre, Paasche,, Marshell - Edgeworth, Fisher's Ideal Index Numbers-Tests of adequacy of Index Numbers. **(9)**

Time Series and Forecasting : Definition- Time Series. Components- -Time series decomposition models: multiplicative and additive models -Forecasting error-measurement using Mean Absolute Deviation(MAD), Mean Absolute Percentage Error (MAPE), Mean Squared Error(MSE) and Root Mean Square Error (RMSE)- Smoothing Techniques: Naïve forecasting, moving averages and weighted moving averages-Exponential smoothing -Simple and double Exponential Smoothing- Trend analysis- linear, quadratic and exponential trend-Seasonal Effects-Decomposition methods: method of simple averages, ratio to trend method and ratio to moving average method-Measurement of cyclic and irregular variations. **(11)**

Statistical Quality Control : Nature of Control Limits-Purpose of Control Charts-Control Charts for Variables-Control Charts for Attributes-Cusum Control Charts. **(6)**

Decision Analysis : Decision making under certainty: Analytic Hierarchy Process- Decision making under risk: Expected value criteria, Expected value of perfect information - Decision making under uncertainty. **(6)**

Designs Of Experiments: Analysis of Variance (ANOVA) technique-Design of experiments - basic concepts - treatment - experimental unit -experimental error - basic principle - replication, randomization and local control- One way Analysis of Variance:Completely Randomized Design- Randomized blocks design - description - layout - analysis-Latin Square Design-description-layout-analysis. **(7)**

Non Parametric Statistics : Introduction toNonparametric tests -Sign test - Signed Rank test-Rank-Sum test-Wilcoxon-Mann-Whitmey test (U test), Kruskal Wallis test-Runs test-Spearman's Rank correlation coefficient. **(6)**

TOTAL : 45

TEXT BOOKS

1. *Ken Black, "Business Statistics for Contemporary Decision Making", 6th Edition, John Wiley &Sons.Inc, 2010 [Para 1,2,3 and 5]*
2. *Richard I. Levin, David S. Rubin, "Statistics for Management", 7th Edition Pearson Education, 2011.[Para 2 and Para 4]*
3. *Ronald E.Walpole, Raymond H. Myers, Sharon L. Myers and Keying Ye, "Probability and Statistics for Engineers and Scientists", 9th Edition, Prentice Hall, 2012 (Para 3, 5 and 6)*

REFERENCE BOOKS

1. *R.P.Hooda, "Statistics for Business and Economics", 5th Edition, Vikas Publishing House Pvt. Ltd., Noida, 2013.*
2. *D M Levine, M L Berensen, T C Krehbiel and P.K.Viswanathan- "Business Statistics: A First Course", 5th Edition, Pearson Education, Delhi, India, 2011*
3. *Dinesh Kumar U. "Business Analytics", Wiley, First Edition, 2017*

17MDC32 - FINANCIAL ANALYSIS AND REPORTING

L	T	P	C
4	0	0	4

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Assess the Procedures of the accounting system.*
- *Prepare financial statements and analyse its linkages.*
- *Evaluate the financial statements and annual reports*
- *Analyse the impact of working capital on the business*
- *Identify the inferior quality of financial reporting*

Financial Accounting : Definition- Three Activities - Generally Accepted Accounting Principles - Accounting Equation: Balance sheet, Income Statement and Retained Earnings. Recording Process: Debit and Credit - Steps in Recording Process - Making Journal Entries, Posting the Journal Entries to Ledger Accounts, Posting the Ledger to Trial Balance, Preparation of Trial Balance. **(15)**

Understanding the Financial Statements: Balance Sheet, Income Statement and Cash flow Statement - Need and Linkages - Individual elements of Financial Statements - Preparation of Common Size Balance sheet and Income Statement. **(8)**

Annual Report Analysis : Reading an annual report for a listed entity - Parts of Annual Reports - Financial Highlights - Directors' Report - Management Discussion and Analysis - Standalone and Consolidated Financial Statements- Notes to Financial Statements- Related Party Transactions. **(7)**

Financial Ratios : Profitability Ratios, Return Ratios, Liquidity Ratios, Stability Ratios, Efficiency Ratios - Interpretation of Ratios. Working Capital Analysis: Working Capital Calculation - Impact of Working Capital on business - Negative and Positive Working Capital - Perspective of the banker and owner in analysing working capital - Calculating Cash Conversion Cycle - Analysis of Receivables, Inventory, Cash and Payables. **(20)**

Quality of Financial Reporting : Measuring Quality of Earnings - Identifying the potential red flag. Costing: Concepts of Cost - Elements of Cost - Classification of cost - Preparation of Cost Sheet **(10)**

TOTAL : 60

REFERENCE BOOKS

1. *Jain and Narang, "Accounting for Managers", Kalyani Publishers, 2006*
2. *Horngren, Sundem, Elliot, "Introduction to Financial Accounting", Pearson Education, 2005*
3. *Maheshwari.S.N, "An Introduction of Accounting", Vikas Publishig House Pvt Limited 2005.*
4. *Narayanaswamy, "Financial Accounting:A Managerial Perspective", PHI Learning Pvt Ltd, 2008.*
5. *Thomas .R. Robinsn and et.al, "International Financial Statement Analysis", John Weily& Sons, Inc, 2009.*

17MDC33 - COMPUTER SYSTEMS

L	T	P	C
3	0	0	3

PRE-REQUISITES

17MDC24

ASSESSMENT : THEORY

COURSE OUTCOME

The student will be able to

- *Demonstrate the basics of computer systems and Operating systems.*
- *Demonstrate Kernel Management for Inter Process Communication systems.*
- *Estimate the system performance through scheduling algorithms - FIFO, round robin, priority, shortest job first.*
- *Recognize the memory allocation and deallocation for both static and dynamic storage.*
- *Discuss the simple File System using Disk and File System Management of Windows Operating System.*

COMPUTER SYSTEMS OVERVIEW

Basic elements, Instruction Execution, Interrupts, The Memory Hierarchy, Cache Memory, Direct Memory Access, Multiprocessor and Multicore Organization.

INTRODUCTION TO OPERATING SYSTEM

Operating System Objectives and Functions, The Evolution of Operating Systems. **(8)**

PROCESS DESCRIPTION AND CONTROL

Process states, Process description, Process control, Processes and threads, Types of Threads.

CONCURRENCY

Principles of Concurrency, Mutual Exclusion: Hardware support, Semaphores, Monitors.

Deadlock and Starvation: Principles of Deadlock, deadlock prevention, deadlock avoidance, deadlock detection. Windows 7 Concurrency Mechanisms. **(10)**

MEMORY MANAGEMENT

Memory management requirements, Memory partitioning, Paging, Segmentation.

Virtual Memory: Hardware and Control Structures, Operating System Software, Windows Memory Management. **(12)**

UNIPROCESSOR SCHEDULING

Types of Processor Scheduling, Scheduling Algorithms. **(6)**

I/O MANAGEMENT, DISK SCHEDULING AND FILE MANAGEMENT

I/O Devices, Organization of the I/O function, Operating System Design Issues, I/O buffering, Disk Scheduling, RAID, Windows I/O.

File Management : Overview, File Organization and Access, File directories, File sharing, Secondary Storage Management, Windows file system. **(9)**

Total : 45

TEXT BOOKS

1. *William Stallings, "Operating systems Internals and Design Principles", 7th edition, PHI, 2016. (Note: Para I: Computer Systems Overview - refer Online edition)*

REFERENCE BOOKS

1. *Umakishore Ramachandran, William D. Leahy Jr., "Computer Systems: An Integrated Approach to Architecture and Operating Systems", International Edition, Pearson, 2011.*
2. *Silberschatz A., Peterson J.L and Galvin P., "Operating System Concepts", John Wiley Publishing Company, 2002.*
3. *H.M.Deital, "An introduction to Operating System", Pearson Education, 2001*

17MDC34 - DATABASE MANAGEMENT SYSTEMS

L	T	P	C
3	0	0	3

PRE-REQUISITES

17MDC15, 17MDC24

ASSESSMENT : THEORY

COURSE OUTCOME

- *Describe the purpose and architecture of database systems from the perspective of persistent storage of real world data.*
- *Analyse the problem statement, construct the Entity Relationship model and map it into relational model by applying normalization.*
- *Generate Relational Algebra and SQL statements to perform queries of real world applications*
- *Evaluate the indexing techniques and choose the suitable technique by analyzing the given application*
- *Determine the concurrency control and recovery mechanisms based on the criticality of the transaction*

INTRODUCTION

Database System Applications, Purpose of Database Systems, View of Data, Database Languages, Relational Databases, Database Architecture, Database Users and Administrators.

Relational Model : Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Query Languages, Relational Operations. **(4+6)**

DATABASE DESIGN

Database Design and the E-R Model, Overview of the Design Process, The Entity-Relationship Model, Constraints, Removing Redundant Attributes in Entity Sets, Entity-Relationship Diagrams, Reduction to Relational Schema.

Relational Database Design : Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Functional-Dependency Theory. **(5+5)**

INTRODUCTION TO SQL

Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Subqueries, Modification of the Database.

Intermediate SQL: Join Expressions, Views, Transactions, Integrity Constraints, SQL Data Types and Schemas, Authorization. **(11)**

Advanced SQL : Accessing SQL from a Programming Language, Functions and Procedures, Triggers.

Formal Relational Query Languages: The Relational Algebra. **(7)**

TRANSACTION, CONCURRENCY CONTROL AND RECOVERY

Concept, Simple Transaction Model, Atomicity and Durability, Isolation, Serializability, Isolation and Atomicity, Isolation Levels. Lock-based Concurrency Control, Time Stamp based Concurrency Control, Failure Classification, Recovery and Atomicity. **(7)**

Total : 45

TEXT BOOKS

1. *Abraham Silberschatz, Henry F.Korth and S.Sudarshan, "Database System Concepts", Sixth Edition, McGraw Hill, 2010.*

REFERENCE BOOKS

1. *RamezElmasri, Shamkant B. NavatheDurvasula, V.L.N. Somayajulu, ShyamK. Gupta, "Fundamentals of Database Systems", Fourth Edition, Pearson Education, 2006.*
2. *Christopher Allen, Simon Chatwin, Catherine A. Creary, "Introduction to Relational Databases and SQL Programming", Tata McGraw-Hill,2003.*

17MDC35 - OBJECT ORIENTED PROGRAMMING

L	T	P	C
3	0	0	3

PRE-REQUISITES

17MDC15

ASSESSMENT : THEORY

COURSE OUTCOME

- *Students can develop applications in Java using Basic Windows, Swing Framework, Multi threaded Applications and Database Connectivity*
- *Students can learn to apply the Object Oriented Concepts in Java Programming for real world problems.*
- *Students can develop UI using Applets and Swing components.*
- *Students can learn to develop data structures using Collections.*
- *Students will be able to logically group classes and interfaces in one place using inner classes and interfaces.*

INTRODUCTION

The Object Model - The Evolution of the Object Model - Elements of the Object Model - Applying the Object Model

An Introduction to Java - The Programming Environment - Fundamental Programming Structures in Java - Static fields and methods - Method Parameters - Object Construction - Packages - The Class Path. **(7)**

BASICS

INHERITANCE : Classes, Super Classes and Subclasses Objects - The Cosmic superclass - Generic Array Lists - Object Wrappers and AutoBoxing - Methods with a variable number of parameters - Enumeration Classes - Strings.

INTERFACES AND INNER CLASSES : Interfaces - Object Cloning - Interfaces and callbacks - InnerClasses. **DEPLOYING APPLICATION :** JAR Files - EXCEPTIONS - Dealing with Errors - Catching Exceptions. **(10)**

USER INTERFACE COMPONENTS WITH SWING

Swing - Introduction to Layout Management - Text Input - Text Fields - Labels and Labeling Components - Password fields - Text areas - Scroll Panes. Choice Components - check boxes, Radio Buttons and combo boxes. Dialog Boxes - Option Dialogs and Creating Dialogs.

APPLETS

Types of Applets- Applet Basics - The applet Class - Applet Architecture - An applet Skeleton- Applet Initialization and Termination - Display Methods- Requesting Repainting - Using the Status Window - Passing parameters - Applet Context and Show document **(10)**

COLLECTIONS - Collection Interface - Concrete collections - The Collections Framework - Legacy Collections - The Hashtable Class **(9)**

MULTITHREADING - Threads - Interrupting Threads - Thread states.

Database Connectivity : JDBC **(9)**

Total : 45

TEXT BOOKS

1. *Grady Booch "Object - Oriented Analysis and Design with Applications", Second Edition, Pearson Education, 2004.*
2. *Gary Cornell and Cay S.Horstmann, "Core Java Volume1", Eighth Edition, Pearson Education 2013.*
3. *Y.Daniel Liang "JAVA PROGRAMMING", 7th Edition, Pearson Education 2009.*

REFERENCE BOOKS

1. *Herbert Shiltz, "Java: The Complete Reference", Seventh Edition, Tata McGraw Hill, 2007.*
2. *Schaum's OuT lines " Programming With Java", Second Edition, Tata McGraw Hill, 2004.*

17MDC36 - BUSINESS STATISTICS LABORATORY USING R

L	T	P	C
0	0	4	2

PRE-REQUISITES
17MDC16, 17MDC25

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *To develop skills in analyzing data using R software package*
- *To compute various Index Numbers used in Economics using R software*
- *To analyze time series data using R software*
- *To develop Shewhart Control charts for variables and attributes using qcc package of R*
- *To analyze data on Statistical Designs of Experiment like CRD, RBD, LSD using R software*
- *To analyze data with non-parametric methods using R software*

CONCEPTS TO BE COVERED :

1. Creating Data sets in R: Data Structures-Vectors-Matrices-Arrays-Data frames-factors-Lists
2. Reading and Writing Data-read. Table, read. Csv - Subsetting a vector - Subsetting a Matrix
3. Basic Graphs-Bar, Pie Charts-Histograms-Box Plots
4. Basic Statistics-Descriptive Statistics-Frequency and Contingency Tables-Correlations and t-tests
5. Regression Analysis
6. Computing Simple and weighted aggregate index numbers -Laspeyre and Paasche Index Numbers
7. Computing Marshell - Edgeworth, Fisher's Ideal Index Numbers
8. Time-Series Data-Reading and Plotting Time Series Data
9. Decomposing Time Series Data-Decomposing Non-seasonal and Seasonal Data-Seasonally Adjusting
10. Forecasts Using Exponential Smoothing
11. Trend Analysis-Fitting linear trend
12. Trend Analysis-Fitting quadratic and exponential trends
13. Control Charts Using qcc package
14. Shewhart quality control charts for variables: xbar, R and S charts
15. Control Charts for attributes: p, np and c charts using qcc package
16. Cusum charts using qcc package
17. One way ANOVA
18. Non-parametric tests using R: Sign test,Wilcoxon Signed Rank test
19. Non-parametric tests: Mann-Whitney-Wilcoxon test
20. Kruskal Wallis test-Runs test-Spearman's Rank correlation coefficient

TEXT BOOKS

1. *Robert I.Kabacoff, "R IN ACTION:Data Analysis and Graphics with R",Manning Publications Co.,2011*
2. *R.D.Peng, "R Programming for Data Science", Leanpub, 2015*

REFERENCE BOOKS / INTERNET RESOURCES

1. *J.Maindonald and W.John Braun, "Data Analysis and Graphics Using R-an Example Based Approach", 3rd Edition, Cambridge University Press, 2010*
2. *M.Logan, "Biological Design and Analysis Using R: A Practical Guide", Wiley-Blackwell, 2010*
3. *A. Coghlan, "A Little Book of R for Time Series Analysis", Release 0.2, 2015,http://www.calvin.edu/~stob/courses/m344/*S15/a-little-book-of-r-for-time-series.pdf

17MDC37 - BUSINESS DATABASE DESIGN LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Design the conceptual data model as Entity Relationship diagram and create the database using DDL statements for a given application*
- *Formulate simple DML SQL queries to retrieve the required data for real world applications*
- *Generate DML queries with Subqueries, Joins, Group By, Order By and Aggregate functions to filter and aggregate the data of the real world applications*
- *Construct reusable PL/SQL blocks with Functions, Procedures, Packages, Triggers, Exception Handling, and Cursors as required by OLTP applications*
- *Develop a database project by constructing the ER model, creating Tables and generating SQL and PL/SQL blocks using RDBMS platform*

CONCEPTS TO BE COVERED

1. Designing a database for an application and representing it through ER diagram
2. Creating and managing tables
3. Basic SQL SELECT statements
4. Restricting and sorting data
5. Single row functions
6. Displaying data from multiple tables
7. Aggregating data using Group function - Group By
8. Sub queries
9. Views, Sequence, Index, Synonym
10. SET operators, Date and Time functions
11. PL / SQL Programs
12. Exception Handling, Cursors, Functions, Procedures, Package, Triggers

Databases for the above Concepts are to be given from Business Applications like:

- Financial Accounting
- Marketing
- Sales
- Operations Management
- Human Resource Management Applications
- Customer Relations Management
- Supply Chain Management
- Collaborative Workforce management software
- Social Networking Applications

17MDC38 - OBJECT ORIENTED PROGRAMMING LABORATORY USING JAVA

L	T	P	C
0	0	4	2

PRE-REQUISITES
17MDC15, 17MDC17

ASSESSMENT : PRACTICAL

COURSE OUTCOME

Students can develop applications in Java using

- *Basic Windows*
- *Swing Framework*
- *Multi threaded Applications*
- *Database Connectivity*
- *Collections*

CONCEPTS TO BE COVERED

1. Creating Classes and Objects
2. Inheritance
3. Polymorphism
4. Runtime Polymorphism using Abstract Class and Interface
5. Packages
6. Exceptions
7. Multithreading
8. Collections
9. Swings and Applets
10. Event Handling
11. JDBC

17MDC41 - PREDICTIVE ANALYTICS

L	T	P	C
3	0	0	3

PRE-REQUISITES

17MDC13, 17MDC21

ASSESSMENT : THEORY

COURSE OUTCOME

- *Analyze time series data and to use it for forecasting.*
- *Formulate and compute multiple linear regression model and understand its properties*
- *Classify objects into different groups using discriminant function, logistic regression equation and cluster analysis techniques*
- *Identify underlying factors in multivariate data sets using principal component analysis and factor analysis.*

Multiple Regression Analysis(MLR) : Variables in Multivariate Data-Mean Vector, Covariance and Correlation Matrices and their properties-Estimation of missing values. Multiple Linear Regression Equation and Polynomial Regression Models- Estimation of the coefficients using method of least squares-Linear Regression using Matrices-Properties of Least Squares-Inferences in Multiple Linear Regression: ANOVA and testing the partial regression coefficients- Interpretation of R2-Standardized Regression Coefficient and its interpretation-Inclusion of categorical or indicator variables in MLR -Multi-collinearity problem-Stepwise Regression. **(10)**

Time Series Forecasting : Regression Model for forecasting-Forecasting Time Series data with Seasonal Variation-Auto-Regressive(AR) Models- AR Model Identification: ACF and PACF, Moving Average -MA(q)) and ARMA(p,q) Models-Auto-Regressive Integrated Moving Average (ARIMA) Process-Dickey Fuller Test-Augmented Dickey-Fuller Test-Transforming Non Stationary Process to Stationary Process using Differencing-ARIMA(p,d,q) model building-Ljung-box test for Auto-Correlations-Power of Forecasting: Theil's Coefficient. **(12)**

Discrimination and Classification : Discriminant Function Analysis- Fisher's discriminant function -Fitting discriminant functions using R and interpreting the results. Logistic Regression:Logistic Model-Definitions of Odds and Logit-Estimation of the logistic regression coefficients-Making Predictions-Multiple Logistic Regression-Fitting logistic regression equation using R and interpreting the results. **(9)**

Principal Component Analysis and Factor Analysis : DataReduction Techniques-Definition of Population Principal Components -Principal Components obtained by Standardized variables -Rules to retain number of Principal Components using Scree Plot-. Factor Analysis-Definitions-The Orthogonal Factor Model-Its Covariance Structure- Factor Loadings and Interpretations-Exploratory and Confirmatory Factor Analysis- Estimation of PCA and FA using R. **(7)**

Clustering - Introduction-Distance and Similarity Measures used in clustering-Euclidean distance-standardized educlidean distance-Manhattan distance-Minkowski Distance-Jaccard Index-Cosine Similarity and Gower's Similarity-Quality and Optimal Number of Clusters-K-Means Clustering and Hierarchical Clustering Methods -Cluster Analysis Using R and other Software Packages-Applications. **(7)**

Total : 45

TEXT BOOKS

1. *Dinesh Kumar U, " Business Analytics", Wiley, First Edition, 2017 [Para 2,Para3, Para 5]*
2. *Alvin C.Rencher,"Methods of Multivariate Analysis", 2nd Edition, Wiley Inter-science, 2002 [Para 1]*
3. *Richard A.Johnsonand Dean W.Wichern, " Applied Multivariate Statistical Analysis", 6th Edition, Pearson Prentice Hall, 2007[Para 3 and Para 4]*

REFERENCE BOOKS

1. *R.E.Walpole,R.H.Myers,S.L.Myers and K.Ye, "Probability and Statistics for Engineers and Scientists", 9th Edition, Prentice Hal, 2012*
2. *Joseph F. Hair Jr., William C. Black, Barry J.Babin and RolphE.Anderson, "Multivariate Data Analysis", 7th Edition, Pearson, 2010.*
3. *G.James,D.Witten, T.Hastie and R.Tibshirani, "An Introduction to Statistical Learning with Applications in R", Springer, 2015.*

17MDC42 - OPERATIONS RESEARCH FOR BUSINESS

L	T	P	C
3	2	0	4

PRE-REQUISITES
17MDC12

ASSESSMENT : THEORY

COURSE OUTCOME

- *Design the optimal model to improve the efficiency and productivity of any organization using the concepts of mathematical modeling of decision problems,*
- *Design of optimization techniques to solve the mathematical models*
- *Analyze any decision situation and offer solutions for the best utilization of limited resources*

LINEAR PROGRAMMING

Linear programming problem - Formulation - Graphical solution - Simplex method.

Duality and sensitivity analysis - Primal-dual relationships - Economic Interpretation of Duality - Dual Simplex Method - Post Optimal Analysis - Generalized Simplex Algorithm. **(16)**

Applications of Linear Programming : Transportation Model - Vogels Approximation method - Assignment model - Hungarian technique - Degeneracy-unbalanced problems. **(8)**

INTEGER PROGRAMMING

Construction of Gomory's Constraints - Fractional Cut method - Branch and Bound method - Applications. **(6)**

DYNAMIC PROGRAMMING

Characteristics of Dynamic Programming - Recursive nature of computation in Dynamic Programming - Forward and Backward Recursion - Applications: Shortest Route problem - Cargo loading problem - Resource allocation problem - Investment and Budgeting Problems - Reduction of Dimentionality **(8)**

SEQUENCING AND REPLACEMENT

Sequencing - Basic assumptions - Sequencing of n jobs on 2 machines (Johnson's procedure).

Replacement - Need for replacement of equipments - Failure mechanism of items.

Replacement policy - Replacement of items that deteriorates gradually - Replacement of items that fail suddenly. **(8)**

INVENTORY

Need for the inventory - Costs involved in inventory - Concepts of average inventory, economic order quantity - Deterministic model: Fixed ordering quantity models - EOQ model with uniform demand, finite / infinite replacement with / without shortages - EOQ with one price break. Inventory control - Buffer stock - Determination of optimum buffer stock - EOQ system of ordering - Multi item EOQ model - ABC analysis. **(8)**

QUEUING THEORY

Characteristics of queuing systems, steady state M/M/1 model. **(6)**

Total : 60

TEXT BOOKS

1. *Frank R.Giordano, Maurice D.Weir and William P.Fox. Mathematical Modeling, Thomson Brooks/Cole, Vikas Publishing House Pvt Ltd., New Delhi.[Para 1]*
2. *Frederick S.Hiller, Gerald J.Leberman, Bodhibrata Nag and PreetamBasu, "Introduction to Operations Research", Ninth Edition, McGraw Hill, 2010.*
3. *Hamdy A.Taha, "Operations Research - An Introduction", Eighth Edition, 2010.*

REFERENCE BOOKS

1. *S. D. Sharma "Operations Research ", KedarNath ram Nath& co publishers, 10th edition, 1995.*
2. *KantiSwarup, P.K. Gupta, Mani Mohan, "Operations Research", Sultan Chand & Sons, 2001.*
3. *Hillier & Lieberman, "Operations Research - An Introduction", Tata McGrawHill, 2004.*
4. *Billey E. Gillett, "Introduction to Operations Research - A Computer Oriented Algorithmic Approach", Edition 1979.*
5. *U. Dinesh Kumar, "Business Analytics: The Science of Data-Driven Decision Making", Wiley India, 2017*

17MDC43 - CORPORATE FINANCE

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC32

ASSESSMENT : THEORY

COURSE OUTCOME

- *Assess the time value of money and risk return calculation and its importance in financial decisions*
- *Analyse the various sources available for getting funds for the business and the cost involved in it.*
- *Evaluate the investment options available and select the best alternative for investments*
- *Decide the proportion of capital for business and frame the dividend policy.*
- *Implementing the principles and concepts used in financial decision making*

Financial Management : Meaning - Importance of Finance - Objectives - Scope- Financial Decisions. Time Value of Money : Valuation Concepts: Compounding Value, Multiple compounding, Future Value, Compounding Annuities, Present Value - Risk and Return: Types of Risk, Measures of Risk, Efficient Risk-Return Trade off, Capital Asset Pricing Model. **(9)**

Sources of Finance : Sources and its features - Types-Long term sources- Equity, Preferred stock, Retained earnings, Term Loan- Short term sources - Bank Sources **(9)**

Capital Budgeting : Concept, Importance, Kinds of Investment Proposals, Capital appraisal Methods: Pay Back period method, Net Present Value method, Present value index method, Accounting rate of return method - Analysis of Risk and Uncertainty in Capital Budgeting.(Problems) **(9)**

Cost of Capital : Concepts -Classification - Cost of Debt - Cost of Equity - Cost of Retained Earnings - Weighted Average Cost of Capital (Problems). Leverages: Meaning - types - Operating and Financial Leverages - Combined Leverages (Problems) **(9)**

Capital Structure : Meaning and Relevance - Point of Indifference -Theories of Capital Structure: NI, NOI, MM and Traditional approaches - Factors determining Capital Structure. Dividend Policy: Irrelevance of dividends - Relevance of dividends - Determinants - Types of dividends **(9)**

Total : 45

REFERENCE BOOKS

1. *Khan and Jain, "Financial Management", Tata McGraw Hill, New Delhi, 2008*
2. *Pandey .I.M," Financial Management", Vikas Publshing House, New Delhi, 2005*
3. *Prasanna Chandra, "Financial Management", Tata McGraw Hill, New Delhi, 2008*
4. *Maheshwari .S.N," Financial Management", Kalyani Publishers*
5. *Brealey and Meyers, "Principles of Corporate Finance", Tata McGraw Hill,New Delhi, 2008*

17MDC44 - PRODUCTION AND OPERATIONS MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

At the end of the course, the students will be able to

- *Recognize situations in a production system environment that suggests the use of certain quantitative methods to assist in decision making on operations management and strategy..*
- *Predict the future demand by using quantitative approach of various business models for time series analysis.*
- *Find a better method to optimize Production planning.*
- *Analyze the available capacity, planned and unplanned loads to determine the production capacity of an enterprise.*
- *Demonstrate various maintenance schedule techniques for real time applications and also be able to identify the waste and the method of controlling and its disposal.*

INTRODUCTION

Introduction-Primary functions-Evolution of POM-Concept of Production-Production System-Production Management-Operation system-Operations Management-managing global operations- Factors affecting POM-Ways of studying POM-Design and development-Scope of production and operations. **(9)**

INFORMATION SYSTEMS IN POM

Information system for manufacturing and services-Productions and Operations-Contracting Production and Operations management-Business model-Transformation process- Input/output models - Cost and revenues, Profit- Productivity-stages of POM development-Organizational Positions and Career Opportunities in POM. **(9)**

MATERIALS MANAGEMENT AND AUTOMATION

Functions of Materials Management - Material Planning and Control-Purchasing- Stores Management-Inventory control-Standardization-Simplification-Value Analysis-Ergonomics-JIT-Automation- types-computer Integrated Manufacturing - Need for Automation- Automation Strategies- Automated Flow Line- Automated Guided Vehicles Systems-Automated Storage/Retrieval Systems-Carousel Storage Systems-Carousel Storage Applications. **(9)**

MAINTENANCE MANAGEMENT AND WASTE MANAGEMENT

Introduction to Maintenance management-Objectives of Maintenance-Types of Maintenance-Maintenance planning-Maintenance Scheduling-Maintenance Schedule Techniques-Total Productive Maintenance (TPM)-Waste Management-Reasons for Generation and Accumulation of Obsolete, Surplus and Scrap items-Identification and control of Waste-Disposal of Scrap. **(9)**

NEW PRODUCT DEVELOPMENT (NPD) AND SUSTAINABILITY

Introduction-Role of Organization-Competition for New Ideas, Resources, and Customers-Product Innovation failures-Continuous Project Management-New Growth Platforms for Innovation-Dynamics of Brand Share-Innovators and Imitators. **(9)**

Total : 45

TEXT BOOKS

1. *Gupta and Martin Starr., "Production and Operations Management Systems" CRC Press, 2014.*
2. *Anil Kumar.S and Suresh.N., "Productions and Operations Management", New Age International (p) Ltd, 2nd Edition, 2015.*

REFERENCE BOOKS

1. *Norman Gaither, Greg Frazier, "Operations Management "Thomson Learning 9th Edition, 2012.*
2. *Chary.S.N., "Theory and Problems in Production & Operations Management" Tata McGraw Hill 3rd Edition, 2012.*
3. *Jay H. Heizer, Barry Render., "Production and Operations Management: Strategies and Tactics", Allyn &Bacaon, 2011.*

17MDC45 - COMPUTER NETWORKS

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC33

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given an inter-network topology configuration, can demonstrate how a packet reaches the destination*
- *For a given inter-network specification, choose appropriate inter-networking devices.*
- *For given requirements, can develop simple network applications using Socket API*
- *For a given inter-network, find the best route to a destination by applying the various routing protocols*
- *For a given network application, can identify the protocols involved at the various layers and demonstrate the role of the protocols*

FOUNDATION AND DIRECT LINK NETWORKS

Building a Network : Applications - Requirements - Network architecture - Implementing Network Software - Performance. Connecting to a network : Perspectives on Connecting - Framing - Error Detection - Reliable Transmission - Ethernet and Multiple Access Networks. **(10)**

INTERNETWORKING

Switching and Bridging - Basic Internetworking - Routing - Implementation - IPv6. **(10)**

END -TO - END PROTOCOLS

Simple demultiplexer - Reliable Byte Stream - Remote Procedure call - Transport for Real-Time Applications. **(9)**

CONGESTION CONTROL AND RESOURCE ALLOCATION

Issues in Resource allocation - Queuing Disciplines - congestion control - Congestion Avoidance - Quality of Service. **(8)**

APPLICATIONS

Traditional Applications - Multimedia applications - Infrastructure services. **(8)**

Total : 45

TEXT BOOKS

1. *Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Morgan Kaufmann, 5th Edition, 2012.*

REFERENCE BOOKS

1. *Andrew S. Tanenbaum, David J Wetherall, "Computer Networks", 5th Edition, Pearson Education, 2010.*
2. *Behrouz Forouzan, "Introduction to Data communication and networking", Tata McGraw Hill, 1998.*
3. *William Stallings, "Data communication", Pearson Education Asia, 2004.*

17MDC46 - PREDICTIVE ANALYTICS LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
17MDC16, 17MDC25

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Use R software to analyze multivariate data using multiple linear regression, discriminant function, logistic regression equation models and cluster analysis tools*
- *Using R software to analyze Time Series Models*
- *Identify underlying factors in multivariate data by applying factor analysis and principal component analysis models using R software packages*

CONCEPTS TO BE COVERED

1. Reading and Plotting Multivariate Data-Matrix scatter plot and Scatter plot with the Data Points Labelled by their Group
2. Calculating Summary Statistics for Multivariate Data-Means and Variances per group, Between-groups Variance and Within-groups Variance for a Variable
3. Calculating Covariances, Correlations and Standardizing Multivariate Data
4. Fitting Multiple Regression Equation using MS-Excel and interpreting the output
5. Writing Script files in R for Fitting Multiple Regression Equation: Summary, extracting ? coefficients, Covaraince matrix, standard errors, residuals and fitted values and plotting,Normal Probability Plot of residuals, Predictions-Compare the results using lm command
6. Step wise regression: forward, backward and stepwise using
7. Differencing a Time Series, Selecting a Candidate ARIMA Model,
8. Forecasting Using an ARIMA Model
9. Fitting logistic regression equation using glm(): Prediction, goodness of fit and Plotting ROC Curve
10. Discriminant function analysis using lda() and loadings for the discriminant functions
11. Principal component Analysis using prcomp() : screeplot to decide on the number of components to retain and loadings for the PCs and Scatter Plots for PCs
12. Factor Analysis using factanal()
13. Cluster Analysis-Hierarchical Clustering using hclust()
14. Cluster Analysis- Non-hierarchical Clustering Methods-K-means Method using kmeans()

TEXT BOOKS

1. *A. Coghlan, "A Little Book of R for Multivariate Analysis", Release 0.1, 2014,http://people.stat.sc.edu/hansont/stat730/Coghlan2014.pdf*
2. *A. Coghlan, "A Little Book of R for Time Series ", Release 0.2, 2018, https://media.readthedocs.org/pdf/a-little-book-of-r-for-time-series/latest/a-little-book-of-r-for-time-series.pdf*

17MDC47 - BUSINESS PROCESS OPTIMIZATION LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

17MDC12, 17MDC42, 17MDC44

ASSESSMENT : PRACTICALS

COURSE OUTCOME

- *Be able to use Of Excel and SciLab programming in solving problems in Operations Research.*
- *Gain knowledge in writing script files in SciLab to perform Optimization problems.*
- *Be able to use Excel in solving problems in Production problems.*
- *Be able to use Excel in solving problems in Operations management.*

CONCEPTS TO BE COVERED

1. A) Solve Linear Programming problems using Excel and Scilab
   B) Transportation Problem
   C) Assignment Problem
2. Perform sensitivity analysis using Excel and Scilab.
3. Solve Replacement problems using Excel and Scilab.
4. Integer Programming solutions using Excel.
5. Perform project Management using Excel.
6. Perform Inventory management using Excel.
7. Solve Just-in-Time and supply chain management problems using Excel.
8. Perform Operations scheduling using Excel.
9. Study a Quality management system using Excel and Scilab.
10. Study Production problems using Excel and Scilab.
11. Perform simulation of Single Server Queuing System using Excel.
12. Perform simulation of Able and Baker Problem using Excel.

17MDC48 - FINANCIAL ANALYSIS LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
17MDC32, 17MDC43

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Evaluate the various items to be included in the financial statements and create a dynamic financial model for preparing the financial statements.*
- *Widen and Deepen their knowledge on the financial statement linkages*
- *Prepare a financial model for time value of money, capital budgeting and cost of capital applications*
- *Analysing the working capital of a company*
- *Develop a model for detailed financial statements analysis model using Excel and Python.*

CONCEPTS TO BE COVERED

1. Financial Statement Building : Financial Statement Modelling projection of Revenues, Costs and other Income statement and Balance Sheet Items. Creating a dynamic model for financial statements
2. Financial Statement Linkages for Company Model Building.
3. Time Value of Money Applications - Loan Schedule Creation, EMIs, Effect of change of parameters on EMI and Tenure;
4. Capital Budgeting Applications : Net Present Value; Internal Rate of Return.
5. Cost of Capital : Cost of Debt, Cost of Equity, Weighted Average cost of capital
6. Capital Structure : Compute Optimal Capital Structure
7. Working Capital Analysis : Arriving at working capital requirement
8. Financial Statement Analysis :
    a. Choose a listed company from BSE website
    b. Download the annual report
    c. Create a financial model for analysing the financial statements of the company
    d. Create a model for identifying the red flags in the statement
    e. Give recommendations for the company

17MDC49 - MANAGERIAL COMMUNICATION SKILLS

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Conceive appropriate verbal responses from the learners to a given social situation, using the guidelines to effective speaking skills and body language.*
- *Generate trouble shooting solutions to develop team building and interpersonal skills with case studies that focus on body language and empathy.*
- *Develop appropriate responses for business phone calls and formulate effective resolutions to professional conflicts that arise out of cross cultural communication gaps in a given managerial context.*
- *Compose appropriate written responses to professional problems faced by a team at the workplace arising out of ineffective communication skills.*

INTRODUCTION

Introduction - Code and Content - Stimulus and Response: Source - The Encoding Process - The Channel - The Decoding Process - The Receiver - Speaking Skills - Effective Speaking Guidelines - Communicating Soft Skills: A Self-assessment - Closing Tips **(6)**

SOFT SKILLS

Introduction to Soft Skills - Lessons from the Three Case Studies - Change in Today's Workplace: Soft Skills as a Competitive Weapon - Antiquity of Soft Skills - Classification of Soft Skills: Time Management - Attitude - Responsibility - Ethics, Integrity, Values and Trust - Self-confidence and Courage - Consistency and Predictability - Teamwork and Interpersonal Skills - Communication and Networking - Empathy and Listening Skills - Problem Solving, Troubleshooting and Speed reading - Leadership - Body Language **(7)**

TELEPHONING SKILLS & NEGOTATIONS

Preparing to make a telephone call - Receiving calls - Taking and leaving messages - Asking for and giving repetition - The secretarial barrier - Cross-cultural communication on the telephone - Setting up appointments - Changing arrangements - Ending a call - Cross-cultural communication on the telephone - Problem-solving on the telephone - Complaints - Negotiations: Types of negotiation - Preparation for a negotiation - Making an opening statement - Bargaining and making concessions - Accepting and confirming - Summarizing and looking ahead - Types of negotiator - Dealing with conflict - Rejecting - Ending the negotiation **(10)**

WRITING SKILLS TO CREATE AN IMPRESSION

Introduction- Fifteen Principle to Increase Clarity in Communication - Edit-Edit-Edit: The Reader's Perspective - Clarity of Thought - Clarity of Text. **(7)**

Total : 30

REFERENCE BOOKS

1. *Mitra K.Barun, "Personality Development and Soft Skills", Oxford University Press, 2011.*
2. *Krishna Mohan, Meera Banerji. "Developing Communication Skills" Mac Million Publishers, 2012.*
3. *Sai Lakshmi. B, "Poly Skills- A Course in Communication and Life Skills" Cambridge University Press, 2012.*

17MDC51 - ORGANISATIONAL BEHAVIOUR

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC14

ASSESSMENT : THEORY

COURSE OUTCOME

- *Develop the skills for influencing and managing groups thus enhancing personal and interpersonal skills*
- *Assess the potential effects of organisation culture and conflict on behaviour and the effective management of stress.*
- *Analyse the functions of the organisation, individual behaviour and manage interactions in the workplace.*
- *Develop the human resource management skill and competencies in planning, control and problem solving*
- *Evaluate the management best practices tools and models to implement an effective HRM system*

Organisational Behaviour : Meaning - Organisation as work settings - Organisational Behaviour and Management - Ethics and Organisational Behaviour - Work force diversity. Organisational Conflict: Meaning -Types - Levels - Managing Conflict - Case Study. **(9)**

Organisational Culture : Concept - Observable aspects - Values and organisational culture - Managing organisational culture - Organisational development process and application - Change in organisation - Planned change strategies - Resistance to change- Case Study. **(9)**

Group Dynamics : Groups in organisation - Stages of group development - Group effectiveness - Group and intergroup dynamics - Decision making in groups - high performance teams -Team building. Interpersonal Relationship: Empowerment, Organisational politics, Essentials of Interpersonal Communication -- Case Study. **(9)**

Introduction to HRM : Meaning and definition of HRM -Organization of HR department: Line and Staff Aspects - Role of HR managers. Recruitment: Planning and Forecasting, Effective Recruiting- Selection: Basic Testing concept, Type of tests, Interviewing candidate: Features of interview- Case Study. **(9)**

Performance Maangement : Performance appraisal system - Techiques and methods for performance appraisal. Training & Development : The Training process- Training's strategic context, Five step training and development process, Types of Training. Compensation : Basic Factors in Determining pay rates- Establishing pay Rates, Competency -Based pay -- Case Study. **(9)**

Total : 45

REFERENCE BOOKS

1. *John .R. Schermerhorn, James. G. Hunt and Richard. N. Osorn, "Organizational Behaviour" Wiley Publication, 7th Edition.*
2. *B. Narayan and Bharati Sharma, 1993; "Behavioral Science in Management" Omsons Publications, New Delhi.*
3. *Harlow/Hamke, 1975; "Behaviour in Organizations Text, Readings and Cases", Little, Brown and Company.*
4. *Stephen P. Robbins, 1985; "Organizational Behaviour, Concepts, Controversies and Applications", Prentice Hall of India Private Limited, New Delhi.*
5. *K. Aswathappa, "Organizational Behaviour Text, Cases and Games" Himalaya Publishing House, Mumbai, Sixth Edition (2005)*
6. *J. W. Newstrom, "Organizational Behaviour Human Behaviour at Work" Tata McGraw Hill Publishing Company Limited, New Delhi, 12th Edition (2007)*

17MDC52 - DIGITAL MARKETING

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Assess the impact of digital technology on the practice of marketing.*
- *Analyse the use of different forms of digital marketing in the development of an online presence.*
- *Develop a plan for marketing a product of business online.*
- *Integrate social media tools into a marketing communications strategy.*
- *Use a publishing platform to build a web presence with integrated data collection and links to social media.*

Understanding Marketing Management : Importance, Scope, Core Marketing Concepts, Marketing Tasks. Company Orientation towards Market Place: Evolution, New Marketing Realities. Marketing Mix: 4 Ps, Movement to 4 Cs & 7 Ps. **(9)**

Introduction to Digital Marketing : Need for digital marketing - Commonly used terminology - 4Cs : Customer, Content, Context and Conversation - three essential ingredients: Traffic, Insights and Conversions - Introduction to customer personas, buying process and their usability - Designing a basic digital marketing plan. **(9)**

Developing Marketing Strategies : Market Segmentation: Levels, Patterns, Bases, Effective Segmentation Criteria. Targeting: Approaches. Positioning : Steps, Differentiation Strategies. Competitive Dynamics: Strategies of Market Leaders, Challengers, Followers & Nichers. **(9)**

Building Online Presence : Introduction to Building online presence for businesses - basic terminology and technology - Website Domain: naming, working & registration - Website operation - Learn to host website - Introduction to WordPress - basic concepts of linking content using HTML.

Building Traffic: Different techniques for driving traffic or visitors to a website - Introduction to search engine optimization, Social media marketing, referral traffic, display ads, search engine marketing, affiliate marketing and email marketing. **(9)**

Getting Insights : Collect and analyze data of visitors to websites - Introduction to Google Analytics and Google Webmaster Tools - Workings of web analytics - Set up Google Analytics for a website - Set up goals and filters in Google Analytics - Access and interpret reports - Set up and use Google Webmaster Tools for effectiveness of search engine optimization.

Driving Conversions : Convert website visitors into buyers - Basic conversion tracking using Google Analytics and ad platforms - Introduction to Landing Pages - Different types of conversions - Campaign optimization - Learn to create a landing page using UnBounce. **(9)**

Total : 45

REFERENCE BOOKS

1. *Seema Gupta, "Digital Marketing", McGraw Hill, 2018.*
2. *Damian Ryan, "Understanding Digital Marketing - Marketing Strategies for Engaging the Digital Generation", 3rd Edition, Kogan Page Ltd., 2014*
3. *Philip Kotler, Kevin Lane Keller, Abraham Koshy&MithileshwarJha, "Marketing Management: A South Asian Perspective", 14th Edition, Pearson, New Delhi, 2014*
4. *Dave Evans and Jake Mckee, "Social Media Marketing - The Next Generation of Business Engagement", Wiley India pvt. Ltd, New Delhi, 2011.*
5. *Perry Marshall, Thomas Melloche, "Ultimate Guide to Facebook Advertising", Tata McGraw Hill, New Delhi, 2011.*

17MDC53 - SOFTWARE ENGINEERING

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Choose and practice the software development process based on the factors such as problem complexity, time and cost to develop the software system*
- *Create the requirements model by specifying the use cases and actors involved in the scenario or by specifying the classes along with their responsibility and collaboration involved in the given problem to describe the requirements of the software system*
- *Design the architecture of the system in the various perspectives such as class model, component model and layered model based on the type of the proposed software system*
- *Design the test plans to conduct unit, integration, system and acceptance testing on the developed system*
- *Determine the size of the product by applying LOC or Function Point metrics*

INTRODUCTION

Software Definition - Software Application Domains - Legacy Software - The Software Process - Software Engineering Practice - Software Process Structure - Process Models: Prescriptive Process Models, Specialized Process Models, The Unified Process, Agile Process: Agile Principles, The Extreme Programming Process. **(8)**

MODELING

Understanding Requirements - Requirements Modeling : Scenario-Based Methods, Class Based methods, Web/Mobile Apps. **(6)**

DESIGN PROCESS

Design Concepts - Design Model : Architectural Design: Software Architecture, Architectural styles, Architectural Design - Component Level Design: Component Definition, Designing Class-Based Components, Component-Level Design for WebApps and Mobile Apps - User Interface Design: Interface Analysis, Interface Design, WebApp and Mobile Interface Design - Pattern-Based Design: Design Patterns, Pattern-Based Software Design, Architectural Patterns - WebApp Design - MobileApp Design. **(15)**

CODING AND TESTING

Code Review - Black Box Testing - White Box Testing - Debugging, Integration and System Testing. **(7)**

SOFTWARE PROJECT MANAGEMENT

Project Management Concepts - Software Project Management Complexities - Responsibilities of a Software Project Manager - Metrics for Project Size Estimation: Lines of Code, Function Point Metric - Project Estimation Technique: Basic COCOMO Model. **(9)**

Total : 45

TEXT BOOKS

1. *Roger S Pressman, "Software Engineering - A Practitioners Approach", Seventh Edition, McGraw Hill Edition, 2010.*
2. *Rajib Mall, "Fundamentals of Software Engineering", Fourth Edition, Prentice Hall India, 2014.*

REFERENCE BOOKS

1. *Ian Somerville,"Software Engineering", 9th edition,Pearson,2010.*
2. *Pankaj Jalote, "An integrated approach to Software Engineering", 3rd edition, Narosa publishing house, Reprint 2013.*

17MDC54 - ENTERPRISE RESOURCE PLANNING

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Develop the integrated approach to managers for various decision making*
- *Identify the various functional modules for vertical and horizontal workflow of business operations*
- *Develop a knowledge on the issues and challenges in developing a software for ERP*
- *Create an understanding on the implementation process of ERP.*
- *Create an understanding on the procedures of e-commerce and e-payment system*

Concept and Benefits of ERP : Definition of ERP - ERP potential in business transformation - Demand for ERP, Evolution - ERP market -Roles of ERP - Need for ERP-Gap analysis-Competitive environment analysis-Strategic needs analysis-Feasibility analysis-ERP project life cycle-cost elements **(9)**

ERP enabled Business process reengineering : Necessity of Reengineering-Business process re-engineering-Implementing BPR-BPR characteristics and steps-ERP and BPR-ERP modelling in BPR-Business case-Five stages- BE analysis. **(9)**

ERP project implementation : ERP implementation life cycle- ERP with respect to small and medium enterprises -Issues in ERP project management. **(9)**

E-Commerce and M-Commerce : E-commerce - Types - PCs and Networking -Concerns for e-commerce growth-Legal framework for e-commerce- M-commerce and Legal framework. **(9)**

E-Payment : Electronic payment systems - Requirements - E cash - Echeque - EFT - Credit Card Payment System - Micro payments - Payment gateways -Mobile payment methods - Mobile Banking. **(9)**

Total : 45

REFERENCE BOOKS

1. *Vinod Kumar Garg and Venkatakrishnan .N.K. "Enterprise Resource Planning Concepts and Planning", Prentice Hall,2011.*
2. *Mahadeo Jaiswal and GaneshVanapalli, "Enterprise Resource Planning",MacMillan Publications,2009.*
3. *Sadagopan.S, "ERP -A Managerial Perspective", Tata Mc.Graw Hill Publications,1999*
4. *Mary Sumner,"Enterprise Resource Planning",Pearson Publications,2005*
5. *Monk Wagner,"Concepts in ERP", Thomsan Publications,2009*

17MDC55 - HUMAN RESOURCES SYSTEM DEVELOPMENT LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
17MDC41, 17MDC46

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Create a dashboard for employer, employee and admin to view the data's in the library created.*
- *Develop a knowledge of exploring the data used in HR analysis.*
- *Create charting and graphical representations of data for easy understanding*
- *Evaluate and investigate the datas to create models to meet the requirements of HR in decision making*
- *Create an HR system for workforce, Compensation, Recruitment, Selection and Performance analytics*

CONCEPTS TO BE COVERED

HR Analytics using Spread sheets and R platform :

Create a HR system for :

- Workforce analytics
- Compensation analytics
- Employee Churn analytics
- Recruitment and selection analytics
- Training analysis
- Employee Performance analysis

Steps to be followed for creating the HR system:

- Understanding HR indicators, Metrics and data
- Data Collection and tracking
- Assess IT requirements to meet HR needs
- Create the Libraries to view the structure of the data
- Data Exploration
- Graphs, Tables, Spread sheets, data manipulation
- Investigate the Data
- Create an Employee Dashboard
- Create a Manager Dashboard
- Create an Admin Dashboard

17MDC56 - DIGITAL MARKETING DESIGN LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
17MDC52

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Design the landing page with professional lead magnets and copywriting*
- *Integrate analytics into the digital marketing process to gain insights*
- *Optimize the website so that the business can be displayed in the Google search engine*
- *Utilize social media for marketing*
- *Audit the impact of social media marketing*

CONCEPTS TO BE COVERED

- Identify a business for which digital marketing is to be launched
- Design the landing page
  - Create Lead Magnets
  - Perform Copywriting
- Integrate Google Analytics
- Email Marketing
  - Plan for Email campaign
  - Create Email templates and designs
  - Track the Email visitors
- Content and Blog Marketing
- Practice SEO (Search Engine Optimization) Techniques
- Social Media Marketing
  - Paid Ads
  - Marketing through Facebook, Instagram, Twitter, LinkedIn, Youtube
- Social Media Marketing Audit

17MDC57 - ENTERPRISE APPLICATION DEVELOPMENT LAB

L	T	P	C
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PRE-REQUISITES
17MDC35, 17MDC38

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Design and implement the web logic using Servlets, application logic using Session EJB and entity objects using Entity EJB, for a given business problem.*
- *Given a business scenario, design a solution using MVC Architecture and model the components needed for the solution.*
- *Given a business application, establish the connection between the database and application using JDBC and connect business applications to persistent data stores.*
- *For a given business scenario, design and create rich client application using RSS Feeds and Tags.*
- *Design and implement innovative business applications manifesting n-tier architecture.*

CONCEPTS TO BE COVERED

- Understand and design the generic business process model of an enterprise.
- Design enterprise applications using MVC Architecture
- Design and implement online business processing through Servlet components.
- Develop reusable business logics using Session EJB components.
- Develop persistent entity objects using Entity EJB components.
- Improve the business through developing enterprise blogs.
- Improve the user accessibility of the application by creating web feeds.

Business Applications relating to:

- Financial Accounting
- Marketing
- Sales
- Operations Management
- Human Resource Management Applications
- Customer Relations Management
- Supply Chain Management
- Collaborative Workforce management software
- Social Networking Applications

17MDC58 - PERSONALITY DEVELOPMENT

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Ascertain the various concepts of Self like the Physical Self - Energy Self - Intellectual Self - Mental Self - Blissful Self with respect to the Western(Occidental) and Eastern(Oriental) theories of the Self and Personality Development.*
- *Outline the significant effects of Self Confidence to build team confidence, given the foundation principles of Self Motivation and Confidence.*
- *Assess the various personalities and Attitudes and choose the best attitude for making bold decisions in personal and professional contexts.*
- *Project the appropriate grooming and the right etiquette in the corporate context to excel in professional life.*

PERSONALITY DEVELOPMENT

One's Personality Sends Out a Signal That Others Read - Same Person: Consciously Different Personalities can be Powerful - There isn't One Right Personality; It Differs by Role - Learning about Personality Development from the Three Cases - Personality Analysis - Freudian Analysis of Personality Development - Swami Vivekananda's Concept of Personality - Development: Physical Self - Energy Self - Intellectual Self - Mental Self - Blissful Self - Personality Begets. **(10)**

LEADERSHIP QUALITIES & INTERPERSONAL SKILLS:

Resolving Conflict - A Smiling Face - Appreciative Attitude - Assertive Nature - Communication Skills - Listening Skills - Developing Empathy - The Personality Attribute of Taking Bold Decisions - Personality Types and Leadership Qualities - Mapping the Different Personality Types - Personality Tests: Example of a Personality Test: Jung Typology Test - Personality Assessment **(10)**

ETIQUETTE

Social Etiquette - Corporate Etiquette - Personal Grooming - Using minimal Body Language - Leadership and Entrepreneurship : Corporate Training - Professionalism - Self awareness - Creativity skills - Cognitive Development - Assertiveness - Positive Thinking and Attitude. **(10)**

Total : 30

REFERENCE BOOKS

1. *Mitra K.Barun, "Personality Development and Soft Skills", Oxford University Press, 2011.*
2. *Krishna Mohan, Meera Banerji. "Developing Communication Skills" Mac Million Publishers, 2012.*
3. *Sai Lakshmi. B, "Poly Skills- A Course in Communication and Life Skills" Cambridge University Press, 2012.*

17MDC61- ECONOMIC FOUNDATIONS OF BUSINESS

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Evaluate the Concepts of economics in the managerial decision making process.*
- *Analyse the production and cost function to maximise profit and minimise cost.*
- *Assess the basics of market structures in the business environment.*
- *Enumerate the GDP and assess its impact on the economic policy*
- *Develop the micro and macro economic approaches in business decisions.*

Principles of Economics: Decisions, Interaction, Economy as a Whole Works. Economist as Scientist: Scientific Method, Assumptions, Economic Model, Microeconomics and Macroeconomics. Economist as policy advisor: Positive Vs Normative analysis, Economists disagree in scientific judgment. Values: Perception Vs Reality. **(9)**

The Market Forces of Supply and Demand: Market and Competition, Demand, Supply, Supply and Demand Equilibrium. Elasticity and Its Application: Elasticity of Demand, Elasticity of Supply, Applications of Elasticity of demand and supply. **(9)**

Production and costs : Production function, Types of costs, costs in short run and in the long run. Firm and market structure: Competitive Markets, Monopolistic Competition, Oligopoly and Monopoly. **(9)**

Monetary System : Functions of Money, Kinds of Money, Banks and the Money Supply. Money Growth and Inflation: Classical Theory of Inflation, Costs of Inflation. Measuring a Nation's Income:Economic Income and Expenditure, Gross Domestic Product, Components of GDP, Real versus Nominal GDP. **(9)**

Aggregate Demand and Aggregate Supply : Key Facts about Economic Fluctuations, Explaining Short-Run Economic Fluctuations, Aggregate-Demand Curve, Aggregate-Supply Curve, Causes of Economic Fluctuations. Influence of Monetary and Fiscal Policy on Aggregate Demand: Monetary Policy Influences, Fiscal Policy Influences and Using Policy to Stabilize the Economy. **(9)**

Total : 45

REFERENCE BOOKS

1. *N. Gregory Mankiw, "Principles of Macroeconomics", 6th Edition, South-Western Cengage Learning, USA, 2012.*
2. *N. Gregory Mankiw, "Principles of Microeconomics", 7th Edition, Cengage Learning, Stamford, USA, 2012.*
3. *Varshney R.L & Maheshwari.K.L, "Managerial Economics" Sultan Chand & Sons, New Delhi, 2013.*
4. *Mehta P.L, Managerial Economics, Sultan Chand & Sons: New Delhi, 2008.*

17MDC62 - COMPUTATIONAL INTELLIGENCE

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Understand the basics of Intelligent Agents and Searching Strategies*
- *Build Simple Knowledge based systems*
- *Demonstrate working Knowledge of reasoning in the presence of uncertain knowledge*
- *Apply various decision making methods in real world environment*
- *Analyze and apply the application view of artificial Intelligence*

INTRODUCTION

Introduction to Computational Intelligence - Computational Intelligence Paradigms **(5)**

ARTIFICIAL INTELLIGENCE

INTRODUCTION : Intelligent Agents - Solving Problems by Searching - Adversial Search- Constraint Satisfaction Problems.

KNOWLEDGE, REASONING AND PLANNING : Logical Agents - First Order Logic - Inference in First order Logic - Knowledge Representation. **(12)**

ARTIFICIAL NEURAL NETWORKS

Artificial Neuron : Calculating the Net Input Signal - Activation Functions - Artificial Neuron Geometry- Artificial Neuron Learning **(6)**

Supervised Learning Neural Networks : Neural Network Types - Supervised Learning Rules - Functioning of Hidden neurons - Ensemble Neural Networks **(7)**

Unsupervised Learning Neural Networks : Background - Hebbian Learning Rule - Principal Component Learning Rule - Learning Vector Quantizer-I - Self-Organizing Feature Maps **(7)**

EVOLUTIONARY COMPUTATION Introduction - Genetic Algorithms - Genetic Programming - Evolutionary Programming **(8)**

Total : 45

TEXT BOOKS

1. *Andries P. Engelbrecht, "Computational intelligence: an introduction", editon 2, John Wiley and Sons, 2007.*
2. *Stuart Russell, Peter Norvig, "Artificial Intelligence- A modern Approach", Pearson Education, 3rd Edition, 2010.*

REFERENCE BOOKS

1. *Elaine Rich, Kevin Knight, Shivashankar B. Nair "Artificial Intelligence", Tata McGraw Hill, 3rd Edition.*
2. *Dan W.Patterson, "Introduction to Artificial Intelligence and Expert Systems", Prentice-Hall of India, 2008.*

17MDC63 - MOBILE AND CLOUD COMPUTING

L	T	P	C
3	0	0	3

PRE-REQUISITES

17MDC33, 17MDC45

ASSESSMENT : THEORY

COURSE OUTCOME

CO1 : *Illustrate the roles of the protocols and architectural components employed in a wireless network technology.*

CO2 : *Describe the adaptations of the various traditional entities to accommodate the issues imposed by mobile environment*

CO3 : *Illustrate the fundamental concepts of cloud computing technology.*

CO4 : *Recognize the levels and mechanisms of resource virtualization applicable for scalable computing.*

CO5 : *Choose appropriate service providers, tools and platforms for implementing cloud computing solutions in an organization considering its requirements.*

MOBILE COMPUTING

Introduction and Layer 1 and 2 of Network Stack : Components of wireless communication systems - Architecture of a Mobile Telecommunication systems - Wireless Networking standards - Wireless LAN Networks - Bluetooth Technologies- Characteristics of Mobile computing - structure of Mobile computing applications - Cellular Mobile communication Technologies : GSM - GPRS - UMTS - MAC protocols. **(9)**

Higher Layers : Mobile Internet Layer - Mobile Transport Layer - Mobile Databases - Operating systems for Mobile computing - Application of Mobile computing: Mobile Commerce **(9)**

CLOUD COMPUTING

Overview of Cloud Computing : Introduction - NIST Cloud Model - Benefits of Cloud Computing - Challenges of Cloud Computing - Cloud-Enabling Technologies - Cloud Standards and References - Cloud Deployment Models - Cloud Service Delivery Models

Cloud Reference Architecture : Introduction to Reference Framework - Role-based Cloud Computing Reference Architectures - Layer-based Cloud Computing Reference Architectures **(9)**

Introduction to Virtualization : Need - Benefits and Limitations - Approaches to Virtualization - Types of Virtualization - Virtualization Concepts: Computer System Architecture - Virtual Machines - Virtualization Software - Resource Virtualization: Processor - Memory - Storage - Network - Input/Output

Cloud Programming and Software Environments - Amazon Web Services - Microsoft Cloud Platform - Google Cloud Platform **(9)**

Cloud Storage System : Basics - Models - Architecture - File Systems - Data Store and Access - Protocols

Cloud Computing Security : Significance of Security - Identified Cloud Security Issues - Categorization of Cloud Security Issues - State-of-the-Art Solutions - Security Reference Architecture - Identity and Access Management

Case Studies : Cloud Service Providers, Scenarios for Cloud Adoption for Small, Medium and Large Enterprises, Incidents on Cloud Security **(9)**

Total : 45

TEXT BOOKS

1. *Pattnaik, Prasant Kumar, Mall, Rajib, "Fundamentals of Mobile Computing", Second Edition, PHI, 2016. (Para I,II)*
2. *A.Kannammal, "Fundamentals of Cloud Computing", Cengage Learning, 2015.*

REFERENCE BOOKS

1. *Jochen Schiller, "Mobile Communications", Addison-Wesley, 2004.*
2. *Raj Kamal, "Mobile Computing", Oxford university press, 2nd edition, 2012.*
3. *Rajkumar Buyya, Christian Vecchiola and S.ThamaraiSelvi, "Mastering Cloud Computing", McGraw Hill, 2013.*
4. *James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.*

17MDC64 - DATA WAREHOUSING AND MINING

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC34

ASSESSMENT : THEORY

COURSE OUTCOME

Upon completion of the course, the students should be able to:

- *Demonstrate the need for data preprocessing and suggest appropriate methods to produce proper data sources for mining.*
- *Analyze the suitability of design technique to find mining solution with efficient time, cost and memory requirement.*
- *Interpret optimized decisions by building data warehouse and employing the mining concepts in business intelligence problems.*
- *Construct a legitimate mining solution with the help of design technique guidelines and validate the suitability of the techniques applied.*
- *Device suitable methods for mining unstructured data in vaiours applications.*

INTRODUCTION

Definition and need of data mining, Kinds of data and patterns, Applications and issues. Types of data : Data objects and attribute types, Measuring data similarity and dissimilarity. Data Pre-processing: Overview, data cleaning, data integration, data reduction, data transformation and data discretization. **(15)**

DATA WAREHOUSE AND OLAP TECHNOLOGY

Data warehouse-basic concepts, data warehouse modelling, data warehouse implementation **(9)**

DATA MINING TECHNIQUES

Mining Frequent Patterns and Associations : Basic concepts, Frequent itemset mining methods.

Classification : Basic concepts, Decision tree induction, Bayes classification methods.

Cluster Analysis : Basic concepts and methods, partitioning methods, hierarchical methods: Agglomerativeand divisive hierarchical clustering.

Outlier Detection : Outliers and Outlier Analysis, Outlier Detection Methods. **(16)**

DATA MINING TRENDS

Mining Sequence Data, Mining Other Kinds of Data, Visual and Audio Data Mining, Data mining applications. **(5)**

Total : 45

TEXT BOOK

1) *Jiawei Han, Micheline Kamber and Jian Pei, "Data Mining - Concepts and Techniques", Third Edition, Elsevier Publications, 2012.*

REFERENCE BOOK

1) *Arun K Pujari, "Data Mining Techniques", Universities Press.*

17MDC65 - MOBILE AND CLOUD APPLICATION DEVELOPMENT LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
17MDC38

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Optimize websites for mobile devices using HTML5.*
- *Design and Build a fully functional store-worthy Android app that is aware of the resource constraints of mobile devices.*
- *Demonstrate knowledge on creating, cloning, migrating virtual machines using a virtualization tool*
- *Utilize public cloud services and offer services in cloud.*
- *Illustrate containarization by developing suitable applications.*

CONCEPTS TO BE COVERED

Mobile Application Development :

HTML5 :

Creation of fully functional HTML5 app

Android :

Building a basic UI-driven App

Using Phone Gap to package HTML5 apps into native apps

Creating Android services

Applications carrying out data management with SQLite3

Basic Networking using WebKit

Image manipulation

Proximity and Location services (Android NFC, Bluetooth, Google Maps)

Cloud Application Development :

I. Virtualization - Virtual Box

1. Create virtual machines of different configurations
2. Establish communication between host and virtual machine
3. Establish communication between virtual machine to virtual machine
4. Show the virtual machine migration from one node to the other.

II. Public Cloud

1. Explore Amazon S3 and EC2
2. Create virtual machines in Amazon, run a sample java application on the EC2 instance
3. Communicate between two EC2 instances
4. Run an application in the Google App Engine
5. Working with Docker Containers.

17MDC66 - DATA MINING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
17MDC34

ASSESSMENT : PRACTICAL

COURSE OUTCOME

The student will

- *Employ data cleaning techniques for normalization and standardization of given dataset.*
- *Determine the mining solutions using data mining techniques in real time problems.*
- *Implement mining techinques, infer and interpret the accurancy of the result.*
- *Find the outliers using various Outlier Detection methods in a given dataset.*
- *Evaluate the accuracy of measures for text retrieval and classification of Web documents.*

CONCEPTS TO BE COVERED

1. Perform data cleaning techniques for a given data test.
2. Perform Data Normalization using min-max, z-score and normalization by decimal scaling methods.
3. Extract Frequent Item Sets using candidate generation and without using candidate generation.
4. Calculate Information Gain measure to select the test attribute in the decision tree.
5. Perform Decision Tree Induction for a given training data.
6. Develop a model to apply Linear Regression for prediction.
7. Implementing clustering techniques (k-means, k-medoids)
8. Find the outliers using various Outlier Detection methods.
9. Evaluation of measures for text retrieval.
10. Classification of Web documents.

Tool : RapidMiner / Wega / R

17MDC71 - PROJECT WORK AND VIVA VOCE - I

L	T	P	C
18			

PRE-REQUISITES

Should have undergone all courses upto 6th Semester

ASSESSMENT : PRESENTATION AND VIVA VOCE

COURSE OUTCOME

- *Perform quantitative and qualitative data analytics in functional areas of business*
- *Analyze business problems using mathematical and statistical modeling and enable data driven decision making.*
- *Analyze the issues in software solutions*
- *Develop enterprise applications applying software engineering principles and business domain knowledge*
- *Visualize and infer meaningful insights to facilitate strategic and operational decisions*
- *Apply and demonstrate software development standards in the software industry*
- *Work in a team to develop solutions for real time applications and solve research issues*

17MDC81 - MODELING AND SIMULATION

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Define Simulation, Systems, models and perform basic manual simulations*
- *To illustrate changes in the dynamic systems like queuing system using simulation.*
- *To predict the behavior of linear and non-linear systems using empirical modeling*
- *To evaluate the behavior of deterministic and stochastic systems using Simulation techniques*

INTRODUCTION TO SIMULATION

When Simulation Is the Appropriate Tool - When Simulation Is Not Appropriate- Advantages and Disadvantages of Simulation- Areas of Application- Systems and System Environment- Components of a System- Discrete and Continuous Systems - Model of a System- Types of Models- Discrete-Event System Simulation- Steps in a Simulation Study

Simulation example-Queuing-Inventory-General Principles of Simulation. **(9)**

STATISTICAL BASICS AND QUEUING MODEL SIMULATION

Useful Statistical Models- Discrete Distributions - Continuous Distributions- Poisson Process- Properties of a Poisson Process- Non-stationary Poisson Process- Empirical Distributions-

Characteristics of Queuing Systems- Queuing Notation- Long-Run Measures of Performance of Queuing Systems- The Conservation Equation- Steady-State Behavior of Infinite-Population Markovian Models - Single-Server Queues with Poisson Arrivals and Unlimited Capacity: M/G/1, Multi-server Queues - Steady-State Behavior of Finite-Population Models- Networks of Queues **(9)**

RANDOM NUMBERS

Generation of Pseudo-Random Numbers- Techniques for Generating Random Numbers- Linear Congruential Method- Combined Linear Congruential Generators- Tests for Random Numbers- Frequency Tests, Tests for Autocorrelation-Random variate generation-Inverse-Transform Technique- Exponential Distribution- Uniform Distribution- Weibull Distribution- Triangular Distribution- Empirical Continuous Distributions- Continuous Distributions without a Closed-Form Inverse- Discrete Distributions- Acceptance-Rejection Technique- Poisson Distribution- Non-stationary Poisson Process- Gamma Distribution- Direct Transformation for the Normal and Lognormal Distributions- Convolution Method-special properties. **(9)**

ANALYSIS OF SIMULATION DATA

Input Modeling- Data Collection- Identifying the Distribution with Data-Histograms- Selecting the Family of Distributions-Quantile-Quantile Plots- Parameter Estimation- Preliminary Statistics: Sample Mean and Sample Variance- Suggested Estimators- Goodness-of-Fit Tests- Chi-Square Test-Kolmogorov--smimov Goodness-of-Fit Test.

Verification and Validation of Simulation Models- Model Building, Verification, and Validation- Verification of Simulation Models- Calibration and Validation of Models- Face Validity-Validation of Model Assumptions-Validating Input-Output Transformations- Input-Output Validation: Using Historical Input Data- Input-Output Validation: Using a Turing Test

OUTPUT ANALYSIS FOR A SINGLE MODEL

Comparison of Two System Designs-Independent Sampling with Equal Variances-Independent Sampling with Unequal Variances. Meta modeling. **(9)**

SIMULATION SOFTWARES / LANGUAGE

Manufacturing systems and Material Handling system

Simulation Software : History of Simulation Software- Selection of Simulation Software-An Example Simulation- Simulation in GPSS- Arena-AutoMod-ProModel- QUEST- SIMULA-Witness- Extend, Simio.

Simulation of Manufacturing and Material-Handling Systems : Manufacturing and Material-Handling. Simulations- Models of Manufacturing Systems- Models of Material-Handling Systems- Goals and Performance Measures- Issues in Manufacturing and Material-Handling Simulations- Modeling Downtimes and Failures- Trace-Driven Models- Case Studies of the Simulation of Manufacturing and Material-Handling Systems **(9)**

Total : 45

TEXT BOOK

1. *Jerry Banks,John S. Carson II,Barry L Nelson, David M Nicol, Discrete-Event System Simulation, Second Edition, Prentice Hall, 1996.*

REFERENCE BOOKS

1. *Law A.M. & Kelton, W.D, Simulation Modeling and Analysis, 2nd ed, New York McGraw Hill Inc. (1991*
2. *Geoffrey Gordon, System Simulation, Prentice Hall publication, 2nd Edition, 1978, ISBN:81-203-0140-4.*
3. *FrankR.Giordano, Maurice D.Weir and William P.Fox. Mathematical Modeling, Thomson Brooks/Cole, Vikas Publishing House Pvt Ltd., New Delhi.[Para 1, II & III]*
4. *H.Sayama, Introduction to the Modeling and Analysis of Complex Systems, Open SUNY Textbooks, Milne Library State University of New York at Geneseo,Geneseo, NY 14454, 2015.*
5. *Clive L.Dym, Principles of Mathematical Modeling, 2nd Edition, Elsevier, 2004.*

17MDC82 - DECISION SUPPORT SYSTEMS

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC54

ASSESSMENT : THEORY

COURSE OUTCOME

- *Identify the components of Decision Support Systems*
- *Work with data modeling and visualization for the given management problem*
- *Choose appropriate model to be used for a problem and design Decision Support System accordingly*
- *Analyze different tools and technologies for knowledge management in an organization*
- *Apply advanced intelligent system concepts to provide insight in the business*

INTRODUCTION

Management Support Systems : Overview : Managers and Decision-Making - Managerial Decision-Making and Information Systems - Managers and Computer Support - Computerized Decision Support and the Supporting Technologies - A Framework for Decision Support - The Concept of Decision Support Systems - Group Support Systems - Enterprise Information Systems - Knowledge Management Systems - Expert Systems - Artificial Neural Networks - Advanced Intelligent Decision Support Systems - Hybrid Support Systems.

Decision-Making Systems, Modeling and Support : Decision-Making: Introduction and Definitions - Systems - Models - Phases of the Decision-Making Process - Decision-Making: The Intelligence Phase - The Design Phase - The Choice Phase - The Implementation Phase - Decision Support Strategy - Personality Types, Gender, Human Cognition, and Decision Styles - The Decision-Makers. **(10)**

DECISION SUPPORT SYSTEMS (DSS)

Decision Support Systems : Configuration - Characteristics and Capabilities of DSS - Components of DSS - The Data Management Subsystem - The Model Management Subsystem - The User Interface Subsystem - The Knowledge-Based Management Subsystem - The User - DSS Hardware - DSS Classifications.

Modeling and Analysis : Management Support System (MSS) Modeling - Static and Dynamic Models - Certainty, Uncertainty, and Risk - Influence Diagrams - MSS Modeling with Spreadsheets - Decision Analysis of a Few Alternatives - The Structure of MSS Mathematical Models - Mathematical Programming Optimization - Multiple Goals, Sensitivity Analysis, What-If, and Goal Seeking - Problem-Solving Search Methods - Heuristic Programming - Simulation - Visual Interactive Modeling and Visual Interactive Simulation - Quantitative Software Packages. **(10)**

BUSINESS INTELLIGENCE

The Nature and Sources of Data - Data Collection, Problems, and Quality - The Web/Internet and Commercial Database Services - Database Management Systems in Decision Support Systems/Business Intelligence - Database Organization and Structures - Data Warehousing - Data Marts - Business Intelligence/Business Analytics - Online Analytical Processing (OLAP) - Data Mining - Data Visualization, Multidimensionality, and Real-Time Analytics - Geographic Information Systems - Business Intelligence and the Web: Web Intelligence/Web Analytics. **(13)**

DECISION SUPPORT SYSTEM DEVELOPMENT

Introduction to DSS Development - The Traditional System Development Life Cycle - Alternative Development Methodologies - Prototyping: The DSS Development Methodology - Change Management - DSS Technology Levels and Tools - DSS Development Platforms - DSS Development Tool Selection - Team-Developed DSS - End User Developed DSS - Putting The DSS Together. **(5)**

GROUP SUPPORT SYSTEMS AND KNOWLEDGE MANAGEMENT

Group Support Systems : Group Decision-Making, Communication, and Collaboration - Communication Support - Collaboration Support: Computer-Supported Cooperative Work - Group Support Systems - Group Support Systems Technologies - Groupsystems

Meetingroom and Online - The GSS Meeting Process - Distance Learning - Creativity and Idea Generation.

Knowledge Management : Introduction to Knowledge Management - Organizational Learning and Transformation - Knowledge Management Initiatives - Approaches to Knowledge Management - Information Technology in Knowledge Management - Knowledge Management Systems Implementation - Roles of People in Knowledge Management. **(7)**

TOTAL : 45

TEXT BOOK

1. *Efraim Turban and Jay E. Aronson, Decision Support System and Intelligent Systems, Prentice Hall International, 9th Edition 2010*

REFERENCE

1. *V.L. Sauter, Decision Support Systems For Business Intelligence, New York: John Wiley & Sons, 2011*

17MDC83 - GAME THEORY AND DECISION ANALYSIS

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Design game model to describe the issue using game theory strategies*
- *Analyze and derive decisions using decision tree and analysis methods*
- *Design and perform decision analysis using Markov chain principles and 6 Sigma Concepts*

GAME THEORY : Decision making-Description of a game-Basic elements of game theory- the Two Person, zero-sum Games - Characteristics of a game- The maxmin and minmax principles- Steps in solving the game- Saddle point method- Principle of dominance in games- Solutions to 2 x 2 games without saddle point: (Mixed strategies)- Method of Oddments (for 2 × 2 games)- Solutions to 2 × n or m × 2 games-Graphical Method-Algebraic Method-Method of Linear Programming-Iterative Method for Approximate Solution-Bidding Problems-n- Person Zero sum games. Strategic games-Nash Equilibrium. **(12)**

DECISION ANALYSIS : Decision Making without Experimentation- Decision Making with Experimentation- Decision Trees-Using Spreadsheets to Perform Sensitivity Analysis on Decision Trees-Utility Theory- The Practical Application of Decision Analysis- Advanced Decision Trees- Chi-Square Automatic Interaction Detection (CHAID)-CHAID Tree Development-Bonferroni Correction-Generating Business Rules using CHAID Tree-Classification and Regression Tree-Gini Impurity Index-Entropy-Cost-Based Splitting Criteria-Ensemble Method-Random Forest **(12)**

MULTI-CRITERION DECISION MAKING : Multi-attribute Decision making - an overview-classification of MCDM methods-deterministic, stochastic and fuzzy-MCDM application areas-MCDM methods-The weighted sum model-The weighted product model-The Analytic Hierarchy process-The revised Analytic Hierarchy process-Goal Programming-The ELECTRE method-The TOPSIS method-Sebsitivity analysis of MCDM methods-Data Estimation of MCDM Problems. **(10)**

STOCHASTIC MODELS-MARKOV CHAINS : Introduction to Stochastic Process-Poisson Process-Compound Poisson Process-- Markov Chains - Chapman-Kolomogorov Equation - Classification of States of Markov Chain - Long run properties of Markov Chains- First Passage times-Markov Chains with Absorbing States- Expected Duration to Reach a State from other States-Calculation of Retention Probability and Customer Lifetime Value using Markov Chains-Markov Decision Process (MDP) **(6)**

SIX SIGMA : Introduction to Six Sigma- What is Six Sigma?- Origins of Six Sigma- Three-Sigma versus Six-Sigma Process- Cost of Poor Quality- Sigma Score- Industrial Applications of Six Sigma- Six Sigma Measures- Yield- DMAIC Methodology. **(5)**

Total : 45

TEXT BOOKS

1. *Rama Murthy P. Operations Research, New Age Intenational, Second Edition, 2007, New Delhi [Para 1]*
2. *Dinesh Kumar U. Business Analytics, Wiley, First Edition, 2017 [Para 2,4,5]*
3. *Triantaphyllou, Evangelos. (2000). Multi-Criteria Decision Making Methods: A Comparative Study. 10.1007/978-1-4757-3157-6, Kluwer Academic Publishers[Para 3]*

REFERENCE BOOKS

1. *Martin Osborne, An Introduction to Game Theory, Oxford University Press, 2003*
2. *Frederick S.Hiller, Gerald J.Leberman, Bodhibrata Nag and PreetamBasu, "Introduction to Operations Research", Ninth Edition, McGraw Hill, 2010.*
3. *HamdyA.Taha, "Operations Research - An Introduction", Eighth Edition, 2010.*
4. *EdmundasKazimierasZavadskas (2019), Multiple-Criteria Decision-Making (MCDM) Techniques for Business Processes Information Management, Publisher: MDPI AG*

5. *Belton, Valerie and Theodor Stewart (2001), Multi Criterion Decision Analysis : An Integrated Approach, Springer.*
6. *Cliff T. Ragsdale, Spreadsheet Modeling and Decision Analysis: A Practical Introduction to Business Analytics, Thomson South-Western*
7. *Avinash K. Dixit and Barry J. Nalebuff, The Art of Strategy, Norton, 2008.*

INTERNET RESOURCES

1. *E. Triantaphyllou, B. Shu, S. Nieto Sanchez, and T. Ray: Multi-Criteria Decision Making: An Operations Research Approach. Encyclopedia of Electrical and Electronics Engineering, (J.G. Webster, Ed.), John Wiley & Sons, New York, NY, Vol. 15, pp. 175-186, (1998).*
2. *Mark Velasquez1and Patrick T. Hester, An Analysis of Multi-Criteria Decision Making Methods. International Journal of Operations Research Vol. 10, No. 2, 56?66 (2013)*
3. *Vyas S. &MisalCheta S. Comparative Study of different Multi-criteria Decuision*

   Making methods. International Journal on Advanced Computer Theory and Engineering (IJACTE), 2319 - 2526, Volume-2, Issue-4, 2013

17MDC84 - BUSINESS INTELLIGENCE LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

17MDC64, 17MDC66

ASSESSMENT : LABORATORY

COURSE OUTCOME

- *Can understand and transform given data in any form to a suitable standard form for performing analysis using tools.*
- *Able to construct appropriate data warehouse model for a given decision making problem.*
- *Apply various techniques and tools to perform operations on multidimensional data.*
- *Generate various levels of analysis reports of data in different forms for inference.*
- *Design and develop dashboards and scoreboards to present the analysed data in a format that help the decision makers to do the prediction.*

CONCEPTS TO BE COVERED

1. Perform ETL processes using large datasets of CSV, XML, XLS, ARFF and other formats.
2. Build Data warehouse using appropriate schema for various business scenarios.
3. Perform OLAP operations using multidimensional data.
4. Perform Exploratory data analysis using Views, concept hierarchies and data cubes.
5. Create BI dashboards and scoreboards to turn insights into actions for various business scenarios.
6. Present the analysed data using maps,plots, graphs and other visualization formats.
7. Generate a powerful, multi-step alert engine that can trigger workflows.

TOOLS REQUIRED

Tableau /Kibana / Business intelligence development studio /SQL Server data tools (SSIS, SSAS, SSRS)

17MDC85 - DECISION ANALYSIS LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
17MDC81

ASSESSMENT : LABORATORY

COURSE OUTCOME

- *Design game model to describe the issue using game theory strategies*
- *Analyze and derive decisions using decision tree and analysis methods*
- *Design and perform decision analysis using 6 Sigma Concepts*

CONCEPTS TO BE COVERED

1. Solving Game Theory Problems using MS-Excel: Maxmin and Minmax criteria
2. Solving Game Theory Problems using MS-Excel: Principle of dominance
3. Solving Game Theory Problems by Linear Programming using MS-Excel's Solver
4. Repeating Exercises 1,2 using R
5. Repeating Exercises 3 using R
6. Solving Game Theory Problems using Gambit software
7. Solving Decision Analysis problems using MS-Excel
8. Using Spreadsheets to Perform Sensitivity Analysis on Decision Trees
9. Construction of Decision Trees using R Packages
10. Construction of Random Forest using R Packages
11. Analysing Decision Trees using TreePlan software
12. Solving MCDM problems using software packages like DEFINITE, MCDA package for R
13. Solving MCDM problems using software packages
14. Computing n-step probabilities using MS-Excel and R
15. Computing steady state probabilities using MS-Excel and R
16. Six Sigma Methodology using Software Packages

17MDC86 - ENTREPRENEURSHIP DEVELOPMENT

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Have the ability to discern distinct entrepreneurial traits*
- *Know the parameters to assess opportunities and constraints for new business ideas*
- *Understand the systematic process to select and screen a business idea*
- *Design strategies for successful implementation of ideas*
- *Evaluate the procedures and prepare a business plan*

UNIT I : Introduction to Entrepreneurship : Meaning, Theories, Categories, Significance. Entrepreneurial India: Evolution over centuries, Current trends. Myths about Entrepreneurship: Myths about passion, surety in riches, financial backing, influential people. Entrepreneur: Definition, Characteristics, Types, Challenges. Entrepreneurship Ecosystem: Context, Positive influencers, Players.-Case Study **(6)**

UNIT II : Intrapreneurship : Meaning, Need, Difference from entrepreneurship, Hurdles, Successful practices. Entrepreneurial Motivation: Key drivers, Mindset, Theories. Entrepreneurial Competencies: Identification & development of competencies, Role of EDPs-Case Study. **(6)**

UNIT III : Business Idea Generation : Approach, Techniques. Opportunity Analysis: Opportunity sighting, evaluation, Mapping ideas to opportunities. Business Modelling: Meaning, Functions, Types, Design & interpretation. Business Planning: Types, Myths, Sections, Documentation Tips. Business Plan Review: Business Model review, Financial review, Technical feasibility Review-Case Study. **(6)**

UNIT IV : Business Creation : Entity types, Steps in setting up a unit, Compliances &approvals.Evolution of a start-up: Key factors, Evolution modelling, Dimensions of maturity. Innovation for Business Growth: Concept, Process, Challenges. Business Sickness: Symptoms, Causes, Remedial measures & rehabilitation-Case Study. **(6)**

UNIT V : Women Entrepreneurship : Need, Development, Benefits, Challenges. Rural Entrepreneurship: Opportunities, Benefits, Role of Government. Social Entrepreneurship: Need, Types & characteristics of social enterprise, Measures of success, Benefits, Sociopreneur-Case Study. **(6)**

Total : 30

REFERENCE BOOKS :

1. *Raj Shankar, "Entrepreneurship: Theory & Practice", 1st Edition, Tata McGraw Hill, New Delhi, 2009.*
2. *Robert D. Hisrich, Michael P. Peters Dean A. Shepherd, "Entrepreneurship", 9th Edition, McGraw Hill/Irwin, 2012.*
3. *Rajeev Roy, "Entrepreneurship", 2nd Edition, Oxford University Press, New Delhi, 2011.*
4. *S. S. Khanka, Entrepreneurial Development, S.Chand and Co, New Delhi, 2012.*

17MDC91 - PRINCIPLES OF INFORMATION SECURITY

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC33, 17MDC45

ASSESSMENT : THEORY

COURSE OUTCOME

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

- *Illustrate the principles of information security and employ them to secure the information.*
- *Identify and prioritize assets and threats to secure the assets in the event of attacks.*
- *Practice professional, and ethical attitude and aware of legal issues in the context of information security.*
- *Choose suitable risk management strategies for the organization's information security requirements.*
- *Discuss policies, standards, models and technologies for the given scenario related to information security.*

INTRODUCTION

Information Security Concepts, Critical Characteristics of Information, CNSS Security Model,Components of an Information System, Security in the Systems Development Life Cycle **(3)**

SECURITY ANALYSIS

Need for Security : Business Needs, Threats and Attacks.

Legal, Ethical and Professional Issues in Information Security: Law and Ethics, Ethics and Information Security **(9)**

SECURITY PLANNING

Information Security Policy, Standards and Practices. The Information Security Blueprint. Security Education, Training and Awareness, Continuity Strategies **(6)**

RISK MANAGEMENT

Overview, Risk Identification, Risk Assessment, Risk Control, Quantitative Versus Qualitative Risk Control Practices **(9)**

SECURITY TECHNOLOGY

Security Technology : Access Controls, Firewalls and VPNs, Intrusion Detection and Prevention Systems and Other Security Tools

Cryptography : Foundations of Cryptology, Cipher Methods, Cryptographic Algorithms, Cryptographic Tools, Protocols for Secure Communication. **(12)**

IMPLEMENTATION AND MAINTENANCE

Implementing Information Security : Information Security Project Management, Technical Aspects of Implementation, Nontechnical Aspects of Implementation

Security and Personnel : Positioning and Staffing, Credentials for Information Security Professionals, Employment Policies and Practices

Information Security Maintenance : Security Maintenance Models, Digital Forensics

Case Study : Latest Practices and Impact of Emerging Technologies **(6)**

Total : 45

TEXT BOOK

1. *Michael E Whitman and Herbert J Mattord, "Principles of Information Security", Cengage Learning, 6th Edition, 2017.*

REFERENCE BOOKS

1. *Micki Krause, Harold F. Tipton, "Handbook of Information Security Management", Vol 1-3 CRC PressLLC, 2004.*
2. *Stuart Mc Clure, Joel Scrambray, George Kurtz, "Hacking Exposed", Tata McGraw-Hill, 2003*
3. *Matt Bishop, "Computer Security Art and Science", Pearson/PHI, 2002.*

17MDC92 - PROJECT MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *The selection and initiation of projects in the enterprise*
- *Conduct project planning activities that accurately forecast project costs, timelines and quality .*
- *Implement the project for successful resource communication and risk management.*
- *Demonstrate effective project execution and control techniques that result in successful projects.*
- *Demonstrate effective organisation leadership skills for managing projects, project teams and stakeholders.*

BASICS OF PROJECT MANAGEMENT : Introduction, Need for Project Management, Project Management Knowledge Areas and Processes, The Project Life Cycle, The Project Manager (PM), Phases of Project Management Life Cycle, Project Management Processes, Impact of Delays in Project Completions, Project Management Principles. **(9)**

PROJECT IDENTIFICATION AND SELECTION : Introduction, Project Identification Process, Project Initiation, Pre-Feasibility Study, Feasibility Studies, Project Break-even point **(9)**

PROJECT PLANNING : Introduction, Project Planning, Need of Project Planning, Project Life Cycle - PERT and CPM: Introduction, Development of Project Network, Time Estimation, Determination of the Critical Path, PERT Model, Measures of variability, CPM Model, Network Cost System **(9)**

RESOURCES CONSIDERATIONS IN PROJECTS : Introduction, Resource Allocation, Scheduling, Project Cost Estimate and Budgets, Cost Forecasts

PROJECT RISK MANAGEMENT : Introduction, Risk, Risk Management, Role of Risk Management in Overall Project Management, Steps in Risk Management, Risk Identification, Risk Analysis, Reducing Risks **(9)**

PROJECT PERFORMANCE MEASUREMENT AND EVALUATION: Introduction, Performance Measurement, Productivity, Project Performance Evaluation, Benefits and Challenges of Performance Measurement and Evaluation, Controlling the Projects

PROJECT EXECUTION AND CONTROL : Introduction, Project Execution, Project Control Process, Purpose of Project Execution and Control **(9)**

TOTAL: 45

REFERENCE BOOKS

1. *Prasanna Chandra, "Projects: Planning, Analysis. Selection. Implementation and Review", Tata McGraw- Hill: New Delhi, 2002.*
2. *Gopalakrishnan, Ramamoorthy, "Project Management", Macmillan: New Delhi, 1993.*
3. *Harold Kerzner, "Project Management : A Systems Approach to Planning, Scheduling and Controlling", 2009.*
4. *Larson, E.W. and Gray, C.F., "Project management the managerial process", Seventh Edition, McGraw-Hill, 2018.*
5. *"UNIDO - Guidelines for Project Evaluation", USA: Oxford, IBH, 1972.*
6. *Prasanna Chandra, "Projects: Planning, Analysis. Selection. Implementation and Review", Tata McGraw- Hill: New Delhi, 2002.*
7. *Gopalakrishnan, Ramamoorthy, "Project Management", Macmillan: New Delhi, 1993.*
8. *UNIDO - Guidelines for Project Evaluation, USA: Oxford, IBH, 1972.*

17MDC93 - HUMAN COMPUTER INTERFACE AND INTERACTION

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC53

ASSESSMENT : THEORY

COURSE OUTCOME

- *Gain knowledge in the foundations of Human Computer Interface and Interaction*
- *Investigate emerging human computer interfaces and paradigms and implement them into prototype and products with original interfaces and interactions for web, PC, mobile, handheld, or next generation platforms*
- *Be familiar with the design technologies for individuals and persons with disabilities.*
- *Be aware of handheld and conventional HCI.*
- *Learn the guidelines for user interface.*

FOUNDATIONS OF HCI

The Human: I/O channels - Memory - Reasoning and problem solving; The computer: Devices - Memory -processing and networks; Interaction: Models - frameworks - Ergonomics - styles - elements - interactivity- Paradigms. **(9)**

DESIGN & SOFTWARE PROCESS

Interactive Design basics - process - scenarios - navigation - screen design - Iteration and prototyping. HCI in software process- software life cycle - usability engineering - Prototyping in practice - design rationale. Design rules - principles, standards, guidelines, rules. Evaluation Techniques - Universal Design. **(9)**

MODELS AND THEORIES

Cognitive models -Socio-Organizational issues and stake holder requirements -Communication and collaboration models- Hypertext, Multimedia and WWW. **(9)**

MOBILE HCI

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools. **(9)**

WEB INTERFACE DESIGN

Designing Web Interfaces - Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Case Studies. **(9)**

TOTAL : 45

TEXT BOOKS

1. *Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 5th Edition, Pearson, Education 2004.*
2. *Brian Fling, "Mobile Design and Development", First Edition,O'Reilly Media Inc., 2009.*
3. *Bill Scott and Theresa Neil, "Designing Web Interfaces", First Edition, O'Reilly, 2009*

17MDC94 - HUMAN COMPUTER INTERFACE AND INTERACTION LAB

L	T	P	C
0	0	4	2

PRE-REQUISITES
17MDC38, 17MDC53

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Analyse and evaluate interaction with computer artifacts from human perspective*
- *Investigate and implement human centered models for usability, utility and satisfaction.*
- *Develop basic prototypes with a range of interaction styles and technologies*

CONCEPTS TO BE COVERED

1. Study the trouble of interacting with machines - Redesign interfaces of home appliances.
2. Design a system based on user-centered approach for any home appliance.
3. Study the features of various handheld systems and computer system.
4. Study of the principles of good screen design.
5. Implement screen design for home appliance
6. Redesign existing Graphical User Interface with screen complexity
7. Design Web User Interface based on any standard theory.
8. Implementation of Different Kinds of Menus
9. Implementation of Different Kinds of Windows
10. Design a system with proper guidelines for icons

*Design and implementation of the above systems to be done for desktop, web based, and handheld interfaces as applicable.

17MDC95 - MINOR PROJECT - DECISION TOOL DEVELOPMENT

L	T	P	C
0	0	8	4

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : PRESENTATION AND VIVA VOCE

COURSE OUTCOME

- *Investigate the business problem in detail*
- *Identify the logical and ordered process to address all the critical elements of the business problem*
- *Analyze various alternatives and select the best alternative for the problem*
- *Develop the decision tool with the help of the analysis*

Effectiveness in managing the business decision making will ultimately determine the success of the company. But this is a problem for companies of all sizes particularly with the companies that are growing rapidly. At this point a clear mechanism for managing, communicating and confirming decision implementation is essential. Hence this minor project concentrates on developing a decision tool for the Chosen business process.

In this minor project students have to :

- Choose a business problem and develop a decision tool for to address the same.

17MDC96 - BUSINESS ETHICS

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Understand the inhereent conflicts in being ethical*
- *Analyse the ethical dilemmas in common business situations and the ways to solve them.*
- *Broaden the understanding of the way to act rightly in different business situations*
- *Learn to commit to mutual ethical treatment of the human person and do ethical business and ethical leadership.*
- *Make ethical decisions effectivelu and decisively based on ethical thinking and decision making frameworks.*

UNIT I

Introduction to Ethics - Moral Development in human theories and Concepts- Definitions of ethics- theories of Ethics and Ethics Projects -Case Study. **(6)**

UNIT II

Decision Making Model : Ethics as Making Decisions and Choices - Decision Making frameworks-Conflicts and Ethical Dilemmas - Moral and Ethical dilemmas-Case Study. **(6)**

UNIT III

Ethics and Business : A sense of Business Ethics - Ethics and International Business - Ethics issues beyond borders- Ethics and economics: Ethical concerns of economic individuals and societies. **(6)**

UNIT IV

Business Disciplines : Ethics of Marketing and advertising - Ethics of Finance and accounting- Ethics of HR and related aspects-Production and related issues -Ethics of IT. **(6)**

UNIT V

Ethics and Environment : Environmental Ethics awareness-Business and Social Responsibility-Business response to environmental problems and ethics-International standards-Global Impact. **(6)**

Total : 30

REFERENCE BOOKS

1. *William. H. Shaw, "Business Ethics", Cengage Advantage Books, 2013.*
2. *Stephen. M. Byars and Kurt Stanberry, "Business Ethices", 2018.*
3. *Das Gupta, Anandha, "Business Ethics", Springer, 2014.*
4. *Denis Collins, "Business Ethics", Second Edition, Sage Publications, 2018*

17MDC101 - PROJECT WORK AND VIVA VOCE - II

L	T	P	C
			18

PRE-REQUISITES

Should have undergone all courses

ASSESSMENT : PRESENTATION AND VIVA VOCE

COURSE OUTCOME

- *Perform quantitative and qualitative data analytics in functional areas of business*
- *Analyze business problems using mathematical and statistical modeling and enable data driven decision making.*
- *Analyze the issues in software solutions*
- *Develop enterprise applications applying software engineering principles and business domain knowledge*
- *Visualize and infer meaningful insights to facilitate strategic and operational decisions*
- *Apply and demonstrate software development standards in the software industry*
- *Work in a team to develop solutions for real time applications and solve research issues*

MANAGEMENT STREAM - FINANCE

Course Code	Course Name
17MDCE01	Security Analysis And Portfolio Management
17MDCE02	Equity Valuation
17MDCE03	Derivatives And Risk Management
17MDCE04	Credit Risk Analytics And Management

17MDCE01 - SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC32, 17MDC43

ASSESSMENT : THEORY

COURSE OUTCOME

- *Evaluate the various investment alternatives available and select the best security for investment*
- *Analyse the nuances of Stock Market operations*
- *Evaluate the economy, industry and company to select the instrument for investment*
- *Assess the trend patterns for investment in securities*
- *Practice the techniques involved in analysing upon purchase or sales of secuirities.*

INVESTMENT SETTING : Financial and Economic meaning of investment - Characteristics and objectives of investment - Types of investment - Investment alternatives choice and evaluation - Risk and return concepts. **(9)**

SECURITIES MARKETS : Financial Market - Segments - Types - Participants in financial market - Regulatory environment - Primary market - Methods of floating new issues, Book building - Role of Primary market - Regulation of primary market - Stock exchanges in India - BSE, OTCEI, NSE, ISE and Regulation of Stock exchanges - Trading system in stock exchanges - SEBI. **(9)**

FUNDAMENTAL ANALYSIS : Economic analysis: Economic Forecasting an Stock investment decisions. Industry Analysis : Industry classification - Industry Life Cycle. Company Analysis: Measuring Earnings - Forecasting Earnings - Applied Valuation Techniques - Graham and Dodd investor ratios. **(9)**

TECHNICAL ANALYSIS : Fundamental Vs Technical Analysis - Charting methods - Market Indicators: Trend, Trend reversals, Patterns, Moving average, Exponential Moving average - Oscillators - Market Indicators - Efficient Market Theory. **(9)**

PORTFOLIO MANAGEMENT : Portfolio Analysis - Portfolio Selection - Portfolio Revision - Portfolio Evaluation. **(9)**

TOTAL : 45

TEXT BOOKS

1. *Prasanna Chandra, "Investment Analysis and Portfolio Management", Tata Mc.Graw Hill, 2011.*
2. *Donald. E. Fischer and Ronald. J. Jordan, "Security Analysis and Portfolio Management", PHI learning, New Delhi, 8th Edition, 2011.*
3. *Bhalla.V.K, "Investment Management", Sultan Chand and Company Ltd, 2012.*
4. *Kevin.S, "Security Analysis and Portfolio Management", PHI Learning,2012.*

17MDCE02 - EQUITY VALUATION

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC32, 17MDC43

ASSESSMENT : THEORY

COURSE OUTCOME

- *Assess valuation and intrinsic value and explain sources of perceived mispricing;*
- *Evaluate definitions of value and justify which definition of value is most relevant to public company valuation;*
- *Apply techniques learned in the course as these are being used in practice by stock market participants .*
- *Analyse the environmental context of the company being valued.*
- *Apply critically various theories of valuation and forecasting.*

Introduction to Valuation and Common Valuation Methodologies - Why Valuation, Various Methods of Valuation, Introduction to Discounted Cash Flow Valuations, Relative Valuations and Other Methods, Advantages and Disadvantages of the various Methods. **(9)**

Discounted Cash Flow Valuation - Introduction to Dividend Discount Model, Free Cash Flow to Firm and Free Cash Flow to Equity Model, Cost of Equity, Cost of Capital, Practical Methods of Cost of Capital Calculations, Interpretation of Capital Asset Pricing Model and other methods of calculating cost of equity, Cash Flow Calculations and Interpretations, Usage of methods based on industries and companies **(9)**

Relative Valuations - Relative Valuation Metrics - Price to Earnings Ratio, Price to Book Ratio, Price to Sales Ratio, Enterprise Value ratios, Exercise on Relative Valuation using Banking Sector. **(9)**

Advanced Valuation Techniques - Introduction to distressed company valuation, Valuation and its applications in Mergers and Acquisitions, Transaction Comparable Methods. **(9)**

Valuation Exercises - Valuation model building using Microsoft Excel for a services company in India, Valuation model building using Microsoft Excel for a manufacturing company in India, including concepts of DCF Valuations and Relative Valuations. Other Exercises - Students to build a detailed model on their own **(9)**

TOTAL : 45

REFERENCE BOOKS

1. *Aswath Damodaran, "Investment Valuation", John Wiley & Sons, Inc., 3rd edition, 2012.*
2. *Benjamin Graham David Dodd, "Security Analysis", Sixth Edition, 2008.*
3. *John D Stowe et al., "Equity Asset Valuation", John Wiley & Sons, Inc., 2nd edition, 2007.*
4. *James Valentine, "Best Practices for Equity Research Analysts: Essentials for Buy-Side and Sell-Side Analysts", Mc Graw Hill, 2011.*

17MDCE03 - DERIVATIVES AND RISK MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC43, 17MDCE111

ASSESSMENT : THEORY

COURSE OUTCOME

- *Understand the operations of Derivatives market.*
- *Analyse and price diverse derivatives products to generate an optimal risk management strategy.*
- *Demonstrate critical thinking, analytical and problem solving skills in the context of derivatives pricing and hedging practice*
- *Understand the procedures followed in the binomial model Black-scholes model in fixing option prices.*
- *Demonstrate an understanding of pricing forwards, futures and option contracts.*

UNIT I : Introduction to derivatives : Derivative markets and instruments, underlying asset, concepts in derivative markets, linkages between spot and derivative markets, Role of Derivative markets. Growth and Development of derivative markets: commodity derivatives, financial derivatives, globalization of derivatives and derivatives in India, Users of derivatives. **(9)**

UNIT II : Structure of Forward and Future contracts : Development of Forward and Future markets, Over the Counter and Futures exchanges, Mechanics of future trading, Futures price quotations, Types of future contracts, Transaction costs. Principles of Pricing : Generic carry arbitrage, carry arbitrage with cash flows. Future arbitrage strategies: short term, intermediate and long term interest rate arbitrage, Stock index arbitrage, Foreign exchange arbitrage. **(9)**

UNIT III : Structure of option markets: Development of options markets, Call options, Put options, Over the Counter option markets and organized exchanges, Option Traders, Mechanics of trading and Types of options. Principles of Pricing: Notation and Terminology, Principles of call option Pricing and Principles of put option pricing. Option Pricing Models: Option Greeks, Binomial model and Black-Scholes option pricing model. **(9)**

UNIT IV : Risk Management applications of option Strategies : Notation and terminology, Stock Transactions, Call option Transactions, Put option Transactions, Covered Call, Productive Put, Synthetic puts and calls. Advanced Risk Management applications of option Strategies: Option spreads, Collar, Butterfly spread, Straddles and Strangle. **(9)**

UNIT V : Interest Rate Swaps : Structure, Valuation, Strategies. Currency swaps: Structure, Valuation, Strategies. Equity swaps: Structure, Valuation, Strategies, Caps, Floor and Swaptions: LM Model and SM Model **(9)**

Total : 45

REFERENCE BOOKS

1. *Don M.Chance and Robert Brooks, "Derivatives and Risk Management Basics", 5th Edition, South-Western Cengage Learning, USA, 2011.*
2. *Jayanth Rama Varma, "Derivatives and Risk Management", 3rd Edition, Tata McGraw Hill, New Delhi, 2010.*
3. *Schwesernotes, CFA Level 1 Book 5 : "Fixed Income, Derivatives and Alternatives Investments", Kaplan Inc., USA, 2014.*
4. *Sundaram Janakiramanan, "Derivatives and Risk Management", Pearson, 2011.*

17MDCE04 - CREDIT RISK ANALYTICS AND MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC32, 17MDC43

ASSESSMENT : THEORY

COURSE OUTCOME

- *Identify the different types of credit risk and how they arise in a financial institution's various activities.*
- *Understand how credit risk can be quantified, monitored and controlled, exploring the role of credit portfolio management tools such as collateral, documentation and credit derivatives*
- *Apply best practice tools and techniques for fundamental credit analysis .*
- *Understanding of businesses, their borrowing needs, making robust risk assessments and making good credit decisions.*
- *Make detailed credit analysis of any company (finance/ non-finance)*

Meaning of Credit - Risk of Credit - Credit Market -Advantages and disadvantages of Credit - Credit Research and analysis - Importance of Credit Research. **(9)**

Rating Methodology and players - Different credit rating companies and credit rating scales - Risks in Fixed income and Terminology - Understanding auditors report - Understanding Management Risk - Debt Schedule understanding and interpretation Self sustainable understanding and interpretation - Bank Basel Report. **(9)**

Advance Ratios for Credit analysis : Cash flow, Debt specific, Liquidity - Adjustment in ratios -Credit Rating companies Procedures for comparing financials - CRISIL, ICRA, CARE - Additional comparison between CRISIL,ICRA and CARE. **(9)**

Term sheet understanding for SME and Education rating - SME rating process - Content and structure of credit rating report - Retail credit assessment - Working capital assessment (fund and non-fund based) - Cash flow/fund flow analysis - Credit Pricing. **(9)**

Rating Methodology of different sector : Banking sector, Infrastructure sector,Two wheeler sector and other sectors. **(9)**

Total : 45

REFERENCE BOOKS:

1. *Ken Brown and Peter Moles, "Credit Risk Management", Edin burgh Business School, Heriot Watt University, 2013.*
2. *Ciby Joseph, "Advanced Credit Risk Analysis and Management", Wiley, First Edition, 2013.*
3. *Arnold Ziegel, "Fundamentals of credit and Credit analysis", Create Space Independant Publishing, 2015.*
4. *Andrew Fight, "Credit Risk Management", Elsevier Butterworth-Heinemann, 2004.*
5. *Harold Scheule, Daniel Rosch and Bart Baesens, "Credit Risk Analysis - The R Companion", Wiley Publishers, 2016.*

MANAGEMENT STREAM - MARKETING

Course Code	Course Name
17MDCE11	Consumer Behaviour
17MDCE12	Services Marketing
17MDCE13	Customer Relationship Management
17MDCE14	Brand Management

17MDCE11 - CONSUMER BEHAVIOUR

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC52

ASSESSMENT : THEORY

COURSE OUTCOME

- *Identify the major influences in consumer behaviour*
- *Distinguish between different consumer behaviour influences and their relationships*
- *Establish the relevance of consumer behaviour theories and concepts to marketing decisions*
- *Recognise social and ethical implications of marketing actions on consumer behaviour*
- *Use most appropriate techniques to apply market solutions*

Introduction to Consumer Behavior : Definition, Concepts, Model. Consumer Motivation: Dynamics of Motivation, Types and System of Needs, Measurement of Motives. Consumer Personality: Theories, Personality and understanding Consumer Behaviour, Brand Personality, Self and Self-image -Predicting consumer behavior with data analytics. **(9)**

Consumer Perception : Sensory dynamics, Elements, Consumer Imagery. Consumer Learning: Elements of Consumer learning, Behavioural learning, Information Processing and Cognitive Learning, Consumer Involvement and Passive Learning, Outcomes and Measures of Consumer learning - Understand consumer perception using marketing anaytics. **(9)**

Consumer Attitude : Concept, Structural Models of Attitude, Attitude Formation, Strategies of Attitude Change, Cognitive Dissonance Theory, Attribution Theory - Analyzing consumer attitude using Marketing analytics. **(9)**

Social Class : Socialization and Roles of family members, Family Decision Making, Family lifecycle, Social Class, Measurement of Social Class. Influence of culture on Consumer Behavior: Dynamics of Culture, Indian Core Values. **(9)**

Diffusion of Innovations : Diffusion Process, Adoption Process, A profile of the Consumer Innovator. Marketing Ethics and Social Responsibility: Exploitive Targeting, Manipulating Consumers, Social Responsibility. **(9)**

TOTAL : 45

REFERENCE BOOKS

1. *Leon G. Schiffman, Leslie Lazar Kanuk& S. Ramesh Kumar, "Consumer Behaviour", 10th Edition, Pearson Education, New Delhi, 2010.*
2. *David L. Loudon & Albert J. Della Bitta, "Consumer Behaviour", 4th Edition, Tata McGraw Hill: New Delhi, 2013.*
3. *Del I Hawkins, "Consumer Behaviour", 12th Edition, Tata McGraw Hill: New Delhi, 2013.*
4. *Roger D Blackwell, Paul WMiniard and James F Engel, "Consumer Behaviour", 10th Edition, Thomson/ South-Western College Publication, Ohio, 2005.*

17MDCE12 - SERVICES MARKETING

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC52

ASSESSMENT : THEORY

COURSE OUTCOME

- *Identify the special management issues and unique challenges involved in marketing and managing services*
- *Assess the expectations of customers and know how to translate this knowledge into genuine value for customers*
- *Interpret service behaviour and service consumption in the light of service-dominant marketing logic and articulate the outcome to service marketing management*
- *Appreciate, modify, and/or extend new theories and concepts pertaining to explaining the characteristics of customers' purchasing and consumption behaviour of services and service firms' marketing behaviour*
- *Apply new approaches to managing customer satisfaction and loyalty*

Introduction to Services : Introduction and Growth of service sector, Characteristics of services, Classification of Services, Service Marketing mix.Service Quality: SERVQUAL dimensions, the gaps Model of Service Quality - Case Study. **(9)**

Focus on the consumer : Consumer Behaviour in Services: Types of consumer expectations, Zone of tolerance. Consumer Expectations of service: Factors influencing customer expectations of service. Customer Perceptions of services: Customer perceptions, Customer satisfaction, Service Encounters- Case Study. **(9)**

Understanding Customer requirements : Building Customer relationships: Relationship Marketing, Relationship value of customers, Relationship Development Strategies. Service Recovery: Service failure and Recovery, Customers' response to service failures, Services Recovery strategies, Service Guarantees- Case Study. **(9)**

Service design and Standards : Service Blueprinting: Service blueprint and its components. Physical Evidence and servicescape: Types of Servicescapes, roles of Servicescape, Guidelines for Physical Evidence strategy. Employee role in Service Industry: Boundary spanning roles, Strategies for delivering service quality through people- Case Study. **(9)**

Delivering Service through intermediaries and electronic channels : Types ofChannels. Managing demand and capacity: Strategies for matching capacity and demand. Integrated service marketing communications: Categories of strategies to match service promises with delivery. Pricing of services: Approaches to Pricing Strategies, Pricing Strategies- Case Study. **(9)**

TOTAL : 45

TEXT BOOK

1. *Zeithaml. A. Valarie, Gremler D Dwayne, Bitner Jo Mary, Ajay Pandit, "Services Marketing- Integrating customer focus across the firm", 4th edition, Tata McGraw-Hill Publishing, New Delhi.*

REFERENCES BOOKS

1. *Lovelock Christopher, JochenWirtz and JayantaChatterjee, "Services Marketing", Pearson Education: New Delhi, 2011.*
2. *Woodruffe Helen, "Services Marketing", McMillan: New Delhi, 2003.*
3. *C Bhattacharjee, "Services Management", Excel Books: New Delhi, 2006.*
4. *Jha S.M., Services Marketing, Himalaya: Mumbai.*
5. *Ravi Shanker, "Services Marketing", Excel Books: New Delhi, 2008.*

17MDCE13 - CUSTOMER RELATIONSHIP MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC52

ASSESSMENT : THEORY

COURSE OUTCOME

- *Critically review and interpret the theoretical aspects of CRM across the main areas of Sales, services and marketing.*
- *Investigate, analyse, demonstrate and present the salient aspects of a CRM implementation in work related environment*
- *Evaluate internal data about customers and analyse for decision making*
- *Conduct data analysis and generate insights about how to better meet the needs of target segments and individual customers*
- *Deliver a marketing mix tailored to the needs and interests of target segments and individual customers.*

CRM concepts - Acquiring customers, - Customer loyalty and optimizing customer relationships - CRM defined - success factors, the three levels of Service/ Sales Profiling - Service Level Agreements (SLAs), creating and managing effective SLAs-Case Study. **(9)**

CRM in Marketing - One-to-one Relationship Marketing - Cross Selling &Up Selling - Customer Retention, Behaviour Prediction - Customer Profitability & Value Modeling, - Channel Optimization - Event-based marketing.

CRM and Customer Service - The Call Centre, Call Scripting - Customer Satisfaction Measurement-Case Study. **(9)**

Sales Force Automation - Sales Process, Activity, Contact- Lead and Knowledge Management - Field Force Automation. - CRM links in e-Business - E-Commerce and Customer Relationships on the Internet - Enterprise Resource Planning (ERP), - Supply Chain Management (SCM), - Supplier Relationship Management (SRM), - Partner relationship Management (PRM)-Case Study. **(9)**

Analytical CRM - Managing and sharing customer data - Customer information databases - Ethics and legalities of data use-Customer Relationship Analytics in customer service evaluation and supply chain management. **(9)**

CRM Implementation - Defining success factors - Preparing a business plan requirements, justification and processes. - Choosing CRM tools - Defining functionalities - Homegrown versus out-sourced approaches - Managing customer relationships - conflict, complacency, Resetting the CRM strategy. Selling CRM internally - CRM development Team - Scoping and prioritizing - Development and delivery - Measurement-Case Study. **(9)**

TOTAL : 45

REFERENCE BOOKS

1. *Alok KumarRai, "Customer Relationship Management Concept & Cases", Prentice Hall of India Private Limited, New Delhi. 2011*
2. *S. Shanmugasundaram, "Customer Relationship Management", Prentice Hall of India Private Limited, New Delhi, 2008*
3. *Kaushik Mukherjee, "Customer Relationship Management", Prentice Hall of India Private Limited, New Delhi, 2008*
4. *Jagdish Seth, et al, "Customer Relationship Management"*
5. *V. Kumar & Werner J., "Customer Relationship Management", Willey India, 2008*

17MDCE14 - BRAND MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC52

ASSESSMENT : THEORY

COURSE OUTCOME

- *Demonstrate knowledge of the nature and processes of branding and brand management.*
- *Evaluate the scope of brand management activity across the overall organisational context and analyse how it relates to other business areas.*
- *Appraise the key issues in managing a brand portfolio and making strategic brand decisions*
- *Formualte and justify brand development decisions*
- *Analyse and Discuss contemporary brand related problems and develop appropriate strategies and initiatives.*

INTRODUCTION

Basics Understanding of Brands - Definitions - Branding Concepts - Functions of Brand -Significance of Brands - Different Types of Brands - Co branding - Store brands-Case Study. **(9)**

BRAND STRATEGIES

Strategic Brand Management process - Building a strong brand - Brand positioning -Establishing Brand values - Brand vision - Brand Elements - Branding for Global Markets -Competing with foreign brands-Analytics in Brand marketing strategy. **(9)**

BRAND COMMUNICATIONS

Brand image Building - Brand Loyalty programmes - Brand Promotion Methods - Role of Brand ambassadors, celebraties - On line Brand Promotions-Case Study. **(9)**

BRAND EXTENSION

Brand Adoption Practices - Different type of brand extension - Factors influencing Decision for extension - Re-branding and re-launching-Case Study. **(9)**

BRAND PERFORMANCE

Measuring Brand Performance - Brand Equity Management - Global Branding strategies -Brand Audit - Brand Equity Measurement - Brand Leverage -Role of Brand Managers- Branding challenges & opportunities - Case Studies. **(9)**

TOTAL : 45

REFERENCE BOOKS

1. *Kevin Lane Keller, "Strategic Brand Management: Building, Measuring and Managing", Prentice Hall, 2012.*
2. *Moorthi.YLR, "Brand Management", Vikas Publishing House, 1st Edition, 2012.*
3. *LanBatey, "Asain Branding - A Great way to fly", PHI, Singapore, 2002.*
4. *Paul Tmepoal, "Branding in Asia", John Willy, 2000.*
5. *Ramesh Kumar, "Managing Indian Brands", Vikas Publication, India, 2002.*
6. *Jagdeep Kapoor, "Brandex", Biztranza, India, 2005*

MANAGEMENT STREAM - HR

Course Code	Course Name
17MDCE21	Strategic Human Resource Management
17MDCE22	Organisational Development
17MDCE23	Performance Management
17MDCE24	Compensation Management

17MDCE21 - STRATEGIC HUMAN RESOURCE MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC51

ASSESSMENT : THEORY

COURSE OUTCOME

- *Evaluate the differing strategic contributions of particular HR disciplines*
- *Analyse organisational and human resource strategies, and perform a strategic gap analysis*
- *Measure and quantify the contribution of HR activity at an organisational level*
- *Align HR activities with overall organisational strategy by developing, planning and applying contextualised strategic solutions to specific organisational human resource challenges*
- *Gain the ability to manage global HR and manage and train the international employees.*

Strategic Role of HRM - Planning and Implementing Strategic HR Policies - HR Strategies to increase firm performance - Case Study. **(9)**

Investment perspectives of HR - Investment Considerations - Investment in Training and Development - Investment Practices for improved Retention - Investments Job Secure work courses - Non traditional investment approaches - Case Study. **(9)**

Managing Strategic Organisational Renewal - Managing change and OD - Instituting TQM Programmes - Creating Team Based Organisations - HR and BPR - Flexible work arrangement - Case Study **(9)**

Establishing Strategic Pay plans - Determining periods - Establishing Periods - Pricing Managerial and Professional Jobs - Compensation trends - Objectives of international compensation - Approaches to international compensation - Issues related to double taxation - Case Study. **(9)**

Managing Global Human Resources - HR and the internationalization of business - Improving international assignments through selections - Training and maintaining international employees - Developing international staff and Multinational teams - Strategic alliances -Sustainable global competitive advantage - Location of production facilities - Repatriation process- Case Study. **(9)**

TOTAL : 45

REFERENCE BOOKS

1. *Gary Dessler, "Human Resource Management", PHI, New Delhi, 2003.*
2. *Charles R. Greer, "Strategic Human Resource Management", Pearson Education, 2003.*
3. *Luis R. Gomez-Mejia, David B. Balkin, Robert L. Cardy, "Managing Human Resources", PHI, 2001.*
4. *Peter J. Dowling, Denice E. Welch, Randall S. Schuler, "International Human Resource Management", Thomson South-Western, 2002.*

17MDCE22 - ORGANISATIONAL DEVELOPMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC52

ASSESSMENT : THEORY

COURSE OUTCOME

- *Assess the organisation development process from a historical, theoretical and practical perspective.*
- *Analyse the various organisation development practices, models, and approaches.*
- *Evaluate the value of organisation development interventions to business performance and productivity.*
- *Analyse the value of human resource intervention to the organisational development*
- *Assess the impact of technology on the organisational development*

Organisational Development - An introduction : Organisational Development - Meaning and Definition, History of OD, Relevance of Organisational Development for Managers, Characteristics of OD, Assumptions of OD. Change Process and Models: Organisational Change, Strategies for Change, Theories of Planned Change (Lewin's change model, Action research model, the positive model), Action Research as a Process, Resistance to Change- Case Study. **(9)**

Role of OD Practitioner : OD Practitioner, Role of OD Professional in Organisations, Competencies Required for an OD Professional, Scope of the Role of an OD Professional.Process of OD: Process of OD, Components of OD program, OD program phases, Making an Entry, Developing Contract, Launch, Situational Evaluation, Closure- Case Study. **(9)**

Designing Interventions : OD Interventions, Characteristics of OD Interventions, Levels of Diagnosis in Organisations, OD Map, Factors Affecting Success of Interventions. Human Process Interventions: Introduction, Team Development Interventions, Interpersonal Development Interventions. Human Resource Interventions: HRM Interventions, Goal Setting, Performance Appraisal, Reward Systems, Career Planning and Development, Managing Workforce Diversity, Employee Wellness- Case Study. **(9)**

Structural Interventions : Socio-Technical Systems, Techno-Structural Interventions, Physical Settings and OD, Types of Techno-Structural Interventions. Strategic Interventions: Integrated Strategic Change, Trans-organisation Development, Merger and Acquisition Integration, Culture Change, Self-Designing Organisations, Organisation Learning and Knowledge Management, Confrontation Meetings, System 4 Management, Learning Organisations- Case Study. **(9)**

Technology and OD : Technology & OD: Basic Concept, Impact of Technology in Organisations, Benefits of Using Technology in OD, Guidelines for Integrating Technology in OD Interventions, Tools used in ODIssues Faced in OD: Introduction, Issues Related to Client Relationships, Power, Politics and Organisational Development. Evaluating OD interventions: Evaluation, Importance of Evaluating Interventions, Types of Evaluation, Methods of Evaluating Interventions- Case Study. **(9)**

TOTAL : 45

REFERENCE BOOKS

1. *Bewnet, Roger cd, "Improving Training Effectiveness", Aldershot, Gower 1988.*
2. *Buckley R & Caple, Jim, "The Theory & Practice of Training", London, Kogan & Page 1995.*
3. *Lynton R & Pareek U, "Training to Development", New Delhi, Vistaar, 2nd Edition, 1990.*
4. *Pepper, Allan D, "Managing the Organisational Development Function", Aldershot, Gower, 1984.*
5. *Rae L etc., "Hon to Measure Training Effectiveness", Aldershot, Gower, 1986.*
6. *Reid M.A. etc., "Training interventions, Managing Employee Development", London IPM, 3rd Edition, 1992.*
7. *Serge P "The Fifth Discipline: The Art and Practice of the Learning Organization", London Century, 1992.*
8. *Huse.F.E. and Cummings.T.C, "Organisational Development and Change", West New York, 1985.*

17MDCE23 - PERFORMANCE MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC52

ASSESSMENT : THEORY

COURSE OUTCOME

- *Design an organisation's performance management process that is compliant with law and supports organisational mission and strategy.*
- *Define attributes of effective performance management systems.*
- *Devise and sustain arguments for using appropriate performance management techniques, rewards and sanctions to improve performance.*
- *Identify the necessary characteristics of accurate performance management tools.*
- *Plan effective performance management policies and practices to improve organisational and employee performance*

Introduction to Performance Management : Definition of performance evaluation-Evolution of Performance management-Definitions and differentiation of terms related to performance management- Importance of performance management-Linkage of performance management to other HR processes-Case Study. **(9)**

An Overview of Performance Management : Aim and Purpose of Performance Management-Employee engagement and performance management - Principles of Performance management - Overview of performance management as a system - Dimensions of Performance management-Case Study. **(9)**

Theoretical Framework of Performance Management : Goal Theory, Control theory, Social Cognitive theory, Organisational justice theory and its applications in Performance Management-Case Study. **(9)**

Process of Performance Management : Overview of performance management process-Performance management process-Performance management planning process-Mid-cycle review process-End cycle review process-Performance management cycle at a glance. Planning and Development: Introduction - Performance management planning - The planning process-Performance agreement-Drawing up the Plan-Evaluating the Performance Planning process-Case Study. **(9)**

Mechanics of Performance Management Planning and Documentation : The need for structure and documentation - Manager's responsibility in performance management planning and creation of performance management-Performance management process through automation-Issues in Performance management-Predictive analytics in identifying and analyzing lead and lag indicators for performance management. **(9)**

TOTAL : 45

REFERENCE BOOKS

1. *Herman Aguinis, "Performance Management", Pearson Publication, Third Edition, 2013.*
2. *R.K.Sahu, "Performance Management System", Excel Books, 2009.*
3. *Elaine.D.Pulakees, "SHRM Foundation".*
4. *Linda Ashdown, "Performance Management", 2014.*
5. *PremChandha, "Performance Management", Macmillan Insia, New Delhi, 2003.*
6. *Michael Armstrong and Angela Baron, "Performance Management:The New Realities", Jaico Publishing House, New Delhi, 2002.*
7. *T.V. Rao, "Appraising and Developing Managerial Performance", Excel Books, 2003.*

17MDCE24 - COMPENSATION MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC52

ASSESSMENT : THEORY

COURSE OUTCOME

- *To promote knowledge in the issues related to the compensation in the organisation.*
- *To analyse the pay relationship with job, skills, competencies in an organisation*
- *To evaluate the legal framework and the pay structure of the organisation in comparison to the competitors.*
- *To get a clear idea in fixing the remuneration principles in the company.*
- *To understand the financial and non-financial compensation fixed for executives in an organization*

UNIT I : Introduction : Compensation Defined, Goals of Compensation System, Compensation Strategy Monetary & Non-Monetary Rewards, Intrinsic Rewards Cafeteria Style Compensation, Fringe Benefits and Supplementary Compensation-Case Study **(9)**

UNIT II : Internal Alignment : Definition of internal alignment, Internal pay Structures, Strategic choices in internal alignment design, choosing the best internal structure - Job evaluation: Major decisions in job evaluation, Job Evaluation Methods, Final result-Person-based structures: Salary Slabs, Flexible Structure, Salary Trends-Case Study. **(9)**

UNIT III : Determining External Competitiveness : Definition of Competitiveness, Factors influencing compensation level - Legal framework: Payment of Wages Act, 1936, Minimum Wages Act, 1948, Payment of Bonus Act, 1965, Equal Remuneration Act, 1976-Case Study. **(9)**

UNIT IV : Reward and Compensation Strategies : Performance based pay, Skill based pay, Team based pay,Broad banding, Profit sharing -Compensation& Payroll: Basic, HRA, Variable pay, Designing PF Plans -Case Study. **(9)**

UNIT V : Executive Compensation : Concepts, components, incentives, executive compensation in Indian context - Leave Policy: Scope, Types, Process-Personal income tax implications of salary: sec 88, 54E, 80C, Companies Act provisions relating to remuneration for senior executives-Analytics in identifying Lead and Lag indicators for compensation management. **(9)**

TOTAL : 45

REFERENCE BOOKS

1. *C.B. Mamoria and S.V. Gankar, "Personnel Management", Himalaya Publishing House, Mumbai, Twenty-fifth Edition, 2005*
2. *Tripathi, P. C. 1995, "Personnel Management and Industrial Relations", Sultan Chand : New Delhi*
3. *Venkatratnam, C.S. (2002). "Rethinking Rewards and Incentive Management", Excel:New Delhi.*

MANAGEMENT STREAM - OPERATIONS & LOGISTICS

Course Code	Course Name
17MDCE31	Total Quality Management
17MDCE32	Logistics Strategy and Planning
17MDCE33	Supply Chain Management
17MDCE34	Warehouse and Distribution Management

17MDCE31 - TOTAL QUALITY MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC44

ASSESSMENT : THEORY

COURSE OUTCOME

- *Develop an understanding on quality management philosophies and frameworks*
- *Gain an in-depth knowledge on various tools and techniques of quality management.*
- *Learn the applications of quality tools and techniques in both manufacturing and service industry*
- *Develop analytical skills for investigating and analyzing quality management issues in the industry and suggest implement able solutions to those.*
- *Design the quality framework for a company*

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Quality statements - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Costs of quality - Case Study. **(9)**

Leadership - Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Quality circles Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating - Case Study. **(9)**

The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types- Case Study. **(9)**

Control Charts - Process Capability - Concepts of Six Sigma - Quality Function Development (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures - Case Study **(9)**

Need for ISO 9000 - ISO 9001-2008 Quality System - Elements, Documentation, QualityAuditing - QS 9000 - ISO 14000 - Concepts, Requirements and Benefits - TQM Implementation in manufacturing and service sectors - Case Study. **(9)**

Total : 45

REFERENCE BOOKS

1. *Senthil Arasu.B and Praveen Paul. J, "Total Quality Management", Scitech Publications (India) PVT Ltd, Second Edition, 2006.*
2. *Dale.H.Besterfield, et al, "Total Quality Management", Pearson Edn, Asia, Third Edition, Indian Reprint, 2006.*
3. *James. R. Evans and William. M. Lindsay, "The Management and Control of Quality", Cengage Learning, Eighth Edition, 2012.*
4. *Suganthi. L and Anand Samuel, "Total Quality Management", Prentice Hall(India) Pvt Ltd, 2006.*

17MDCE32 - LOGISTICS STRATEGY AND PLANNING

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC44

ASSESSMENT : THEORY

COURSE OUTCOME

- *Design a logistical planning and Strategy framework*
- *Analyse and design the optimal logistics customer services levels*
- *Compute optimal batch sizes and propose optimal transport routes*
- *Assess different modes of transportation and inter-modals*
- *Design and allocate storage location for products in the warehouse*

Introduction to Logistics : Introduction to Logistics - Scope of logistics in business, Logistics and Supply Chain Management, Core and support activities of logistics; Logistical integration hierarchy; Integrated Logistics; Operating objectives; Barriers to internal integration; Logistical performance cycles; Supply chain relationships - Channel participants, Channel structure, Basic functions, Risk, power and leadership-Case Study. **(9)**

Logistics Systems Design : Logistics system design -Logistics reengineering, Logistical environmental assessment, Time based logistics, Anticipatory and Response based strategies, Alternative strategies, Logistical operational arrangements, Time based control techniques; Integration theory - Location structure, Transportation economies, Inventory economies, Formulating logistics strategy-Case Study. **(9)**

Logistics Strategy and Planning : Logistics strategy and planning - Logistics planning triangle, Network appraisal; Guidelines for strategy formulation - Total cost concept, Setting customer service level, Setting number of warehouses in logistics system, Setting safety stock levels, Differential distribution, Postponement, Consolidation, Selecting proper channel strategy-Case Study. **(9)**

Inventory, Purchasing and Location Decisions : Inventory and purchasing decisions; Multi facility location problems - Exact method, Heuristic methods, other methods; Logistics planning and design - Feasibility analysis, Project planning, Assumptions and data collection, Analysis, Development of recommendation, Implementation-Case Study. **(9)**

Logistics planning and design : Planning and design techniques - Logistics adhoc analysis, Location analysis, Inventory analysis, Transportation analysis-Logistics Analytics. **(9)**

TOTAL : 45

REFERENCE BOOKS

1. *Bowersox & Closs, "Logistical Management", McGraw-Hill Companies, 1996.*
2. *Muthu Mathirajan, Chandrasekharan Rajendran, Sowmyanarayanan Sadagopan, Arunachalam Ravindran and Parasuram Balasubramanion, "Analytics in Operations/Supply Chain Management", I.K. International Publishing House Pvt Ltd., 2015.*
3. *R.H. Ballou, "Business Logistics Management", Prentice-Hall International, 2004.*
4. *David J Bloomberg, "Logistics", Pearson Education, 1st Ed, 2015.*
5. *Ganapathi SL, Nandhi SK, "Logistics Management", Oxford University Press India, 2015.*

17MDCE33 - SUPPLY CHAIN MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC44

ASSESSMENT : THEORY

COURSE OUTCOME

- *Understand fundamental supply chain management concepts*
- *Evaluate and manage an effective supply chain*
- *Align the management of supply chain with corporate goals and strategies*
- *Analyse and improve supply chain process*
- *Understand the importance of the supply chain analytics and optimization*

Concepts of Supply Chain : Understanding supply chains - Supply chain decisions - Enablers and Drivers of Supply Chain Performance - Assessing and Managing Supply chain Performance - Supply chain metrics and Financial metrics relationship - Supply chain Processes and Strategies - Importance of Supply Chain Management-Service and manufacturing supply chain dynamics - Manufacturing supply chains - Bullwhip effect. **(9)**

Forecasting Drivers of Supply chain Performance : Forecasting introduction - Framework for a forecast system - Choosing right forecasting technique - Judgment methods (Composite Forecasts, Surveys, Delphi Method, Scenario Building, Technology Forecasting, Forecast by Analogy) - Causal methods (Regression Analysis -Linear & Non-Linear Regression, Econometrics) - Time series analysis (Autoregressive Moving Average (ARMA), Exponential Smoothing, Extrapolation, Linear Prediction, Trend Estimation, Growth Curve, Box-Jenkins Approach) - CPFR. **(9)**

Inventory management methods in supply chain : Decision framework for inventory management - Preliminary modelling, Two critical and ABC analysis -Single item, Single period problem - Single item, multi period problem - Multi item inventory models - Multi-echelon inventory system. Transportation Decision in Supply Chain: Motor carrier freight - Truck load mode - Steeping back - Building A Rate Model using LTL service - Rail and Cargo. Location and Distribution Decision in Supply Chain : Modelling with binary variables - Supply Chain network optimization - Risk pooling - Continuous location models: Gravity, iterative method - Multiple facility location. **(9)**

Supply Chain Processes and Strategies : Integrated supply chains design - Customer relationship process - Order fulfillment process - Supplier relationship process - Supply chain strategies - Strategic focus - Mass customization - Lean supply chains - Outsourcing and offshoring - Virtual supply chains.Resource planning and scheduling: Enterprise resource planning - Planning and control systems for manufacturers - Materials requirement planning - Drum - Buffer - Rope system - Scheduling - Scheduling service and manufacturing processes - Scheduling customer demand - Scheduling employees - Operations scheduling-Analytics for sequencing and scheduling. **(9)**

Supply Chain Analytics : Understanding and defining supply chain analytics- Importance of analytics in supply chain management - Supply chain analytics in the flow involving material, money, information and ownership - Key issues in supply chain analytics. **(9)**

TOTAL : 45

REFERENCE BOOKS

1. *Ravi Ravindran.A and Donald.P.Warsing, "Supply Chain Engineering Models and Applications", CRC press:Taylor and Francis Group*
2. *Sunil Chopra, Peter Meindl & D.V. Kalra, "Supply Chain Management: Strategy, Planning and Operation", Pearson Education; 5th Ed.. 2012*

3. *Lee Krajewski, Larry P. Ritzman, Malhotra, "Operations Management 8e", Pearson Education; 11th edition2015*
4. *Christopher Martin, "Logistics and Supply Chain Management", Pearson Education Asia,2002.*
5. *David Simchi-Levi, Ravi Shankar, "Designing and Managing Supply Chain concepts, Strategies and Case Studies", McGraw Hill Publication, 3rd Edition, 2011.*
6. *Janat Shah, "Supply Chain Management - Text and Cases", Pearson Education, 2nd Edition, 2016.*

17MDCE34 - WAREHOUSE AND DISTRIBUTION MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC44

ASSESSMENT : THEORY

COURSE OUTCOME

- *Apply the concepts and principles used in warehousing and distribution management.*
- *To analyse the various operational activities of warehouse and distribution management.*
- *To analyse and quantify warehouse and distribution system performance*
- *To understand the challenges faced in complex warehousing and distribution operations.*
- *To understand the processes in unitization,shipping and packaging of warehouse.*

Introduction To Warehousing, Issues and Processes : Warehouse rationale and material flow - Need for a warehouse - Types of warehouses - Fluid model of the product flow - Storage decisions - Functions, Systems, Storage and handling equipment's - Material flow and warehouse layout : Pallets and cartons, Fast pick area, Slotting-Case Study **(9)**

Managing Warehouse Efficiency : Order picking - Picking by 'Bucket brigade', Pick paths, Cross docking - Measuring warehouse efficiency: Activity profiling and Benchmarking - Warehouse workforce design and development: Safety and Ergonomics-Case Study. **(9)**

Unitization : Container Optimization - Container loading - Dock Management - Labelling and its essentials -Case Study. **(9)**

Shipping and Packaging : Packaging : Design, Materials and kinds, Preparation for packaging - Packing for transportation - Packing procedures, cost, Marking - Packaging of hazardous goods -Case Study. **(9)**

Distribution Facilities Management : Material handling system design -Material Handling Technologies- Modern warehousing: Automatic identification and communication system, AS / RS - Warehousing around the world-Case Study. **(9)**

Total : 45

REFERENCE BOOKS

1. *Frazelle, "World Class Warehousing & Material Handling", Tata McGraw-Hill, 2008.*
2. *Satish K. Kapoor and Purva Kansa, "Basics of Distribution Management - A Logistical Approach", Prentice Hall, 2003.*
3. *Satish K. Kapoor and PurvaKansal, "Marketing Logistics - A Supply Chain Approach", Pearson Education, 2003.*
4. *Vinod V Sople, "Logistics Management", Pearson Education, 2004.*
5. *Arnold, "Introduction to Materials Management", Pearson Education, 2009.*

MANAGEMENT STREAM - GENERAL MANAGEMENT

Course Code	Course Name
17MDCE41	Business Environment
17MDCE42	Legal Aspects of Business
17MDCE43	Information Technology for Managers
17MDCE44	Direct and Indirect Tax
17MDCE45	Technology and Innovation Management
17MDCE46	Business Process Management

17MDCE41 - BUSINESS ENVIRONMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Differentiate between the needs and wants of a society and can identify how these are satisfied through business activity.*
- *Distinguish between the primary, secondary and tertiary sectors of the economy.*
- *Evaluate the difference between the public and private sectors of an economy and can identify their differing objectives.*
- *Assess the differing objectives of private and public sector businesses.*
- *Assess the various constituents of business environment and their impact in the globalized scenario.*

Business Environment : Meaning, Types of Environment. Environmental Analysis: Stages, Approaches, Techniques. Nature and Scope of Business: Business System, Classification of business, Characteristics of business, classification of industries. Economic Environment: Nature, Structure, Economic Policies, Economic conditions- Case Study **(9)**

Consumerism and Business : Consumer Rights, Exploitation of Consumers, Consumer Protection, UN Guidelines for Consumer Protection, Consumer Protection and consumerism in India, Consumer Protection Act 1986. Corporate Governance: Meaning, Importance, Reasons for the growing demand for CG- Case Study **(9)**

Industrial Policies & Regulations : Industrial Policy, Industrial Licensing. Competition Law: Competition Act 2002. Patents & Trademarks: Patent Protection in India, The Trade Marks Act 1999. Technological Environment: Innovation, Product and Process innovation, Technology and Competitive advantage- Case Study. **(9)**

Societal Environment : Business Ethics, Business and Culture, Cultural Traits, Technological developments and Social change. Social Responsibility of Business: Meaning, Classical and contemporary views, Social Orientations of Business, Factors affecting Social Orientation. Responsibility to different Sections.Social Audit.- Case Study. **(9)**

Globalisation : GATT/ WTO/The Uruguay Round, WTO & Developing Countries, WTO and India .MNCs: Definition and Meaning, MNCs & International Trade, MNC's in India. Globalisation of World Economy, Globalisation of Business, Stages of Globalisation, Foreign Market Entry Strategies- Case Study. **(9)**

TOTAL : 45

TEXT BOOK

1. *Francis Cherunilam, "Business Environment: Text & Cases", Himalaya Publishing, Mumbai, 18th Edition, 2014.*

REFERENCE BOOKS

1. *Justin Paul, "Business Environment", Tata McGraw Hill, New Delhi, 2nd Edition, 2006.*
2. *SubbaRao P, "International Business: Text & Cases", Himalaya Publishing, Mumbai, 4th Edition, 2014.*
3. *Aswathappa K, "Essentials of Business Environment", Himalaya Publishing, Mumbai, 4th Edition, 2014.*
4. *Philip R. Cateora, "International Marketing", Irwin McGraw Hill, 9th edition.*

17MDCE42 - LEGAL ASPECTS OF BUSINESS

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Create knowledge about the legal perspective of the business*
- *Understand the implications of legal laws in improving business practices*
- *Analyse the situation of business environment and make business decisions*
- *Develop the best tax practices for the business in the legal perspectives*
- *Analyse the various Legal business case problems make decisions.*

COMMERCIAL LAW

The Indian Contract Act 1872: Definition of contract, essentials, elements and types of a contract, Formation of a contract, performance of contracts, breach of contract and its remedies, Quasi contracts - Contract of Agency: Nature of agency, Creation and types of agents, Authority and Liability of Agent and principal; Rights and duties of principal and agents, termination of agency. Case Study **(9)**

The Sale of Goods Act 1930: Nature of sales contract, documents of title, risk of loss, Guarantees and Warranties, performance of sales contracts, conditional sales and rights of an unpaid seller - Negotiable Instruments Act 1881: Nature and requisites of negotiable instruments, Types of negotiable instruments, liability of parties, holder in due course, special rules for cheque and drafts, discharge of negotiable instruments-Case Study. **(9)**

COMPANY LAW

Major principles- Nature and types of companies, Formation, Memorandum and Articles of Association, Prospectus, Power, duties and liabilities of directors, winding up of companies, Corporate Governance-Case Study. **(9)**

INDUSTRIAL LAW

An Overview of Factories Act - Payment of Wages Act- Payment of Bonus Act - Industrial Disputes Act-Case Study. **(9)**

Income Tax Act and Sales Tax Act

Corporate Tax Planning, Overview of central sales tax act 1956 - Defiitions, Scope, Incidence of CST and GST, Practical issues of CST and GST, Value Added Tax - Concepts, Scope, Methods of VAT Calculation, Practical Implications of VAT-Case Study. **(9)**

Total : 45

REFERENCE BOOKS

1. *N.D. Kapoor, "Elements of Mercantile Law", Sultan Chand and Company, India, 2006.*
2. *P.K. Goel, "Business Law for Managers", Biztantatara Publishers, India, 2008*
3. *Akhileshwar Pathack, "Legal Aspects of Business", Tata McGraw Hill, 2009*
4. *P.P.S. Gogna, "Mercantile Law", S. Chand & Co Ltd, India, Fourth Edition, 2008.*
5. *Dr. Vinod, K.Singhania, "Direct Taxes Planning and Management", 2008.*
6. *Richard Stim, "Intellectual Property - Copy Rights, Trade Marks and Patents", Cengage Learning, 2008.*

17MDCE43 - INFORMATION TECHNOLOGY FOR MANAGERS

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Develop an understanding about the use of business analytics*
- *Understand the application of business analytics in industries like banking, insurance, retail and media & communication*
- *Analyse and make decisions using business analytics in the major industrial domains*
- *Gain knowledge with case studies and the impact of business analytics*
- *Evaluate the use of business analytics in the major industrial domains*

Introduction to Business Analytics for Industries and open standards : Understanding briefly - Banking Industry, Insurance Industry, Retail & CPG Industry and Media & Communication (Telecom) Industry: Briefly understanding Business Analytics applications with respect to banking, insurance: retail & CPG and social media and communication industry: Introduction to Industry Vertical Open Standards: Advantages of Open Industry standards: Healthcare, Retail, Insurance verticals-Case Study. **(9)**

Business Analytics for Banking Industry : Banking Industry Overview: IT Landscape / Business Applications: Key Issues/Pain points: Business Analytics solutions & Use case Scenarios for below Business Areas/Organization Units: Marketing, Product Management, Channel Management, Risk Management, Finance Treasury, Payments. Case Studies. **(9)**

Business Analytics for Insurance Industry : Insurance Industry Overview: IT Landscape / Business Applications: Key Issues/ Pain points: Business Analytics solutions & Use case Scenarios in below are as: Finance, Sales and marketing distribution, Risk, Claims: Case Studies. **(9)**

Business Analytics for Retail & Consumer Products : Retail & CPG Industry Overview; IT Landscape / Business Applications; Key Issues/Pain points; Business Analytics solutions & Use case Scenarios; Case Studies - Merchandising, Operations, Marketing, Store Managers, Brand Managers, Distribution, Finance, HR Case Studies. **(9)**

Business Analyticsfor Media & Communication : Media & Communication (Telecom) Industry Overview; IT Landscape/ Business Applications: Key Issues/Pain points: Business Analytics solutions & Use. Case Scenarios: Finance, Marketing, Product development, Customer care Case Studies. **(9)**

TOTAL : 45

REFERENCE BOOKS

1. *Sesil, J.C., "Applying Advanced Analytics to HR Management Decisions: Methods for Selection, Developing Incentives, and Improving", Pearson FT Press, 2013.*
2. *PavelRyzhov, "Haskell Financial Data Modeling and Predictive Analytics", Packt Publishing, 2013.*
3. *Chuck Hemann& Ken Burbary, "Digital Marketing Analytics: Making Sense of Consumer Data in a Digital World (Que Biz-Tech)", 2013.*

17MDCE44 - DIRECT AND INDIRECT TAX

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Apply the critical thinking and problem solving skills related to taxation.*
- *Understand and apply the ethical principles and Professional standards in taking decision related to tax.*
- *Describe how the provisions in the corporate tax laws can be used for tax planning.*
- *Evaluate the practical cases of tax planning as an important managerial decision-making process.*
- *Compare the real life situations involving taxation and make tax-sensitive decisions.*

Tax : Meaning, Characteristics, Objectives, and Canons of Taxation Effects of Taxation, Direct and Indirect Taxes, Merits and Demerits. **(9)**

Direct Tax : Income Tax Act, Principles of Income, Computation of Total Income (Problems), Assess, Assessment year, previous year, Residential Status. **(9)**

Theoretical Concepts related to Salaries - Income from House Property - Capital Gains - Deductions. **(9)**

Indirect Tax: Central Excise Act 1944 - Basic Concepts and Definitions - Customs Act 1962. **(9)**

Service Tax and Value Added Tax (VAT): Service tax - concept, computing methods - Sales tax concept - VAT- Concept, computing methods - GST - Concept, Computing Methods - Filing Procedures of GST. **(9)**

TOTAL : 45

REFERENCE BOOKS

1. *Gaurishankar. V, "Principles of Taxation", Eastern Book Company: New Delhi, 2007*
2. *Gaur and Narang, "Income Tax Law and Practice", Kalyani Publications: New Delhi.*
3. *Balachandran V., "Indirect Taxes", Sultan Chand & Sons: New Delhi.*
4. *P.Radha Krishnan, "Indirect Taxation", Kalyani Publishers: New Delhi.*
5. *Richard A. Musgrave, "The Theory of Public Finance", McGraw Hill Book Company, INC, New York.*
6. *Vinod Singhania, "Income Tax Law and Practice", Taxman's: New Delhi.*
7. *Datey V.S. "Indirect Taxes, Law and Practice", Taxmann Publications: New Delhi*

17MDCE45 - TECHNOLOGY AND INNOVATION MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Develop Conceptual Knowledge and Practical skill regarding technological innovation*
- *Understand how technological innovation diffuse overtime*
- *Analyse the support of the organisation for technology innovation*
- *Integrate external and internal technologies and innovations*
- *Apply the knowledge of Technology and Innovation to real business cases.*

Introduction : The Importance of Technological Innovation - The Impact of Technological Innovation and Society - Innovation by Industry-Case Study. **(9)**

Industry Dynamics of Technological Innovation : Sources of Innovation - Types and Patterns of Innovation - Standards Battles and Design Dominance - Timing of entry-Case Study. **(9)**

Formulating Technological Innovation Strategy : Defining the organisations strategic direction - Choosing innovation projects - Collaboration strategies - Protecting Innovation-Case Study. **(9)**

Implementing Technological Innovation Strategy : Organising for Innovation - Managing the New Product Development Process - Managing New Product Development Teams-Crafting a Deployment strategy-Case Study. **(9)**

Technology Based Entrepreneurship - Knowledge Spill over Entrepreneurship - Innovation in Large and Small Firms-Case Study. **(9)**

Total : 45

REFERENCE BOOKS

1. *Melissa Schilling, "Strategic Management of Technological Innovation", Mc.Graw Hill Publications, New York, Fourth Edition, 2012.*
2. *Scott Shane, "Handbook of Technology and Innovation Management", Wiley Publications.*
3. *Chesbrugh, "Open Innovations", Harvard Business School Press, USA, First Edition, 2003.*
4. *Osterwalder and Pigneur, "Business Model Generation", Wiley Hoboken, NI, USA, First Edition, 2010.*

17MDCE46 - BUSINESS PROCESS MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Discover the processes associated with the given business problem*
- *Analyze the business process and identify the issues of the process.*
- *Design the business process by applying the necessary changes.*
- *Develop the IT solution to automate the business process*
- *Infer Business Process Management as a cross-disciplinary field, striking a balance between business management and IT aspects*

INTRODUCTION TO BUSINESS PROCESS MANAGEMENT (BPM)

Business Process Definition - Origin and History of BPM - The BPM Lifecycle **(7)**

PROCESS IDENTIFICATION AND MODELING

Focusing on Key Processes - Designing a Process Architecture - BPMN Initiation - Branching and Merging - Information Artifacts Resources. **(9)**

ADVANCED PROCESS MODELING

Process Decomposition - Process Reuse - Rework and Repetition - Handling Events - Handling Exceptions - Processes and Business Rules. **(10)**

PROCESS DISCOVERY

The Setting of Process Discovery - Discovery Methods - Process Modeling Method - Process Model Quality Assurance. **(9)**

PROCESS ANALYSIS AND REDESIGN

Qualitative Process Analysis : Value-Added Analysis - Root Cause Analysis - Issue Documentation and Impact Assessment. Quantitative Process Analysis : Performance Measures - Flow Analysis - Queues - Simulation. Redesign: Definition and Need - Heuristic Process Redesign - The Case of a Health Care Institution - Product-Based Design. **(10)**

TOTAL : 45

TEXT BOOK

1. *Marlon Dumas, Marcello La Rosa, Jan Mendling and Hajo A. Reijers, "Fundamentals of Business Process Management", Springer-Verlag Publication, 2013.*

REFERENCE BOOK

1. *Forrest W. Breyfogle III, "The Business Process Management Guidebook: An Integrated Enterprise Excellence BPM System", Citius Publishing, 2013.*

COMPUTER SCIENCE STREAM - DATA ANALYTICS

Course Code	Course Name
15MSSE34	Machine Learning
16MDS53	Big Data Architecture
16MDSE2	Web Mining
16MDS83	Data Visualization
16MDSE6	Information Security Analytics
16MDSE20	Data Centric Computing
16MDSE8	Bio Informatics
16MDSE3	Social Network Analysis
16MDSE4	Geographical Information Analysis
16MDSE11	Econometric Analysis
16MDS92	Deep Learning

15MSSE34 - MACHINE LEARNING

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Describe and design the concepts of learning, and the perspectives and issues in machine learning.*
- *Apply the machine learning techniques - Clustering, Induction, Bayesian, Decision Tree, Analytical, Instance based learning and to apply the techniques in computing.*
- *Compare the various machine learning techniques and design issues in machine learning.*
- *Perform evaluation of learning algorithms, model selection, and how to apply a variety of learning algorithms to data.*
- *Development of new machine learning algorithms that learn more accurately, utilize data from dramatically more diverse data sources available over the Internet.*

INTRODUCTION

Designing a learning system - Perspectives and Issues in machine learning - Concept learning task - Concept learning as search - Version spaces - Candidate Elimination learning algorithm - Inductive Bias. **(9)**

DECISION TREE LEARNING

Decision Tree representation - Appropriate Problems for Decision Tree Learning - Basic Decision tree learning algorithm - Hypothesis space search and Inductive Bias in Decision tree learning - Issues in Decision Tree Learning. **(7)**

ANN

Perceptrons - Back propagation Algorithms. Evaluating Hypothesis: Deriving confidence intervals - Hypothesis testing - comparing learning algorithms. **(5)**

BAYESIAN LEARNING

Bayes Theorem and Concept learning - Maximum Likelihood and Least Squared error hypothesis - Maximum Likelihood hypotheses for predicting probabilities - Minimum description Length principle - Bayes optimal classifier - Gibbs algorithm - Naïve Bayes classifier - Bayesian Belief networks -EM algorithm. **(9)**

ANALYTICAL AND COMBINING ANALYTICAL & INDUCTIVE LEARNING

Analytical learning - Explanation based learning - Inductive Analytical approaches to learning - Using prior knowledge to, initialize the hypothesis, alter the search objective and augment search operators. **(6)**

INSTANCE-BASED AND REINFORCEMENT LEARNING

K - nearest neighbour learning -Locally weighted regression - Radial Basis functions - Case based reasoning - Reinforcement learning: Learning task-Q Learning-Q function - Algorithm for learning Q-convergence - updating sequence - Temporal difference learning - Non deterministic rewards and actions. **(9)**

TOTAL : 45

REFERENCE BOOKS

1. *Tom M Mitchell, "Machine Learning", McGraw Hill, 1st Edition, 2003.*
2. *EthemAlpaydin, "Introduction to Machine Learning", MIT Press, 2nd Edition, 2010.*
3. *Stephan Marsland, "Machine Learning - An Algorithmic Perspective", Chapman and Hall, 1st Edition, 2009.*
4. *Nils Nilsson, "Introduction to Machine Learning", MIT Press, 1997.*
5. *Jude Shavil, Thomas G Dietterich, "Readings in Machine Learning", Morgan Kaufmann Publishers, 1990.*

16MDS53 - BIG DATA ARCHITECTURE

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC34

ASSESSMENT : THEORY

COURSE OUTCOME

- *Architectural issues present when building big data systems.*
- *Analyze the analytical techniques on variety of Big data application scenarios.*
- *Apply hadoop clusters and map reduce programs for parallel processing of big data.*
- *Compare :Compare PIG and HIVE with traditional databases.*
- *Generate: Generate dynamic solutions for data analytics problems using map reduce framework.*

INTRODUCTION

Big data characteristics - Volume, Veracity, Velocity, Variety Value - Issues - Case for Big data - Big data options. Team challenge - Big data sources - Acquisition - Features of Big Data - Security, Compliance, auditing and protection.

Understanding the Big Data Project's Ecosystem - Creating the Foundation of a Long-Term Big Data Architecture -Early Big Data with NoSQL - NoSQL Landscape - Introducing Couchbase - Introducing ElasticSearch - Using NoSQL as a Cache in a SQL-based Architecture. **(9)**

STREAMING DATA

Streaming Data - Streaming Architecture - The Anatomy of the Ingested Data - Setting Up the Streaming Architecture

QUERYING AND ANALYZING PATTERNS

Definining an Analytics Strategy - Process and Index Data Using Spark **(9)**

THE HADOOP ECOSYSTEM

Big Data and the HadoopEcosystem- The Hadoop Ecosystem - Hadoop Core Components - Hadoop Distributions - Developing Enterprise Applications with Hadoop

STORING DATA IN HADOOP - HDFS -HBase -Combining HDFS and HBase for Effective Data Storage -Using Apache Avro - Managing Metadata with HCatalog - Choosing an Appropriate Hadoop Data Organization **(9)**

PROCESSING DATA WITH MAPREDUCE

Getting to Know First MapReduce Application - Designing MapReduce Implementations

CUSTOMIZING MAPREDUCE EXECUTION

Reading Data Way with Custom Record Readers -Organizing Output Data with Custom Output Formats - Writing Data Your Way with Custom Record Writers - Optimizing MapReduce Execution with a Combiner - Controlling Reducer Execution with Partitioners - Using Non-Java Code with Hadoop **(9)**

PIG

Installing and Running Pig - Comparison with Databases - Pig Latin -User-Defined Functions - Data Processing Operators -Pig in Practice

Hive

Installing Hive - Running Hive -Comparison with Traditional Databases -HiveQL -Tables - Querying Data -User-Defined Functions **(9)**

TOTAL : 45

TEXT BOOKS

1 . *Bahaaldine Azarmi. "Scalable Big DataArchitecture -A Practitioner's Guide to ChoosingRelevant Big Data Architecture" A Press, 2016, (Para 1, Para 2, Para 3)*

2. *Kevin T. Smith, Alexey Yakubovich, Boris Lublinsky, "Professional Hadoop® Solutions", John Wiley & Sons Inc, 2013. (Para 4, Para 5, Para 6)*

3. *Tom White - Beijing, "Hadoop: The Definitive Guide", O'reilly, Third Edition, Jan 2012. (Para 7, Para 8)*

16MDSE2 - WEB MINING

L	T	P	C
3	0	0	3

PRE-REQUISITES

17MDC64

ASSESSMENT : THEORY

COURSE OUTCOME

- *To outline on a detailed overview of the data mining process and techniques, specifically those that are relevant to Web mining.*
- *Identify and differentiate between application areas for web content mining, web structure mining and web usage mining.*
- *To demonstrate the basics of Information retrieval and Web search with special emphasis on web Crawling.*
- *To apply the use of machine learning approaches for Web Content Mining, the role of hyper links in web structure mining and the various aspects of web usage mining.*
- *Develop skills of using recent data mining software for solving practical problems of Web Mining.*

INTRODUCTION

Introduction - Web Mining - Theoretical background -Algorithms and techniques - Association rule mining - Sequential Pattern Mining -Information retrieval and Web search - Information retrieval Models-Relevance Feedback- Text and Web page Pre-processing - Inverted Index - Latent Semantic Indexing - Web Search - Meta-Search - Web Spamming **(9)**

WEB CONTENT MINING

Web Content Mining - Supervised Learning - Decision tree - Naïve Bayesian Text Classification - Support Vector Machines - Ensemble of Classifiers. Unsupervised Learning - K-means Clustering - Hierarchical Clustering -Partially Supervised Learning - Markov Models - Probability-Based Clustering - Evaluating Classification and Clustering - Vector Space Model - Latent semantic Indexing - Automatic Topic Extraction - Opinion Mining and Sentiment Analysis - Document Sentiment Classification. **(9)**

WEB LINK MINING

Web Link Mining - Hyperlink based Ranking - Introduction -Social Networks Analysis- Co-Citation and Bibliographic Coupling - Page Rank -Authorities and Hubs -Link-Based Similarity Search - Enhanced Techniques for Page Ranking - Community Discovery - Web Crawling - A Basic Crawler Algorithm- Implementation Issues- Universal Crawlers- Focused Crawlers - Topical Crawlers Evaluation - Crawler Ethics and Conflicts - New Developments **(9)**

STRUCTURED DATA EXTRACTION

Structured Data Extraction: Wrapper Generation - Preliminaries- Wrapper Induction- Instance-Based Wrapper Learning ·- Automatic Wrapper Generation: Problems - String Matching and Tree Matching -. Multiple Alignment - Building DOM Trees - Extraction Based on a Single List Page and Multiple pages- Introduction to Schema Matching - Schema-Level Match -Domain and Instance-Level Matching - Extracting and Analyzing Web Social Networks. **(9)**

WEB USAGE MINING

Web Usage Mining - Click stream Analysis -Web Server Log Files - Data Collection and PreProcessing - Cleaning and Filtering- Data Modeling for Web Usage Mining - The BIRCH Clustering Algorithm -Affinity Analysis and the A Priori Algorithm - Binning. Discovery and Analysis of Web Usage Patterns - Modeling user interests -Probabilistic Latent Semantic Analysis - Latent Dirichlet Allocation Model- Applications- Collaborative Filtering- Recommender Systems - Web Recommender systems based on User and Item - PLSA and LDA Models **(9)**

TOTAL : 45

TEXT BOOKS

1. *Bing Liu, "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data (Data-Centric Systems and Applications)", Springer; 2nd Edition 2009. (Para 1, Para 2, Para 3, Para 4, Para 5)*
2. *Guandong Xu ,Yanchun Zhang, Lin Li, "Web Mining and Social Networking: Techniques and Applications", Springer; 1st Edition, 2010. (Para 1, Para 2, Para 4)*
3. *Zdravko Markov, Daniel T. Larose, "Data Mining the Web: Uncovering Patterns in Web Content, Structure, and Usage", John Wiley & Sons, Inc., 2007. (Para 5, Para 2)*

REFERENCE BOOKS

1. *Soumen Chakrabarti, "Mining the Web: Discovering Knowledge from Hypertext Data", Morgan Kaufmann; edition 2002.*
2. *Adam Schenker, "Graph-Theoretic Techniques for Web Content Mining", World Scientific Pub Co Inc, 2005.*
3. *Min Song, Yi Fang and Brook Wu, Handbook of research on Text and Web mining technologies, IGI global, information Science Reference - imprint of : IGI publishing, 2008.*

16MDS83 - DATA VISUALIZATION

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Understand different data visualization techniques.*
- *Gain practical experience in building and evaluating visualization systems.*
- *Determine the methods of presentation to an audience once an insight has been found.*

INTRODUCTION TO DATA VISUALIZATION

Seven stages of visualizing data-getting started with processing-mapping-Time Series- Connections and Correlations-scatterplot maps-trees, hierarchies & recursions-Networks and graphs-Acquiring data-Parsing data **(15)**

DATA REPRESENTATION

Computer graphics and visualization-Discrete data representation in visualization applications-Visualization pipeline. **(10)**

TECHNIQUES FOR DATA VISUALIZATION

Fundamental techniques for scalar visualization-Vector visualization techniques- Tensor visualization techniques- Information visualization techniques. **(10)**

INTRODUCTION TO D3

Technology Fundamentals: Embedding with HTML, DOM, CSS, Javascript, SVG-Drawing with data-Scales **(10)**

TOTAL : 45

TEXT BOOKS

1. *Ben Fry, O'Reilly, "Visualizing data: Exploring and Explaining data with the processing environment", 2007. (Para I)*
2. *Alexandru C Telea, "Data Visualization Principles and Practice, CRC Press", 2nd edition, 2014. (Para II, III)*
3. *Scott Murray, O'Reilly," Interactive data visualization for the web", 2013 (Para IV)*

16MDSE6 - INFORMATION SECURITY ANALYTICS

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *To give insights into the practice of analytics.*
- *To utilize analytic techniques to identify trends.*
- *To provide a wealth of analytics experience to demonstrate practical, hands-on techniques through case studies.*

INTRODUCTION

ANALYTICS DEFINED AND ANALYTICAL SOFTWARE TOOLS

Introduction to Security Analytics - Concepts and Techniques in Analytics - Data for Security Analytics - Analytics in Everyday life - Security Analytics Process. Introduction - Statistical Programming- Introduction to Databases and Big Data Techniques- Introduction to R- Introduction to Python-Introduction to Simulation. **(10)**

ANALYTICS AND INCIDENT RESPONSE

Introduction - Scenarios and Challenges in intrusions and incident identification- Analysis of Log files- Loading the Data-Another Potential Analytical Data Set: Unstacked Status Codes- Other Applicable Security Areas and Scenarios. **(9)**

SIMULATIONS AND SECURITY PROCESSES

Simulation - Designing and Creating a Model- Adding Data and Parameters to the Model - Running and Analyzing the Simulation. **(7)**

ACCESS ANALYTICS

Introduction -Technology Primer- Scenario, Analysis and Techniques - Case Study- Analyzing the Results. **(7)**

TEXT MINING AND SECURITY INTELLIGENCE

Scenarios and challenges in security Analytics with Text Mining - Use of Text mining Techniques to analyze and find patterns in unstructured Data - Step by Step Text Mining Example in R- other Applicable Security Areas and Scenarios. Security Intelligence Overview - Security Breaches - Practical Applications. **(12)**

TOTAL : 45

TEXT BOOK

1. *Mark Talabis, Robert McPherson, I Miyamoto, Jason Martin," Information Security Analytics: Finding Security Insights, Patterns and Anomalies in Big Data", SyngressMedia,U.S. 2014.*

REFERENCE BOOK

1. *Jay Jacobs, Bob Rudis," Data-Driven Security: Analysis, Visualization and Dashboards", Wiley ,2014.*

16MDSE20 - DATA CENTRIC COMPUTING

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC34, 17MDC63

ASSESSMENT : THEORY

COURSE OUTCOME

- *To understand the importance of Data-Intensive Computing and the need for Parallel Computing.*
- *To provide knowledge on Data-Intensive architecture and techniques.*
- *To learn security in Data-Intensive Computing.*

DATA-INTENSIVE COMPUTING - INTRODUCTION

A Challenge for the 21st century - Characterizing Data-Intensive Applications - Anatomy of Data-Intensive Computing Applications. **(8)**

DATA-INTENSIVE COMPUTING ARCHITECTURE

Hardware Architectures - Data Management Architecture - Overview of Cloud Computing - Large-scale Data Management Techniques in Cloud Computing Platform - Data-Intensive applications with MapReduce, High Performance Network Architecture for Data-Intensive Computing. **(9)**

DATA-INTENSIVE SOFTWARE SYSTEMS

Architecting Data-Intensive Computing Software systems - ECL/HPCC: A unified approach to Big Data - Scalable Storage for Data-Intensive Computing. **(9)**

TECHNOLOGIES AND TECHNIQUES

Load Balancing Techniques for Data-Intensive Computing - Parallel Processing, Multiprocessors and Virtualization in Data-Intensive Computing. **(9)**

SECURITY IN DATA-INTENSIVE COMPUTING

Security in Data-Intensive Computing systems - Data Security and Privacy in Data-Intensive Computing clusters - Information Security in large scale distributed systems - Privacy and Security requirements of Data-Intensive Computing Clouds. **(10)**

TOTAL : 45

TEXT BOOKS

1. *Ian Gorton, Deborah K. Gracio, "Data-Intensive Computing - Architectures, Algorithms and Applications", Cambridge University Press, 2013.*
2. *BorhoFurht, Armando Escalante, "Handbook of Data-Intensive Computing", Springer*

REFERENCE BOOK

1. *Frederic Magoules, Jie Pan, FeiTeng, "Cloud Computing - Data-Intensive Computing and Scheduling", CRC Press, Taylor & Francis Group*

16MDSE8 - BIO-INFORMATICS

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *To introduce a new scientific discipline Bioinformatics, the combined power of biology, mathematics and computers.*
- *To impart knowledge in computer science with biology to unite raw data with powerful software tools and mathematical models.*
- *It represents a frontier in biological research and the best path toward finding meaning in a world of complex data.*

INTRODUCTION

System approach in molecular biology, Central dogma of molecular biology, important definitions, bioinformatics approach, Applications, European molecular biology network - national center for bio technology information. **(7)**

CODING

Common health care language, coding techniques - coded and quasi-coded data - Medical vocabulary - industry wide communication standards HL7 - unified medical language system - quality of care paradigms, risk management bioethics. **(8)**

PATIENT RECORD MAINTENANCE

Electronic patient record - models or ERP - environmental services - metrics - telemedicine - community networks - telemedicine peripherals and equipment selection - anatomy of video conferencing technology. **(8)**

PROTEIN INFORMATION RESOURCES

Biological data basics - primary secondary data basics - protein pattern data basics - DNA sequences data basics, DNA analysis, Genes structure and DNA sequences - interpretation of EST structures - different approach to EST analysis. **(8)**

ALIGNMENT TECHNIQUES

Data base searching, comparison of two sequences - identity and similarity - global and global similarity - global and local alignment, multiple sequence alignment - data basis of multiple alignments - secondary database **(7)**

PROBLEM SOLVING IN BIOINFORMATICS

Gnome analysis for DNA sequences, protein sequences, Strategies and options for similarity search, Practical considerations in sequence analysis, Flow chart for protein structure prediction -Illustrations **(7)**

TOTAL : 45

TEXT BOOK

1. *Teresa Attwood, David Parry-Smith, "Introduction to Bioinformatics", Pearson Education, New Delhi, 2001.*

REFERENCE BOOKS

1. *Arthur M. Lesk, "Introduction to Bio-Informatics", Oxford Press, New Delhi, 2004.*
2. *Pierre Baldi, Soren Brunak, " Bioinformatics - The Machine Learning Approach", East-West Press, New Delhi, 2003.*
3. *Rastogi.S.C, Namita Mendiratta, Parag Rastogi, "Bioinforamtics - Concepts, Skills, Applications", CBS Publications & Distributors, New Delhi, 2003.*

16MDSE3 - SOCIAL NETWORK ANALYSIS

L	T	P	C
3	0	0	3

PRE-REQUISITES

17MDC64, 16MDS83

ASSESSMENT : THEORY

COURSE OUTCOME

- *Work on the internal components of the social network.*
- *Model and visualize the social network.*
- *Mine the behaviour of the users in the social network.*
- *Predict the possible next outcome of the social network.*
- *Preserving privacy in social networks and real time social network application.*

INTRODUCTION

Introduction to Web - Limitations of current Web - Development of Semantic Web - Emergence of the Social Web - Statistical Properties of Social Networks -Network analysis - Development of Social Network Analysis - Key concepts and measures in network analysis - Discussion networks - Blogs and online communities - Web-based networks **(9)**

MODELING AND VISUALIZATION

Visualizing Online Social Networks - A Taxonomy of Visualizations - Graph Representation - Centrality- Clustering - Node-Edge Diagrams - Visualizing Social Networks with Matrix Based Representations- Node-Link Diagrams - Hybrid Representations - Modelling and aggregating social network data - Random Walks and their Applications -Use of Hadoop and Map Reduce - Ontological representation of social individuals and relationships. **(9)**

MINING COMMUNITIES

Aggregating and reasoning with social network data, Advanced Representations - Extracting evolution of Web Community from a Series of Web Archive - Detecting Communities in Social Networks - Evaluating Communities - Core Methods for Community Detection & Mining - Applications of Community Mining Algorithms - Node Classification in Social Networks. **(9)**

EVOLUTION

Evolution in Social Networks - Framework - Tracing Smoothly Evolving Communities - Models and Algorithms for Social Influence Analysis - Influence Related Statistics - Social Similarity and Influence - Influence Maximization in Viral Marketing - Algorithms and Systems for Expert Location in Social Networks - Expert Location without Graph Constraints - with Score Propagation - Expert Team Formation - Link Prediction in Social Networks - Feature based Link Prediction - Bayesian Probabilistic Models - Probabilistic Relational Models. **(9)**

PRIVACY IN SOCIAL NETWORKS AND APPLICATIONS

Introduction - Privacy breaches in Social Networks - Privacy definitions for publishing data - privacy preserving mechanisms. APPLICATION : A learning based approach for Real Time Emotion Classification of Tweets - Assessing the opinion of users in Social Network enviroments. **(9)**

TOTAL : 45

TEXT BOOKS

1. *Peter Mika, "Social Networks and the Semantic Web", Springer, 1st edition, 2007.*
2. *Borko Furht, "Handbook of Social Network Technologies and Applications, Springer", 1st edition, 2011.*
3. *Charu C. Aggarwal, "Social Network Data Analytic", Springer; 2014.*

REFERENCE BOOKS

1. *Ajith Abraham, Aboul Ella Hassanien, Václav Snášel, "Computational Social Network Analysis: Trends, Tools and Research Advances", Springer, 2012*
2. *Giles, Mark Smith, John Yen, "Advances in Social Network Mining and Analysis", Springer, 2010.*
3. *Guandong Xu , Yanchun Zhang and Lin Li, "Web Mining and Social Networking - Techniques and applications", Springer, 1st edition, 2012*
4. *Przemyslaw Kazienko, Nitesh Chawla,"Applications of Social Media and Social Network Analysis", Springer, 2015 CP5007 BIO-INSPIRED CO.*

16MDSE4 - GEOGRAPHICAL INFORMATION ANALYSIS

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

The student will be able to

- *Describe the issues in spatial data analysis and categorize the spatial data using data fields.*
- *Apply the suitable spatial data analytical technical methods to geographical application.*
- *Generate the procedure to analyze the spatial data based on the spatial objects and field objects.*

INTRODUCTION

Geographic Information Analysis and Spatial Data : Spatial Data Types - Scales for Attribute Description - GIS and Spatial Data Manipulation. The Pitfalls and Potential of Spatial Data: The Pitfalls of Spatial Data - The Potential of Spatial Data. **(6)**

MAPPING AND MAP PROCESS

Mapping It Out : The Cartographic Tradition - Geovisualization and Analysis - The Graphic Variables of Jacques Bertin - New Graphic Variables - Issues in Geovisualization - Mapping and Exploring Points - Mapping and Exploring Areas - Mapping and Exploring Fields - The Spatialization of Nonspatial Data. Maps as Outcomes of Processes: Introduction: Maps and Processes - Processes and the Patterns They Make - Predicting the Pattern Generated by a Process - Stochastic Processes in Lines, Areas, and Fields. **(10)**

POINT PATTERN ANALYSIS

Basics - Describing a Point Pattern - Assessing Point Patterns Statistically - Monte Carlo Testing. Practical Point Pattern Analysis: Problems of Spatial Statistical Analysis - Alternatives to Classical Statistical Inference - Alternatives to IRP/CSR 162 - Point Pattern Analysis in the Real World - Dealing with homogeneity - Focused Approaches - Cluster Detection: Scan Statistics - Using Density and Distance: Proximity Polygons - A Note on Distance Matrices and Point Pattern Analysis. **(10)**

AREA OBJECTS, LOCAL STATISTICS

Types of Area Objects - Geometric Properties of Areas - Measuring Spatial Autocorrelation - An Example: Tuberculosis in Auckland 2001-2006 - Other Approaches. Local Statistics: Think Geographically, Measure Locally Introduction - Defining the Local: Spatial Structure - An Example: The Getis-Ord Gi and Gi * Statistics - Inference with Local Statistics - Other Local Statistics. **(9)**

ANALYZING FIELDS AND STATISTICS OF FIELDS

Describing and Analyzing Fields : Scalar and Vector Fields Basics - Modeling and Storing Field Data - Spatial Interpolation - Derived Measures on Surfaces - Map Algebra. Knowing the Unknowable : The Statistics of Fields: Regression on Spatial Coordinates: Trend - Surface Analysis - The Square Root Differences Cloud and the (Semi-) Variogram - A Statistical Approach to Interpolation: Kriging. Map Overlay: Boolean Map Overlay and Sieve Mapping - A General Model for Alternatives to Boolean Overlay - Indexed Overlay and Weighted Linear Combination - Weights of Evidence - Model-Driven Overlay Using Regression. **(10)**

TOTAL : 45

TEXT BOOK

1. *David O'Sullivan and David J. Unwin, "Geographic Information Analysis", John Wiley Inc., Second Edition, 2010.*

16MDSE11 - ECONOMETRIC ANALYSIS

L	T	P	C
3	0	0	3

PRE-REQUISITES

17MDC13, 17MDC21, 17MDC31, 17MDC41

ASSESSMENT : THEORY

COURSE OUTCOME

At the end of this course the students will be able to

- *Understand the analysis of economic data using Simple and Multiple Regression Models.*
- *Analyse the properties of Ordinary Least Square (OLS) Estimators, assumptions underlying Multiple Linear Regression Equation and understand the properties of sampling distribution of OLS Estimators.*
- *Get a good knowledge in using Dummy Variables in Regression Analysis.*
- *Analyse time series data using Regression models.*

REVIEW OF MATHEMATICS AND STATISTICS

The Nature of Econometrics and Economic Data-What is Econometrics? - Steps in Empirical Economic Analysis-The structure of Economic Data- Causality and the Notion of Ceteris Paribus in Econometric Analysis-Regression Analysis with Cross-Sectional Data - The Simple Regression Model-Properties of OLS on any sample of data- Units of measurement and functional form-Expected values and Variances of OLS Estimators-Assumptions of Simple Regression - Regression through the origin and Regression on a constant. **(9)**

MULTIPLE LINEAR REGRESSION (MLR) - OLS ESTIMATES

Analysis Estimation- Motivation for Multiple Regression: The Model with two independent variables- The Model with k independent variables- Obtaining OLS Estimates-Mechanics and Interpretation of the OLS Regression Equation-Meaning of holding other factors fixed in Multiple Regression-Changing more than one independent variable simultaneously-OLS fitted values and residuals-Goodness of fit-Regression through origin-The expected values of OLS Estimators-Assumptions of MLR-Including irrelevant variables in MLR-Omitted Variable bias-Variance of the OLS -The components of the OLS Variance: Multicollinearity-Estimating :Standard errors of OLS Estimators- -Efficiency of OLS-Gauss Markov Theorem. **(9)**

MLR INFERENCE

Multiple Regression Analysis Inference-Sampling distribution of OLS estimators-Testing Hypotheses about a single population parameter-The t-test-Confidence Intervals- Testing hypotheses about a single linear combination - Testing Multiple Linear Restrictions: The F test-Reporting regression results Multiple Regression Analysis - Further Issues: Effects of data scaling on OLS Statistics-More on functional form- More on goodness of fit and selection of regressors-Prediction and residual analysis **(9)**

MLR INCLUSION OF DUMMY VARIABLES

Multiple Regression Analysis with qualitative information Dummy variables-Describing qualitative information - A single dummy independent variable-Using Dummy variables for multiple categories-Interactions involving dummy variables-A binary dependent variable-The linear probability model-Interpreting Regression results with discrete dependent variables. **(9)**

ANALYSIS OF TIME SERIES DATA

Regression Analysis with Time Series Data Nature of Time Series Data-Examples of Time Series Regression Models-Static models-Finite distributed lag models. **(9)**

TOTAL : 45

TEXT BOOK

1. *Wooldridge J.M." Introductory Econometric", A Modern Approach, Fifth Edition, South-Western(2009)*

REFERENCE BOOKS

1. *Gujarati, "Basic Econometrics", Fourth Edition, The McGraw Hill Companies, 2004.*
2. *William H.Greene, "Econometric Analysis ", Fifth Edition, Prentice Hall ,2002.*
3. *Koutsoyiannis, A. "Theory of Econometrics", Second Edition,Palgrave Macmillian ,2001.*

16MDS92 - DEEP LEARNING

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSSE34

ASSESSMENT : THEORY

COURSE OUTCOME

Upon completion of the course, the students will be able to

- *Understand basics of deep learning.*
- *Explain how traditional feed-forward networks are constructed and why they can approximate almost any function.*
- *Summarise the key components in convolutional neural networks (CNNs) and their key advantages.*
- *Describe common types of recurrent neural networks (RNN) and their applications.*
- *Apply popular Deep learning models to their research problems.*

INTRODUCTION

Deep Learning: Overview of Methods, Learning, Numerical, Machine Learning Basics.

Deep Feed-forward Networks: Gradient-Based Learning, Hidden Units, Architecture Design, Back Propagation and other Differentiation Algorithms **(6)**

REGULARIZATION

Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multitask Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop and Manifold Tangent Classifier. **(9)**

OPTIMIZATION FOR TRAINING DEEP MODELS

Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Method, Optimization Strategies and Meta-Algorithms. **(9)**

CONVOLUTIONAL NETWORKS

The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, The Neuroscientific Basis for Convolutional Networks, Convolutional Networks and the History of Deep Learning. **(9)**

SEQUENCE MODELING: RECURRENT AND RECURSIVE NETS

Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, The Challenge of Long-Term Dependencies, Echo State Networks, Leaky Units and Other Strategies for Multiple Time Scales, The Long Short-Term Memory and Other Gated RNNs, Optimization for Long-Term Dependencies, Explicit Memory

APPLICATIONS

Speech Recognition, Natural Language Processing **(12)**

TOTAL : 45

TEXT BOOK

1. *Ian Goodfellow, Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Press, 2016.*

REFERENCE BOOKS

1. *Deng & Yu," Deep Learning: Methods and Applications", Now Publishers, 2013.*
2. *Michael Nielsen, "Neural Networks and Deep Learning", Determination Press, 2015.*

COMPUTER SCIENCE STREAM - DISTRIBUTED AND NETWORK SYSTEMS

Course Code	Course Name
15MSSE19	Soa and Web Services
15MSSE35	Blockchain Technology
15MSSE17	Internetworking Protocols
17MDCE51	Distributed Systems

15MSSE19 - SOA AND WEB SERVICES

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Examine the requirements of distributed applications and design web services*
- *Apply the concepts of Service Oriented Architecture in designing platform independent real time distributed applications*
- *Design and develop simple to complex web services that meet the specified requirements*
- *Develop web services based on requirements of the web application using Java APIs and also consume them in web applications*
- *Determine the security requirements of web services and incorporate them in building web application*

INTRODUCTION TO SOA

Fundamental SOA - Common Characteristics of Contemporary SOA - Evolution of SOA **(7)**

WEB SERVICES AND SOA

The Web Service Framework - Services - Service Descriptions - Messaging - Message Exchange Patterns - Service Activity: Coordination; Atomic Transactions; Business Activities; Orchestration; Choreography. **(10)**

SOA AND SERVICE-ORIENTATION

Anatomy of a Service-Oriented Architecture - Common Principles of Service-Orientation and Their Inter- Relationships - Service Layers **(8)**

BUILDING SOA

Service Oriented Analysis: Introduction, Guidelines - Service Oriented Design: Introduction, WSDL-Related XML Schema Language, WSDL Language Basics, SOAP Language Basics, SOA Composition Guidelines, Service Design Overview, Business Process Design: WS-BPEL Languages Basics, WS-Coordination Overview, Service-Oriented Business Process Design-WS-Security Language Basics. **(10)**

WEB SERVICES IN JAVA

Building Web Services with JAX-WS - Binding between XML Schema and Java Classes - Streaming APIfor XML - SOAP with Attachments API for Java - Generating Client-Support Code from a WSDL - Building RESTful Web Service with JAX-RS. **(10)**

TOTAL : 45

TEXT BOOKS

1. *Thomas Eri, "Service-Oriented Architecture- Concepts, Technology and Design", Pearson Education, Second Edition, 2008*
2. *Eric Jendrock, Jennifer Ball, Debbie Carson, Ian Evans and Kim Haase, "The Java EE5 Tutorial", Oracle Corporation Press, 2010*
3. *Eric Jendrock, Ricardo Cervera-Navarro, Ian Evans, Devika Gollapudi, Kim Haase, William Markito and Chinmayee Srivarthsa, "The Java EE6 Tutorial", Oracle Corporation Press, 2013*
4. *Martin Kalin,"Java Web Services: Up and Running", O'Reily Media Inc., First Edition, 2009.*

15MSSE35 - BLOCKCHAIN TECHNOLOGY

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Describe the basics of distributed environment and decentralization.*
- *Describe the fundamentals of Blockchain.*
- *Analyze the working principles of Bitcoin, Develop Cryptography algorithms to protect Cryptocurrencies.*
- *Analyze the concepts of smart contracts and ethereum.*
- *Examine the development platform ethereum and Hyperledger.*

BLOCKCHAIN

Introduction - Distributed Systems, History of blockchain, Introduction to blockchain, Types of blockchain, CAP theorem and blockchain, Benefits and limitations of blockchain. Decentralization - Decentralization using blockchain, methods of decentralization, routes to decentralization, blockchain and full ecosystem decentralization, smart contract, decentralized autonomous organization, corporations, societies, application, Platforms for decentralization. **(10)**

CRYPTOCURRENCIES

Cryptographic primitives - Hash Functions, Bitcoin, transactions, blockchain, bitcoin payments, Alternative coins - theoretical foundations, bitcoin limitations. **(10)**

SMART CONTRACTS AND ETHEREUM

Smart Contracts, Ethereum - Introduction, ethereum blockchain, elements, precompiled contracts, accounts, block, ether, messages, mining, clients and wallets, trading and investment, symbols, ethereum network, applications, scalability and security. **(9)**

CONTRACT DEVELOPMENT AND DEPLOYMENT

Ethereum development - Setting up a development environment, development tools and clients, Solidity, Web3. **(9)**

HYPERLEDGER

Hyperledger - Fabric, Sawtooth lake, CORDA **(7)**

TOTAL: 45

TEXT BOOK

1. *Imran Bashir, "Mastering Blockchain", Packt Publishing, First Edition, 2017.*

REFERENCE BOOKS

1. *Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder, "Bitcoin and Cryptocurrency Technologies", Princeton University Press, 2016.*
2. *Roger Wattenhofer, "The Science of the Blockchain", Inverted Forest Publishing, First Edition, 2016.*
3. *Don and Alex Tapscott, "Blockchain Revolution". Portfolio Penguin 2016.*
4. *Andreas M. Antonopoulos, "Mastering Bitcoin: Programming the Open Blockchain", O'Reilly, Second Edition, 2017.*

15MSSE17 - INTERNETWORKING PROTOCOLS

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given an inter-network topology configuration, can demonstrate how a packet reaches the destination*
- *Given a protocol of TCP/IP stack, explain how the protocol is used in forwarding the packets across networks.*
- *Given the assigned addresses, able to design an inter-network utilizing the given set fully.*
- *Given a protocol implementation, analyze and identify the possible threats and specify solutions*
- *Given a network topology with internetworking devices, demonstrate how the devices obtain their network configuration*

INTRODUCTION

Architectural Principles - Design and Implementation- The Architecture and Protocols of the TCP/IP Suite. The Internet Address Architecture: Basic IP Address Structure - CIDR and Aggregation - Special-Use Addresses - Unicast Address Assignment- Attacks Involving IP Addresses. **(9)**

LINK LAYER

Ethernet - Full Duplex, Power Save, Auto-negotiation, and 802.1X Flow Control - Bridges and Switches - Wireless LAN- Point-to-Point Protocol - Loopback - tunneling - Attacks on the Link Layer. **(8)**

INTERNET LAYER

Address Resolution Protocol : Operation and frame Format - Internet Protocol: Introduction - IPv4 and IPv6 Headers - IPv6 Extension Headers - IP Forwarding - Mobile IP - Host Processing of IP Datagrams - Attacks Involving IP - System configuration : DHCP and Auto configuration. Internet control Message Protocols: ICMPv4 and ICMPv6 Broadcasting and Local Multicasting. **(9)**

TRANSPORT LAYER

User Datagram Protocol: Header - checksum - UDP and IPv6 - UDPLite - Translating UDP/IPv4 and UDP/IPv6 Datagrams - Name resolution and Domain Name system. Transmission Control Protocol: Introduction - connection management - TCP Timeout and Retransmission - TCP data flow and window management - classic congestion control algorithms. **(8)**

APPLICATION LAYER

HTTP - DNS - E Mails - SNMP **(11)**

TOTAL : 45

TEXT BOOKS

1. *Kevin R. Fall, W. Richard Stevens, "TCP/IP Illustrated, Volume 1", Pearson Education, 2nd edition, 2012.*
2. *James F Kurose, "Computer networking: A top-down approach Featuring the Internet", 3rd edition, Pearson Education, 2006*

REFERENCE BOOKS

1. *Behrouz A. Forouzan, "TCP/IP Protocol Suite", Tata McGRAW-HILL edition, 4th edition, 2009*
2. *Ed Tittel, Laura Chappell,Guide to TCP/IP, Cengage Learning, Third Edition 2006.*
3. *Douglas E. Comer, "Internetworking with TCP/IP- Volume One", 6th Edition, Addison-Wesley, 2013.*

17MDCE51 - DISTRIBUTED SYSTEMS

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Elucidate the foundations and issues of distributed systems*
- *Understand the various synchronization issues and global state for distributed systems.*
- *Understand the Mutual Exclusion and Deadlock detection algorithms in distributed systems*
- *Describe the agreement protocols and fault tolerance mechanisms in distributed systems.*
- *Describe the Architecture of a Distributed System*

INTRODUCTION

Definition, Goals, Types of Distributed Systems **(4)**

ARCHITECTURES

Architectural Styles, System Architectures - Centralized Architectures, Decentralized Architectures, Hybrid Architectures, Architectures Versus Middleware **(6)**

PROCESS AND COMMUNICATION

Threads, Virtualization, Clients, Servers, Layered Protocols, Types of Communication, Remote Procedure call, Message Oriented Communication, Stream Oriented Communication, Multicast communication. **(10)**

SYNCHRONIZATION : CLOCK SYNCHRONIZATION, LOGICAL CLOCKS, MUTUAL EXCLUSION

Distributed Transactions: Consistency and Replication - Introduction ,Data Centric Consistency Models, Client Centric Consistency Models, Replica Management, consistency Protocols **(8)**

Distributed Computing Paradigm - Paradigm for distributed Applications - Basic Algorithms in Message Passing Systems, Leader Election in Rings, Mutual Exclusion in shared Memory, Fault-Tolerant Systems - Synchronous systems with Crash failures, Synchronous systems with Byzantine failures, Impossibility in Asynchronous Systems **(12)**

EXAMPLES OF DISTRIBUTED SYSTEMS

CORBA, Jini. **(5)**

TOTAL : 45

TEXT BOOKS

1. *Distributed Systems - Principles and Paradigms, Andrew S. Tanenbaum, Maarten van Steen, Prentice Hall of India, 2007 (Para I to Para IV)*
2. *HaggitAttiya and Jennifer welch - Distributed Computing - Fundamentals, Simulation and Advanced Topics, Second Edition, Wiley 2012 (Para V)*
3. *Distributed Object Architectures with CORBA , Henry Balen, Mark Elenko, Jan Jones and Gordon Palumbo, 1st Edition, Kindle Edition*

REFERENCE BOOKS

1. *Liu M.L., "Distributed Computing, Principles and Applications", Pearson Education, 2004*
2. *Nancy A Lynch, "Distributed Algorithms", Morgan Kaufman Publishers, USA, 2003.*
3. *Kshemkalyani, Ajay D., and MukeshSinghal. Distributed computing: principles, algorithms, and systems. Cambridge University Press, 2011.*
4. *George Coulouris, Jean Dollimore and Tim Kindberg, "Distributed Systems Concepts and Design", Fifth Edition, Pearson Education, 2012.*

COMPUTER SCIENCE STREAM - SOFTWARE SYSTEMS

Course Code	Course Name
15MSSE09	Graphics and Multimedia Technologies
15MSS63	Software Testing and Quality Assurance
16MDSE7	Image Processing
15MSSE06	Software Requirements Engineering
15MSSE07	Software Reliability
15MSSE08	Open Source Software Development
16MDSE25	Software Architecture and Design Patterns
15MSSE24	Real Time Systems
15MSSE25	Analysis and Design of Real Time Systems
15MSSE27	Computer Vision
15MSSE14	Design Thinking
15MSSE36	Advanced Web Technology

15MSSE09 - GRAPHICS AND MULTIMEDIA TECHNOLOGIES

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Recognize the need for graphical systems*
- *Deduce the primitive graphical operations*
- *Differentiate the various Multimedia file formats*
- *Develop graphical applications with animations*
- *Assess on the latest graphical issues*

INTRODUCTION

Graphics hardware - raster and random scan - display devices - input devices -hard copy devices. Implementation algorithms for graphic primitives - line, poly line, circle, ellipse, curves - attributes - fill Styles **(8)**

TRANSFORMATIONS AND VIEWING

Two dimensional geometric transformations - translation - scaling - rotation - reflection - shearing - composite transformations. Two dimensional viewing - window port, viewport - clipping - point - line - Cohen-Sutherland, Liang-Barsky, Nicholl-Lee-Nicholl. Three-Dimensional Geometric Transformations - Translation - Scaling - Rotation - reflection - shearing - affine transforms **(10)**

COMPUTER ANIMATIONS

Raster methods - double buffering - raster operations - morphing - simulating accelerations - motion specifications - character animations - motion capture - OpenGL animation procedures **(8)**

INTRODUCTION TO MULTIMEDIA

Multimedia Applications - Multimedia Systems Architecture - evolving technologies - defining objects - Compression and Decompression - Binary image compression - Color , gray scale, Still-video images - JPEG compression - video Image Compression **(10)**

FILE FORMATS AND MULTIMEDIA I/O

Flich - text format - TIFF - RIFF - MIDI file formats, JPEG DIB, MPEG, AVI file formats. TWAIN - architecture - setting up new WAVE type. Pen Input, Video image display systems, Print output, Image Scanners, Digital Video and Audio, Video images and animation, Full-Motion video. **(9)**

TOTAL : 45

TEXT BOOKS

1. *Donald D. Hearn, M. Pauline Baker, Warren, "Computer Graphics with Open GL",4th Edition, 2010, Prentice Hall. (para 1, para2 & para3)*
2. *Prabhat K. Andleigh, KiranThakrar "Multimedia Systems Design", Prentice - Hall of India Pvt. Ltd. 2007. (para 4 & para 5)*

REFERENCE BOOKS

1. *James D. Foley, Andries Van Dam, Steven K. Feiner, F. Hughes John, "Computer Graphics Principles and Practices in C", Second Edition, Pearson publications.*
2. *Ralf Steinmetz and KlaraNahrstedt, " Multimedia: Computing, Communications and Applications", 2009, Pearson Educations.*

15MSS63 - SOFTWARE TESTING AND QUALITY ASSURANCE

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC53

ASSESSMENT : THEORY

COURSE OUTCOME

- *Analyze different approaches to test software, and select applicable techniques for different situations and projects.*
- *Design test plans, create test procedures and define criteria for adequacy.*
- *Apply black box and white box testing techniques at various testing levels for given requirements.*
- *Examine standards, models and techniques aimed at achieving quality in different software development environments.*
- *Prepare a software quality plan for a software project considering process evaluation models including issues related to change management, configuration management, validation and verification and measurement.*

INTRODUCTION

The Role of Process in Software Quality - Testing as a Process - Overview of the Testing Maturity Model (TMM)-Basic definitions-Software Testing Principles-Origin of Defects-Defect Classes, the Defect Repository ad Test Design - Defect examples: the coin problem. **(8)**

TESTING STRATEGIES

Test case design strategies-Black Box Approach-Random Testing - Equivalence Class Partitioning- Boundary Value Analysis-Cause and Effect Graphing-State Transition Testing - Error Guessing - White Box Approach-Test Adequacy Criteria-Coverage and Control Flow Graphs-Covering Code Logic-Data Flow and White Box Test Design-Loop Testing-Mutation Testing. **(10)**

LEVELS OF TESTING

Unit Test: Functions, Procedures, Classes and Methods as Units-Unit Test Planning - Designing the Unit Tests - The Class as a Testable Unit - The Test Harness - Integration Test: Goal - Integration Strategies for Procedures and Functions - Integration Strategies for Classes - Designing Integration Test. **(10)**

SYSTEM TEST AND TESTING ARTIFACTS

System Test- The Different Types-Regression Testing -Alpha, Beta and Acceptance Tests-Test Planning - Test Plan Components-Test Plan Attachments- Reporting Test Results **(9)**

SOFTWARE QUALITY

Defining Quality-Importance of Quality- Quality Assurance at each Phase of SDLC-Managing Software Quality in an Organization-Quality Management System-Product Quality and Process Quality **(8)**

TOTAL : 45

TEXT BOOKS

1. *Ilene Burnstein, "Practical Software Testing", Springer International Edition, First Indian reprint, 2004. (para 1, para 2, para 3 and para 4)*
2. *Nina S Godbole "Software quality Assurance, Principles and Practice", Narosa Publishing House,2004 (para 5)*

REFERENCE BOOKS

1. *C.Jorgensen,"Software Testing-A Craftman'sApproach",CRC press,1995.*
2. *Boris Beizer,VanNostrandReinhold."Software Testing Techniques", 2ndEdition, 1990.*
3. *GlenfordJ.Myers,"The Art of Software Testing", Wiley, 3rd edition, 2011.*

16MDSE7 - IMAGE PROCESSING

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Students can apply the image fundamentals and mathematical transforms necessary for image processing.*
- *Students can apply the image enhancement techniques.*
- *Students can apply image restoration procedures.*
- *Students can apply the image compression procedures.*
- *Students can apply the image segmentation and representation techniques.*

FUNDAMENTALS OF IMAGE PROCESSING

Introduction - Elements of visual perception, Steps in Image Processing Systems - Image Acquisition - Sampling and Quantization - Pixel Relationships - Colour Fundamentals and Models, File Formats- Introduction to the Mathematical tools. **(9)**

IMAGE ENHANCEMENT AND RESTORATION

Spatial Domain Gray level Transformations Histogram Processing Spatial Filtering - Smoothing and Sharpening. Frequency Domain: Filtering in Frequency Domain - DFT, FFT, DCT, Smoothing and Sharpening filters - Homomorphic Filtering., Noise models, Constrained and Unconstrained restoration models. **(9)**

IMAGE SEGMENTATION AND FEATURE ANALYSIS

Detection of Discontinuities - Edge Operators - Edge Linking and Boundary Detection - Thresholding - Region Based Segmentation - Motion Segmentation, Feature Analysis and Extraction. **(9)**

MULTI RESOLUTION ANALYSIS AND COMPRESSIONS

Multi Resolution Analysis: Image Pyramids - Multi resolution expansion - Wavelet Transforms, Fast Wavelet transforms, Wavelet Packets. Image Compression: Fundamentals - Models - Elements of Information Theory - Error Free Compression - Lossy Compression - Compression Standards - JPEG/MPEG. **(9)**

APPLICATIONS OF IMAGE PROCESSING

Representation and Description, Image Recognition- Image Understanding - Image Classification - Video Motion Analysis - Image Fusion - Steganography - Colour Image Processing. **(9)**

TOTAL : 45

TEXT BOOKS

1. *Rafael C.Gonzalez and Richard E.Woods, "Digital Image Processing", Pearson Education, Third Edition, 2008.*
2. *Milan Sonka, Vaclav Hlavac and Roger Boyle, "Image Processing, Analysis and Machine Vision", Brooks Cole, Third Edition, 2008.*

REFERENCE BOOKS

1. *Anil K.Jain, "Fundamentals of Digital Image Processing", Prentice-Hall India, 2007.*
2. *Madhuri A. Joshi, 'Digital Image Processing: An Algorithmic Approach", Prentice Hall India, 2006.*
3. *Rafael C.Gonzalez , Richard E.Woods and Steven L. Eddins, "Digital Image Processing Using MATLAB", Pearson Education, First Edition, 2004.*

15MSSE06 - SOFTWARE REQUIREMENTS ENGINEERING

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC53

ASSESSMENT : THEORY

COURSE OUTCOME

- *Demonstrate how prototypes may be used in the RE process.*
- *Analyze of user and system requirements.*
- *Examine how software requirements may be organized in a requirements document.*
- *Describe and develop the activities in the requirements engineering process.*

INTRODUCTION

Importance of Requirements Engineering, Misconceptions, Industrial Challenges, Key Success Factors, Definition, Relationship to Business Processes Characteristics, Requirements and Project Failure, Quality and Metrics. Requirements Engineering Artifact Modeling: Re Taxonomy, Artifact Model, Templates, Artifact Model Tailoring, System Life Cycle Process. Elicting Requirements: Issues and Problems, Methods, Customer-Specific Business Rules, Managing Customer Relationship, Managing and Planning Elicitation, Cost Estimation, Customer Relationship, Elicitation for Incremental Product Development. **(10)**

REQUIREMENTS MODELING

MDRE, Advantages, Prerequisites, Processes, Elicitation and Analysis Model Heuristics, Determining Model Completeness, Analysis to Design, Model Conversion Heuristics, Design Model Structure, Tooling **(9)**

QUALITY ATTRIBUTE REQUIREMENTS

Integrated Model, Requirements, Selecting Stakeholders, Methods, Testing ASRs, Case Study **(8)**

RE FOR PLATFORMS AND REQUIREMENTS MANAGEMENT

Challenges, Practices, Experiences. Requirements Management: Change Management, Routine Activities, Traceability, Measurements and Metrics, Scalability, Requirements Management Process, Measuring Savings, Organizational Issues. **(9)**

REQUIREMENT DRIVEN SYSTEM TESTING AND REQUIREMENTS EVOLUTION

Inputs, Model Based Testing, Testing Performance and Scalability, Requirements, Best Practices

Requirements Evolution Techniques: Prototyping, Practices and Experience. Distributed RE Hazard Analysis and Threat Modeling. **(9)**

TOTAL : 45

TEXT BOOK

1. *Brian Berenbach, Daniel J. Paulish, Juergen Kazmeier, Arnold Rudorfer, "Software and Systems Requirements Engineering in Practice", Tata McGraw Hill Edition, 2009.*

15MSSE07 - SOFTWARE RELIABILITY

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC53

ASSESSMENT : THEORY

COURSE OUTCOME

- *Define the basic concept of software reliability and software reliability model*
- *Describe fault detection and correction approaches*
- *Apply Software Reliability Growth Models in Software Development.*
- *Analyze the design principles for achieving higher reliable software system.*
- *Design the scientific concepts of Software and Hardware Reliability.*

INTRODUCTION

Need and Concepts of Software Reliability, Failure and Faults - Prevention, Removal, Tolerance, Forecast, Dependability Concept-Failure Behaviour, Characteristics, Maintenance Policy, Reliability and Availability Modeling, Reliability Evaluation. **(9)**

SOFTWARE RELIABILITY MODELS

Historical Perspective and Implementation, classification, limitations and issues, Exponential Failure Models - Jelinski moranda model, Poisson, Musa, Exponential models, Weibull Model, Musa(okumoto Model, Bayseian Model - Littlewood verral Model, Phase Based Model **(9)**

PREDICTION ANALYSIS

Model Disagreement and Inaccuracy - Short & Long Term Prediction, Model Accuracy, Analyzing Predictive Accuracy - Outcomes, PLR, U & Y Plot, Errors and Inaccuracy, Recalibration - Detecting Bias, Techniques, Power of Recalibration, Limitations in Present Techniques, Improvements. **(9)**

THE OPERATIONAL PROFILE

Concepts and Development Procedures - Customer Type, User Type, System Mode, Functional and Operational Profile, Test Selection, Selecting Operations, Regression Test, Special Issues - Indirect Input Variables, Updating, Distributed system, CASE STUDY (Application of DEFINITY & FASTAR, Power Quality Resource System) **(9)**

TESTING FOR RELIABILITY MEASUREMENT

Software Testing - Types, White and Black Box, Operational Profiles - Difficulties, Estimating Reliability, Time/Structure based software reliability - Assumptions, Testing methods, Limits, Starvation, Coverage, Filtering, Microscopic Model of Software Risk. **(9)**

TOTAL : 45

TEXT BOOKS

1. *Patric D. T.O connor, "Practical Reliability Engineering", 4th Edition, John Wesley & sons, 2003.*
2. *John D. Musa, "Software Reliability Engineering", Tata McGraw Hill, 1999.*
3. *Michael Lyu, "Handbook of Software Reliability Engineering", IEEE Computer Society Press, 1996.*

15MSSE08 - OPEN SOURCE SOFTWARE DEVELOPMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC53

ASSESSMENT : THEORY

COURSE OUTCOME

- *Identify the advantage of using open source software in application development*
- *Choose appropriate open source software during different stages of software development life cycle*
- *Modify the existing open source software and customize according to different user requirement.*
- *Assess the viability of using licensed versus open source software in developing solution to real time problems in various domains*
- *Justify the need to have open source community through active participation in open source code development.*

INTRODUCTION

Software source code definition- Open source definition- Examples of open source software products. History of open source software: The Berkeley software distribution-tex-the free software foundation- Linux-Apache-Mozilla-Advocacy groups-FSF and OSI-Project coordinators and hosts-OSS companies. **(9)**

OPEN SOURCE SOFTWARE PROCESS

Framework for analyzing open source software: zachman's framework for IS architecture CATNOE and soft systems method-Deriving an analytical framework for OSS. Qualification to define a software system as open source: defining open source software-categorizing open source software-Specific characteristics of open source software. Transformation: OSS developing process-Taboos and harms in OSS development-OSS development life cycle **(9)**

OSS STAKEHOLDERS AND ENVIRONMENT

Stakeholders : OSS stake holders-OSS developers communities-OSS user communities-OSS commercial organizations-OSS non-commercial organizations. Open source development environment. **(9)**

WORLD VIEW

A framework for classifying OSS motivations-Technological micro level motivations-technological macrolevel motivations-economic macro level motivations-social political micro level motivations **(9)**

OPEN SOURCE LICENSING

Contract and copyright law-Basic principles of copyright law-Contracts and copyright-open source software licensing-Issues with copy rights and patents-Examples: The Apache license V1.1 and V2.0, the academic free license and the Mozilla public license 1.1.Non open source license: Classic proprietary license-Sun community source license-Microsoft shared source Initiative. **(9)**

TOTAL : 45

TEXT BOOKS

1. *Joseph Feller and Brain Filzgerald, "Understanding open source software development", Pearson education limited (Addison Wesley) 1st Edition, 2000. (Para I to IV).*
2. *Andrew M ST Laurent, "Understanding open source and free software licensing", O'Reilly media inc, 1st Edition,2004. (Para V).*

REFERENCE BOOKS

1. *Lawrence E.Rosen, "Open source Licensing: Software Freedom and Intellectual Property, Law", Prentice Hall, 2005.*
2. *Van Lindberg, "Intellectual Property and Open Source: A Practical Guide to Protecting Code, 2008.*

16MDSE25 - SOFTWARE ARCHITECTURE AND DESIGN PATTERNS

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC53

ASSESSMENT : THEORY

COURSE OUTCOME

- *On Completion of the course, the students should be able to*
- *Describe the various types of software patterns and their needs in software development.*
- *Apply design patterns to solve the issues in designing the objects.*
- *Design the software architectures using appropriate architectural patterns based on the quality attributes and documenting them.*

INTRODUCTION TO PATTERNS

Definition - Making a pattern - Pattern categories - Relationship between patterns - Patterns and software architecture. **(8)**

DESIGN PATTERNS

Introduction - Creational patterns - Structural patterns - Behavioral patterns - Case study. **(10)**

INTRODUCTION TO SOFTWARE ARCHITECTURE

Software architecture definition and needs. Introduction: Architectural patterns - Reference models - Reference architecture - Architectural structures and views. **(8)**

ARCHITECTURAL STYLES

Pipes and filters - Data abstraction and object oriented organization - Event based, Implicit invocation - Layered style - Repository - Interpreter - Process control - Distributed - Case study. **(9)**

THE ARCHITECTURAL BUSINESS CYCLE

Creating an architecture: Understanding quality attributes - Achieving qualities - Designing the architecture - Documenting the architecture - Case study. **(10)**

TOTAL : 45

TEXT BOOKS

1. *Frank Buschmann, Regine Meunier, Hans Rohnex, Peter Sommerland & Michael, "Pattern - Oriented Software Architecture - A Systems of Patterns Volume - I", 1996 (Reprint 2001) (Para - I).*
2. *Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, "Design Patterns - Elements of reusable Object Oriented Software", Pearson Education, 1999. (Para II).*
3. *Mary Shaw, David Garlan, "Software Architecture - Perspectives on an Emerging Discipline", PHI,1996 (Para IV).*
4. *Len Bass, Paul Clements, Rick Kazman, "Software Architecture in Practice", 2nd Edition, Pearson Education, First Indian Reprint, 2003. (Para III & V).*

15MSSE24 - REAL TIME SYSTEMS

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given the requirements and timing constraints, develop hard and soft real time systems*
- *Given the requirements and timing constraints, choose appropriate scheduling algorithm to meet the requirements and justify the selection.*
- *For a given set of requirements, develop real-time applications exploiting the features of the given Real-Time operating system.*
- *For a given requirements, compare the real-time communication protocols and choose one to meet the timing constraints.*
- *Re-cast practical design problems into real time task models for the purpose of analysis, evaluation or implementation*

INTRODUCTION

Real-Time Scheduling: characteristics of Real-Time tasks - Task Scheduling - Clock driven - Event-Driven -Rate Monotonic algorithm **(9)**

RESOURCE SHARING AND SCHEDULING

Resource Sharing among Real-Time Tasks - Scheduling Real-Time Tasks in Multiprocessor and Distributed systems: Multiprocessor task allocation - Dynamic allocation of Tasks - Centralized and Distributed Clock synchronization **(9)**

REAL-TIME OPERATING SYSTEMS

Time Services - Feature of RTOS - UNIX as a RTOS - UNIX based RTOS - VxWorks. **(9)**

REAL-TIME COMMUNICATIONS

Real-Time communication in LANs - Soft Real-Time and Hard real-time communication in LANs - Bounded Access Protocols for LANs - Real-Time communication over packet switched Networks - Routing - Resource Reservation - Rate Control - QoS Models. **(9)**

REAL-TIME DATABASES

Example Applications - Real-Time Database Application design issues - Characteristics of Temporal data - Concurrency Control in Real-Time Data bases - Commercial Real-Time Databases **(9)**

TOTAL : 45

TEXT BOOK

1. *Rajib Mall, "Real-Time Systems: Theory and Practice," Pearson, 2008.*

REFERENCE BOOKS

1. *Jane W. Liu, "Real-Time Systems", Pearson Education, 2001.*
2. *Krishna and Shin, "Real-TIme Systems", Tata McGraw Hill. 1999.*

15MSSE25 - ANALYSIS AND DESIGN OF REAL TIME SYSTEMS

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given a real-time application, can apply real-time extensions to software requirements analysis.*
- *Given the real-time requirements of a system, analyse, design and implement a small scale real- time system*
- *Evaluate the implications of design choices on real time system implementation*
- *Given a real-time solution, can analyze the performance and can optimize the solution*

REQUIREMENTS

Requirements Engineering for Real-Time Systems - Formal Methods in System Specification - Semiformal Methods in System Specification - The Requirements Document. **(9)**

DESIGN

Software Design Approaches - Software Engineering Principles - Procedural Design Approach - Object- Oriented Design Approach - Life Cycle Models. **(9)**

ANALYSIS

Performance Analysis Techniques - Applications of Queuing Theory - Input/ Output Performance - Analysis of Memory Requirements. **(9)**

Metrics - Predictive Cost Modeling - Uncertainty in Real-Time Systems - Design for Fault Tolerance - Software Testing and Systems Integration - Performance Optimization Techniques. **(9)**

CASE STUDY

Software Requirements Specification - Designing Real - Time Software - Future Visions on Real - Time Systems. **(9)**

TOTAL : 45

TEXT BOOK

1. *Phillip Laplante, "Real-Time Systems Design and Analysis", Wiley-IEEE Press, 2012.*

REFERENCE BOOK

1. *Alan C. Shaw, "Real-Time Systems and Software", Wiley, 2001.*

15MSSE27 - COMPUTER VISION

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Understand and use the vision technology in conjunction with real world applications*
- *Detecting features, discuss feature correspondences across different images and review image segmentation techniques like Active contours, Split and merge, Mean shift and mode finding*
- *Investigate techniques like shading and focus, merging multiple range or depth images into 3D models, and reconstructing them.*
- *Perform pose estimation, camera's intrinsic calibration, estimate 3D point structure from 2D matches, 3D geometry, camera motion and the motion between two or more images.*
- *Reconstructing the 3D shape of a scene from images taken from different views.*

INTRODUCTION, IMAGE FORMATION AND FILTERING

What is computer vision?, Photometric image formation, The digital camera, Point operators, Linear filtering, neighbourhood operators, Fourier transforms, Pyramids and wavelets. **(9)**

FEATURE DETECTION AND SEGMENTATION

Feature Detection: Points and patches, Edges, Lines.

Segmentation: Active contours, Split and merge, Mean shift and mode finding **(8)**

3D RECONSTRUCTION

Shape from X, Active range finding, Surface representations, Point-based representations, Volumetric representations, Model-based reconstruction, Recovering texture maps and albedos. **(8)**

MOTION ESTIMATION

Feature-based alignment: 2D and 3D feature-based alignment, Pose estimation, Geometric intrinsic calibration.

Structure from motion: Triangulation, frame structure from motion, Factorization, Bundle adjustment, Constrained structure and motion.

Dense motion estimation: Translational alignment, Parametric motion, Spline-based motion, Optical flow, Layered motion.**(12)**

RECOGNITION

Object detection, Face recognition, Instance recognition, Category recognition, Context and scene understanding. **(8)**

TOTAL : 45

TEXT BOOK

1. *Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer-Verlag London Limited 2011.*

REFERENCE BOOKS

1. *Forsyth, D. and Ponce, J, "Computer Vision: a modern approach", Prentic Hall, 2002.*
2. *Rafael C.Gonzalez and Richard E.Woods, "Digital Image Processing", Third Edition, Pearson Education, 2008.*
3. *Rafael C.Gonzalez, Richard E.Woods and Steven L. Eddins, "Digital Image Processing Using MATLAB", First Edition, Pearson Education, 2004.*

15MSSE14 - DESIGN THINKING

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC53

ASSESSMENT : THEORY

COURSE OUTCOME

- *Analyze and determine the drivers and target groups of the given problem*
- *Generate an idea for addressing the issues based on the problem study*
- *Design and Present the creative ideas in an understandable way using appropriate methods*
- *Modify the generated ideas based on thinking in visual forms*
- *Develop the prototype for the generated idea and implement it using appropriate techniques*

OVERVIEW OF DESIGN PROCESS

Stages of thinking: The design process - Define - Research - Ideate - Prototype - Select-Implement-Learn - Example project. Research-Identifying drivers - Information gathering - Target groups - Samples and Feedback **(10)**

IDEA GENERATION

Basic design directions- Themes of thinking - Inspiration and references-Brainstorming -Value - Inclusion - Sketching -Presenting ideas **(12)**

REFINEMENT

Thinking in images - Thinking in signs - Appropriation - Humour - Personification - Visual metaphors - Modification - Thinking in words - Words and language - Thinking in shapes - Thinking in proportions - Thinking in color **(12)**

PROTOTYPING AND IMPLEMENTATION

Prototyping: Developing of designs - Types of prototype - Vocabulary. Implementation: Format - Materials- Finishing - Media-Scale - Series. **(11)**

TOTAL : 45

TEXT BOOK

1. *Gavin Ambrose and Paul Haris, "Basic Design 08 Design Thinking", AVA Publishing, 2010.*

15MSSE36 - ADVANCED WEB TECHNOLOGY

L	T	P	C
3	0	0	3

PRE-REQUISITES

17MDC23, 17MDC26

ASSESSMENT : THEORY

COURSE OUTCOME

- *Create responsive user interface using HTML5, CSS3, BOOTSTRAP.*
- *Design richly interactive web pages using AJAX, JSON, jQuery.*
- *Design and develop web applications using the front-end javascript framework AngularJS based on MVC design pattern.*
- *Understand Django fundamentals and use its concepts to build and deploy robust web applications.*
- *Understand the different types of security attacks in web applications.*

USER INTERFACE DESIGN

Markup Language (HTML5): HTML5 Form Input Types, HTML Graphics: Canvas, SVG, HTML Media: Video, Audio, HTML API: Drag/Drop, Geolocation, Web Storage, Web Workers, SSE.

Cascading Style Sheet (CSS3): Introduction, Text Shadows, Rounded Corners, Color, Box Shadows, Linear Gradients, Radial Gradients, Text Stroke, Multiple Background Images, Reflections, Image Borders, Animation, Selectors, Transitions and Transformations, Downloading Web Fonts, Flexible Box Layout Module, Multicolumn Layout, Media Queries. Bootstrap: Introduction to Bootstrap. **(8)**

ADVANCED JAVASCRIPT

Introduction to JSON, JSON Structure, Introduction to jQuery, Introduction to AJAX, Traditional Web Applications, Ajax Applications, Rich Internet Applications (RIAs) with Ajax, History of Ajax, Ajax Example Using the XMLHttpRequest Object, Using XML and the DOM, Creating a Full-Scale Ajax-Enabled Application using JSON. **(8)**

ANGULARJS

Introduction to AngularJS, MVC, Filters and Modules, Directives, Working with Forms, Services and Server Communication. **(11)**

DJANGO FRAMEWORK

Introduction, Django for the Impatient: Building a Blog, Starting Out - Dynamic Web Site Basics, layers - Models, Views, Templates, Django Architecture, Django in depth: URLs, HTTP Mechanisms, and Views, Templates and Form Processing. **(11)**

WEB APPLICATION SECURITY

Authentication: Authentication fundamentals, Web Application Authentication, Authorization: Authorization, Authorization Layers, Attacks against authorization, Session management- Attacks against sessions, Browser Security Principles- cross-site scripting and request forgery. **(7)**

TOTAL : 45

TEXT BOOKS

1. *Paul Deitel, Harvey Deitel, Abbey Deitel, "Internet and World Wide Web How To Program", 5th edition, Pearson Education, 2011.*
2. *Andrew Grant, "Beginning AngularJS", Apress, 2014.*
3. *Jeff Forcier, Paul Bissex, Wesley Chun, "Python Web Development with Django", Addison Wesley, 2011.*
4. *Bryan Sullivan, Vincent Liu, "Web Application Security", McGraw Hill, 2012.*

WEB REFERENCES

1. *https://www.w3schools.com/html/*
2. *https://www.w3schools.com/js/js_json_intro.asp*
3. *https://www.w3schools.com/js/js_jquery_elements.asp*
4. *https://www.w3schools.com/bootstrap4/*
5. *https://developer.mozilla.org/en-US/docs/Web/*

REFERENCE BOOKS

1. *Brad Dayley, Brendan Dayley, "AngularJS, JavaScript, and jQuery", Pearson Education, 2016.*
2. *Jorge Krause, "Introducing BOOTSRAP 4", Apress, 2016.*
3. *Ben Smith, "Beginning JSON", Apress, 2015.*
4. *David Flanagan, "JavaScript: The Definitive Guide, Sixth Edition", O'Reilly Media, 2011.*
5. *Brad Dayley, Brendan Dayley, "AngularJS, Javascript, and jQuery", Pearson Education, 2016.*
6. *Ken Williamson, "Learning AngularJS", O'Reilly Media, 2015.*
7. *Ayman Hourieh, "Learning Website Development with Django", Packt Publishing, 2008.*
8. *Sanjeev Jaiswal, Ratan Kumar, "Learning Django Web Development", PACKT publishing, 2015.*

ELECTIVE LABORATORY COURSES

Course Code	Course Name
17MDCEL1	Minor Project in Business / Data Analytics
17MDCEL2	Modeling and Simulation Laboratory
15MSSL08	Image Processing Laboratory
15MSSL03	Graphics and Multimedia Laboratory
15MSSL13	Advanced Web Technology Laboratory
16MDS55	Machine Learning Laboratory
16MDS56	Big Data Modeling Laboratory
16MDS85	Data Visualization Laboratory
16MDS94	Deep Learning Laboratory
15MSS65	Software Testing Laboratory
16MDSEL2	Web Mining Laboratory

17MDCEL1- MINOR PROJECT IN BUSINESS / DATA ANALYTICS

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PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Identify a business problem existing in an organization that needs to be addressed.*
- *Analyse the business environment with respect to the identified problem.*
- *Design an appropriate solution considering economic, technical and implementation feasibility.*
- *Justify the designed solution in terms of its pros and cons.*

ACTIVITIES TO BE CARRIED OUT

1. Identify a business issue in a certain organization
2. Report the detailed study of the problem and its environment
3. Perform Literature Survey
4. Develop a suitable strategy
5. Prepare detailed feasibility study report
6. Present the solution
7. Submit complete report

17MDCEL2- MODELING AND SIMULATION LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
17MDC81

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *To simulate Manufacturing systems using R software*
- *To simulate Material Handling systems using R software*
- *To estimate linear and non-linear models to observed data using R software*
- *To apply simulation techniques to real world problems using R software*

TOPICS:

1. Modeling and simulating a Queuing system
2. Modeling and simulating an Inventory system
3. Simulation of a Poisson process.
4. Comparison of Transient and steady state solutions of a Queuing model
5. Generation of random numbers and testing them.
6. Generation of discrete random variates
7. Generation of continuous random variates.
8. Simulation of Manufacturing systems.
9. Simulation of Material Handling systems.
10. Sensitivity analysis of simulation outputs.

TEXT BOOKS

1. *Simulation Model Design and Execution : Building Digital Worlds ,Fishwick, P.A. New Jersey: Prentice Hall Int'l Inc.(1995)*

REFERENCE BOOKS

1. *John M Chambers, "Software for Data Analysis:Programming with R", Springer, 2008*
2. *NarsinghDeo, Systems Simulation with Digital Computer, PHI Publication (EEE), 3rd Edition, 2004,ISBN : 0-87692-028-8.*
3. *G.James,D.Witten, T.Hastie and R.Tibshirani, "An Introduction to Statistical Learning with Applications in R", Springer, 2015.*

15MSSL08 - IMAGE PROCESSING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Develop the basic Knowledge of any Image processing toolbox (Matlab/Scilab) available and perform different basic image operations.*
- *Perform various filtering operations in the image processing toolbox.*
- *Implement different types of edge detection technique on same image and measure the accuracy.*
- *Apply various image transforms and analyse the characteristics of the image.*
- *Apply image processing technique to solve real world problems*

LIST OF EXPERIMENTS

1. Display of Grayscale Images.
2. Histogram Equalization.
3. Filtering in frequency domain.
4. Display of color images.
5. Conversion between color spaces.
6. Non-linear Filtering.
7. Edge detection using Operators.
8. 2-D DFT and DCT.
9. DWT of images.
10. Segmentation using watershed transform.

15MSSL03 - GRAPHICS AND MULTIMEDIA LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
15MSSE09

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Examine the efficiency for drawing graphics primitives such as line, circle, ellipse and polygon using DDA, Midpoint and Bresenham's algorithms.*
- *Demonstrate 2D transformations such as translation, scaling, rotation, reflection and shearing for a given application.*
- *Develop an interactive multimedia presentation by using multimedia devices and identify theoretical and practical aspects in designing multimedia applications surrounding the emergence of multimedia technology.*

I COMPUTER GRAPHICS

1. Primitive Algorithms
   Line - Bresenham, DDA, Midpoint. Circle - Midpoint, Trigonometric Ellipse - Midpoint, Trigonometric
2. Polygon, Polygon Filling.
3. Transformations - 2D Translations, Scaling, Rotation

II MULTIMEDIA AND ANIMATIONS: FLASH PROGRAMMING (OR) MAYA

1. Creating Layers, Symbol objects, effects for objects
2. Creating scene by combining objects and layers
3. Creating Animations using various technologies
4. Creating Interactive Animation.
5. Adding audio to animations.
6. Creating small animation projects.

15MSSL13 - ADVANCED WEB TECHNOLOGY LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
17MDC23, 17MDC26

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Acquire knowledge and skills for creation of web site considering both client and server side programming.*
- *Create responsive web pages using HTML5,CSS3 and BOOTSRAP.*
- *Build richly interactive web pages using AJAX, JSON, and jQuery.*
- *Design and develop fully functional web application using AngularJs, Vue.js and Django.*

CONCEPTS TO BE COVERED

- Create a responsive web page using HTML5, CSS3.
- Create an online Registration form for a website and validate using JQuery.
- Handle the form submission using AJAX.
- Construct a JSON structure for an application and validate it using JSON and use JQuery for parsing.
- Create a Single Page application using Bootstrap and JQuery for designing the User Interface.
- Design and develop Notes application using AngularJS.
- Develop a Blog application using Django.
- Develop a fully functional web application using AngulaJS/Vue.js, Django

16MDS55 - MACHINE LEARNING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
15MSSE34

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *To introduce students to the basic concepts and techniques of machine learning.*
- *To develop skills of using recent machine learning software for solving practical problems.*
- *To gain experience of doing independent study and research in machine learning.*

CONCEPTS TO BE COVERED

1. **Supervised Learning : Regression.**

   Generate a proper 2-D data set of N points. Split the data set into Training Data set and Test Data set.

   i) Perform linear regression analysis with Least Squares Method.
   ii) Plot the graphs for Training MSE and Test MSE and comment on Curve Fitting and Generalization Error.
   iii) Verify the Effect of Data Set Size and Bias-Variance Tradeoff.
   iv) Apply Cross Validation and plot the graphs for errors.
   v) Apply Subset Selection Method and plot the graphs for errors. vi) Describe your findings in each case.

2. **Supervised Learning : Classification**

   i) Implement Naïve Bayes Classifier on a Data set . Test for Accuracy and Precision.
   ii) K-Nearest Neighbor Classifier on a Data set . Test for Accuracy and Precision.

3. **Unsupervised Learning**

   i) Implement K-Means Clustering on proper data set.
   ii) Implement Hierarchical clustering on proper data set.

4. **Dimensionality Reduction**

   i) Principal Component Analysis-Finding Principal Components, Variance and Standard Deviation calculations of principal components.

5. **Supervised Learning and Kernel Methods Design**

   Implement SVM for classification with proper data set.

16MDS56 - BIG DATA MODELING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
16MDSE53

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Analyze the analytical techniques on variety of Big data application scenarios.*
- *Apply hadoop clusters and map reduce programs for parallel processing of big data.*
- *Practice structured/unstructured data analysis using PIG and HIVE programs.*
- *Experiment the NOSQL operations for processing of big data.*
- *Generate: Generate dynamic solutions for data analytics problems using map reduce framework.*

CONCEPTS TO BE COVERED

1. Import /Export the data from datacenter(website or unstructed)to HDFS
2. Import /Export the data from SQL to HDFS
3. Parallize Input/output process /compute process using MAPREDUCE
4. Storage /Process the data in NOSQL using MongoDB
5. Perform structured/unstructured data analysis using (Internal Map Reduce) PIG
6. Perform structured data process/analysis using HIVE

16MDS85 - DATA VISUALIZATION LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Enhance the ability to understand and communicate data through visualization tools.*
- *Use tools like D3, Shinning to visualize the insights derived from large data.*
- *Explore the various methods to visualize data from various domains.*
- *Design of new interactive systems for data visualization and data analysis.*

Concepts to be Covered:

Softwares Required : D3(HTML, Javascript, CSS) , Shiny tool in R

D3

1. Setting up D3
2. Adding DOM and SVG elements
3. Binding data to DOM elements
4. Using data bound to DOM elements
5. Creating SVG elements based on data
6. Using SVG co-ordinate space
7. SVG basic shapes and D3
8. D3 Scales
9. D3 text element
10. D3 Axes

SHINY TOOL

1. Input and output widgets in shiny
2. Creating dynamic user interface
3. Reactive Programming
4. Interactive Plotting
5. Generating reports
6. Client server programs

16MDS94 - DEEP LEARNING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
16MDS92

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Upon completion of the course, the students will be able to*
- *Demonstrate how traditional feed-forward networks are constructed and why they can approximate almost any function.*
- *Implement the key components in convolutional neural networks (CNNs) and their key advantages.*
- *Describe common types of recurrent neural networks (RNN) and their applications.*
- *Apply popular Deep learning models to their research problems.*

Implement the following concepts using Python and use the necessary libraries like Tensorflow, Keras,Theano, Torch, etc.,

1. Logistic Regression
2. Multilayer perceptron
3. Deep Convolutional Network
4. Linear Factor Models : PCA, ICA etc.
5. Auto Encoders, Denoising Autoencoders
6. Monte Carlo methods
7. Stacked Denoising Auto-Encoders Restricted Boltzmann Machines
8. Deep Belief Networks

15MSS65 - SOFTWARE TESTING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
17MDC53

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Analyze given requirements, identify suitable testing techniques and develop test cases and test data for testing.*
- *Given requirements and executable code, write test cases in JUnit, execute test cases and interpret results.*
- *Given a business need, use Rational Suite to develop requirements, UML design and develop test related artifacts applicable across the SDLC.*
- *Design and develop test cases using Selenium for web based testing.*

INTRODUCTION AND PROJECT DEFINITION

Introduction of tools used in the lab-Discussion on various projects and learn to write problem definition.

SOFTWARE REQUIREMENT SPECIFICATION

Learn how to write requirements and specifications-Gain exposure to requirements management using Requisite pro.

RATIONAL SUITE

Benefits of using Rational suite-Rational Administrator-Rational Test Manager-Rational Clear Quest- Rational Pure Coverage-Rational Purify-Rational Requisite pro-Rational Robot.

WIN RUNNER

Identifying GUI objects-Spying on GUI Objects-choosing GUI Map mode-The GUI Map File per Test Mode-The Global GUI Map File Mode-Creating Data Driven Test-Creating Batch Test-Running the test- Analyzing test results-Recording the test-Synchronizing the test-Running the synchronized test .

Open source testing software to be used. Tools : J Unit, Selenium

16MDSEL2 - WEB MINING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

16MDSE2

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Identify and differentiate between application areas for web content mining, web structure mining and web usage mining.*
- *Develop skills of using recent data mining s/w for solving practical problems of web mining.*
- *To apply the use of machine learning techniques for web content mining, the role of hyper links in web structure mining and the various aspects of web usage mining.*

WEB CONTENT MINING

1. Keyword based association analytics
2. Automatic document classification similarity detection
3. Cluster documents containing information from a common source
4. Sequence Analysis: predicting a recurring event
5. Trend Analysis: discovering trends
6. Anomaly detection: find information that violates usual patterns.
7. Discovery of frequent phrases
8. Text segmentation (into logical chunks)
9. Web Data Mining Query Language

a. Covers
b. Covered By
c. Like
d. Close To

WEB STRUCTURE MINING

10. Page Rank
11. Weighted Page Rank
12. Correlation Algorithm for Relevance Ranking
13. Improve structure of a sites web page

WEB USAGE MINING

14. Personalization
15. Determining frequent access behaviour of users
16. Aid in caching and prediction of future page references
17. Improve design of individual pages
18. Gathering Statistics

COIMBATORE INSTITUTE OF TECHNOLOGY

(Government Aided Autonomous Institution Affiliated to Anna University, Chennai)

COIMBATORE - 641 014, TAMILNADU, INDIA

DIAMOND JUBILEE

(1956 - 2016)

DEPARTMENT OF COMPUTING

M.Sc. (DECISION AND COMPUTING SCIENCES)

Curriculum and Syllabi

Under Choice Based Credit System

(For the students admitted during 2017 - 2018 and onwards)

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Department of Computing

M.Sc. (Software Systems)

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DEPARTMENT OF COMPUTING

COIMBATORE INSTITUTE OF TECHNOLOGY

VISION AND MISSION OF THE INSTITUTE

Vision

The institute strives to inculcate a sound knowledge in engineering along with realized social responsibilities to enable its students to combat the current and impending challenges faced by country and to extend their expertise to the global arena.

MISSION

The Mission of CIT is to impart high quality education and training to its students to make them world-class engineers with a foresight to the changes and problems and pioneers to offers innovative solutions to benefit the nation and the world at large.

DEPARTMENT OF COMPUTING

COIMBATORE INSTITUTE OF TECHNOLOGY

VISION AND MISSION OF DEPARTMENT OF COMPUTING

Vision

Department of Computing endeavors to make the students, world class software engineers with prudence of pioneering the solutions to the challenges of the nation and the world.

MISSION

The Mission of Department of Computing is

M1 To impart sound conceptual knowledge along with intensive practical training and real time industry/ research project exposure to the students

M2 To provide a learning ambience to enhance innovations, problem solving skills, leadership qualities, team-spirit and ethical responsibilities.

M3 To establish Industry Institute Interaction program to provide exposure of latest tools and technologies used in the IT organizations and enhance the entrepreneurship skills

DEPARTMENT OF COMPUTING

COIMBATORE INSTITUTE OF TECHNOLOGY

PROGRAMME EDUCATIONAL OBJECTIVES (PEOS)

Our Graduates will :

PEO1 **Expertise in software solution :** Work productively as highly competent software professionals with the capability of investigating the problem, planning and developing the quality software solutions for various domains.

PEO2 **Research :** Promote research in the development of leading innovative products

PEO3 **Leadership :** Inspire and guide the groups they work with in bringing their ideas to fruition, with managerial skills, self-assurance and integrity.

PEO4 **Social Responsibility :** commit to social ethical and professional responsibilities.

PEO5 **Life-long Learning :** Participate in life-long learning to enhance knowledge and skills necessary to contribute to the betterment of profession

PEO6 **Entrepreneurship :** Become Successful entrepreneurs with the strong business managerial skills.

DEPARTMENT OF COMPUTING

COIMBATORE INSTITUTE OF TECHNOLOGY

PROGRAMME OUTCOMES (POS)

Students in the M.Sc.(Software Systems) should possess the following abilities :

PO1 : Analyze a problem and design an efficient solution with the knowledge of Mathematics and Computing

PO2 : Plan, develop and manage software solutions that aid the industry or government to accomplish their set goals using state-of-the-art technology

PO3 : Design and develop the decision support system

PO4 : Design and develop internet based embedded software systems for real time environment

PO5 : Assess the quality standards of the development process and software solutions

PO6 : Communicate effectively with stakeholders and work as part of teams

PO7 : Work with professional, and ethical values

PO8 : Understand and solve legal and security issues of socio-economical applications

PO9 : Recognize the importance of research to develop leading innovative products in diversified fields of computer science

PO10 : Self learning and adaptation to the emerging technologies to address the challenging issues

PO11 : Apply the principles of management in defining, planning and tracking the projects.

COIMBATORE INSTITUTE OF TECHNOLOGY

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DEPARTMENT OF COMPUTING

M.Sc. (Software Systems)

Curriculum from the Academic Year 2015 - 2016 and onwards

Semester I

Course Code	Course Name	L	T	P	C	CAT
15MSS11	Technical English	3	0	0	3	HS
15MSS12	Algebra and Calculus	3	2	0	4	BS
15MSS13	Problem Solving and Programming in C	3	2	0	4	PC
15MSS14	Basics of Information Systems	3	0	0	3	ES
15MSS15	Digital Electronics	3	0	0	3	ES
15MSS16	Programming Laboratory in C	0	0	4	2	PC
15MSS17	Digital Electronics Laboratory	0	0	4	2	ES
15MSS18	Computing Laboratory	0	0	4	2	BS
15MSS19	English Language Laboratory	0	0	2	1	HS
	TOTAL CREDITS				**24**	

Semester II

Course Code	Course Name	L	T	P	C	CAT
	Language Elective	3	0	0	3	HS
15MSS21	Probability and Statistics	3	2	0	4	BS
15MSS22	Fundamentals of Web Technology	3	0	0	3	PC
15MSS23	Data Structures and Algorithms	3	2	0	4	PC
15MSS24	Object Oriented Programming	3	0	0	3	PC
15MSS25	Data Structures and Algorithms Laboratory	0	0	4	2	PC
15MSS26	Object Oriented Programming Laboratory	0	0	4	2	PC
15MSS27	Scripting Laboratory	0	0	4	2	PC
	TOTAL CREDITS				**23**	

Semester III

Course Code	Course Name	L	T	P	C	CAT
	THEORY					
15MSS31	Discrete Mathematical Structures	3	2	0	4	BS
15MSS32	Computer Architecture	3	0	0	3	PC
15MSS33	Operating Systems	3	0	0	3	PC
15MSS34	Advanced Data Structures and Algorithms	3	0	0	3	PC
15MSS35	Software Engineering	3	0	0	3	PC
	PRACTICALS					
15MSS36	Advanced Datastructures and Algorithms Laboratory	0	0	4	2	PC
15MSS37	Visual Programming Laboratory	0	0	4	2	PC
15MSS38	Operating Systems Laboratory	0	0	4	2	PC
15MSS49	Communication Skills & Personality Development*					EEC
	TOTAL CREDITS				**22**	

* A pass is required

Semester IV

Course Code	Course Name	L	T	P	C	CAT
	THEORY					
15MSS41	Resource Management Techniques	3	2	0	4	BS
15MSS42	Theory of Computing	3	0	0	3	PC
15MSS43	Microprocessors and Assembly Language Programming	3	0	0	3	PC
15MSS44	Database Management Systems	3	0	0	3	PC
15MSS45	Java Programming	3	0	0	3	PC
	PRACTICALS					
15MSS46	Microprocessors Laboratory	0	0	4	2	PC
15MSS47	Database Management Systems Laboratory	0	0	4	2	PC
15MSS48	Java Programming Laboratory	0	0	4	2	PC
15MSS49	Communication Skills & Personality Development*					EEC
	TOTAL CREDITS				**22**	

* A pass is required

Semester V

Course Code	Course Name	L	T	P	C	CAT
	THEORY					
15MSS51	Computational Intelligence	3	0	0	3	PC
15MSS52	Object Oriented Software Engineering	3	0	0	3	PC
15MSS53	Computer Networks	3	0	0	3	PC
	Elective - I	3	0	0	3	PE
	Elective - II	3	0	0	3	PE
	PRACTICALS					
15MSS54	Object Oriented Software Development Laboratory	0	0	4	2	PC
15MSS55	Network Programming Laboratory	0	0	4	2	PC
	Elective Laboratory - I	0	0	4	2	PE
	TOTAL CREDITS				**22**	

Semester VI

Course Code	Course Name	L	T	P	C	CAT
	THEORY					
15MSS61	Software Architecture	3	0	0	3	PC
15MSS62	Mobile Computing	3	0	0	3	PC
15MSS63	Software Testing and Quality Assurance	3	0	0	3	PC
	Elective - III	3	0	0	3	PE
	Elective- IV	3	0	0	3	PE
	PRACTICALS					
15MSS64	Mobile Application Development Laboratory	0	0	4	2	PC
15MSS65	Software Testing Laboratory	0	0	4	2	PC
	Elective Laboratory - II	0	0	4	2	PE
	TOTAL CREDITS				**23**	

Semester VII

Course Code	Course Name	L	T	P	C	CAT
15MSS71	Project Work and Viva Voce - I	0	0	0	18	EEC
	TOTAL CREDITS				**18**	

Semester VIII

Course Code	Course Name	L	T	P	C	CAT
	THEORY					
15MSS81	Software Project Management	3	0	0	3	PC
15MSS82	Internet of Things	3	0	0	3	PC
	Elective - V	3	0	0	3	PE
	Elective - VI	3	0	0	3	PE
	Elective - VII	3	0	0	3	PE
	PRACTICALS					
15MSS83	Internet of Things Laboratory	0	0	4	2	PC
	Elective Laboratory - III	0	0	4	2	PE
	Elective Laboratory - IV	0	0	4	2	PE
	TOTAL CREDITS				**21**	

Semester IX

Course Code	Course Name	L	T	P	C	CAT
	THEORY					
15MSS91	Information Security	3	0	0	3	PC
15MSS92	Professional Ethics	3	0	0	3	EEC
	Elective - VIII	3	0	0	3	PE
	Elective - IX	3	0	0	3	PE
	Elective - X	3	0	0	3	PE
	PRACTICALS					
15MSS93	Information Security Laboratory	0	0	4	2	PC
	Elective Laboratory - V	0	0	4	2	PE
	Elective Laboratory - VI	0	0	4	2	PE
	TOTAL CREDITS				**21**	

Semester X

Course Code	Course Name	L	T	P	C	CAT
15MSS101	Project Work and Viva Voce - II	0	0	0	18	EEC
	TOTAL CREDITS				**18**	
	GRAND TOTAL OF CREDITS				**215**	

PROFESSIONAL ELECTIVES

Course Code	Course Name	L	T	P	C	CAT
	GENERAL STREAM					
15MSSE01	Software User Interface Design	3	0	0	3	PE
15MSSE02	Software Language Engineering	3	0	0	3	PE
15MSSE03	Enterprise Application Development	3	0	0	3	PE
15MSSE04	Data Centric Computing	3	0	0	3	PE
15MSSE05	Agile Process Models	3	0	0	3	PE
15MSSE06	Software Requirements Engineering	3	0	0	3	PE
15MSSE07	Software Reliability	3	0	0	3	PE
15MSSE08	Open Source Software Development	3	0	0	3	PE
15MSSE09	Graphics and Multimedia Technologies	3	0	0	3	PE
15MSSE10	IT infrastructure Management	3	0	0	3	PE
15MSSE11	Bio-Informatics	3	0	0	3	PE
15MSSE12	Accounting and Financial Management	3	0	0	3	PE
15MSSE13	Geographic Information System	3	0	0	3	PE
15MSSE14	Design Thinking	3	0	0	3	PE
15MSSE15	Business Process Management	3	0	0	3	PE
15MSSE16	Human Resource Management	3	0	0	3	PE
	DISTRIBUTED AND NETWORKED SYSTEMS STREAM					
15MSSE17	Internetworking Protocols	3	0	0	3	PE
15MSSE18	Distributed Computing	3	0	0	3	PE
15MSSE19	SOA and Web Services	3	0	0	3	PE
15MSSE20	Cloud Computing	3	0	0	3	PE
15MSSE21	Parallel Computing	3	0	0	3	PE
15MSSE22	Software Defined Networks	3	0	0	3	PE
15MSSE23	Autonomic Computing	3	0	0	3	PE
	EMBEDDED AND AUTONOMOUS SYSTEM STREAM					
15MSSE24	Real Time Systems	3	0	0	3	PE
15MSSE25	Analysis and Design of Real Time Systems	3	0	0	3	PE
15MSSE26	Embedded Processors	3	0	0	3	PE
15MSSE27	Computer vision	3	0	0	3	PE
15MSSE28	Sensing and Sensors	3	0	0	3	PE
15MSSE29	Mechanics of Robotic manipulation	3	0	0	3	PE
	DATA ANALYTICS STREAM					
15MSSE30	Advanced Database Concepts	3	0	0	3	PE
15MSSE31	Data Mining	3	0	0	3	PE
15MSSE32	Big Data Analytics	3	0	0	3	PE
15MSSE33	Business Intelligence	3	0	0	3	PE
15MSSE34	Machine Learning	3	0	0	3	PE

PROFESSIONAL ELECTIVE - LABORATORIES

Course Code	Course Name	L	T	P	C	CAT
	GENERAL STREAM					
15MSSL01	Software Language Engineering Laboratory	0	0	4	2	PE
15MSSL02	Enterprise Application Development Laboratory	0	0	4	2	PE
15MSSL03	Graphics and Multimedia Laboratory	0	0	4	2	PE
15MSSL04	Accounting Software Laboratory	0	0	4	2	PE
	DISTRIBUTED AND NETWORKED SYSTEMS					
15MSSL05	Web Services Laboratory	0	0	4	2	PE
15MSSL06	Cloud Computing Laboratory	0	0	4	2	PE
15MSSL07	Parallel Computing Laboratory	0	0	4	2	PE
	EMBEDDED AND AUTONOMOUS SYSTEMS					
15MSSL08	Image Processing Laboratory	0	0	4	2	PE
15MSSL09	Real-Time Embedded System Laboratory	0	0	4	2	PE
	DATA ANALYTICS					
15MSSL10	Business Intelligence Laboratory	0	0	4	2	PE
15MSSL11	Data Mining Laboratory	0	0	4	2	PE
15MSSL12	Big Data Analytics Laboratory	0	0	4	2	PE

LANGUAGE ELECTIVES

Course Code	Course Name	L	T	P	C	CAT
15MSSLE01	Professional English	3	0	0	3	HS
15FY22F	Basic French	3	0	0	3	HS
15FY22G	Basic German	3	0	0	3	HS

HUMANTIES AND SOCIAL SCIENCES

Course Code	Course Name	L	T	P	C	CAT
15MSS11	Technical English	3	0	0	3	HS
15MSS19	English Language Laboratory	0	0	2	1	HS
	Language Elective	0	0	0	3	HS

BASIC SCIENCES

Course Code	Course Name	L	T	P	C	CAT
15MSS12	Algebra and Calculus	3	2	0	4	BS
15MSS18	Computing Lab	0	0	4	2	BS
15MSS21	Probability and Statistics	3	0	2	4	BS
15MSS31	Discrete Mathematical Structures	3	2	0	4	BS
15MSS41	Resource Management Techniques	3	2	0	4	BS

ENGINEERING SCIENCE

Course Code	Course Name	L	T	P	C	CAT
15MSS14	Basics of Information Systems	3	0	0	3	ES
15MSS15	Digital Electronics	3	0	0	3	ES
15MSS17	Digital Electronics Laboratory	0	0	4	2	ES

PROFESSIONAL CORE

Course Code	Course Name	L	T	P	C	CAT
	THEORY					
15MSS13	Problem Solving and Programming in C	3	2	0	4	PC
15MSS22	Fundamentals of Web Technology	3	0	0	3	PC
15MSS23	Data Structures and Algorithms	3	2	0	4	PC
15MSS24	Object Oriented Programming	3	0	0	3	PC
15MSS32	Computer Architecture	3	0	0	3	PC
15MSS33	Operating Systems	3	0	0	3	PC
15MSS34	Advanced Data Structures and Algorithms	3	0	0	3	PC
15MSS35	Software Engineering	3	0	0	3	PC
15MSS42	Theory of Computing	3	0	0	3	PC
15MSS43	Microprocessors and Assembly Language Programming	3	0	0	3	PC
15MSS44	Database Management Systems	3	0	0	3	PC
15MSS45	Java Programming	3	0	0	3	PC
15MSS51	Computational Intelligence	3	0	0	3	PC
15MSS52	Object Oriented Software Engineering	3	0	0	3	PC
15MSS53	Computer Networks	3	0	0	3	PC
15MSS61	Software Architecture	3	0	0	3	PC
15MSS62	Mobile Computing	3	0	0	3	PC
15MSS63	Software Testing and Quality Assurance	3	0	0	3	PC
15MSS81	Software Project Management					
15MSS82	Internet of Things	3	0	0	3	PC
15MSS91	Information Security	3	0	0	3	PC
	PRACTICALS					
15MSS16	Programming Laboratory in C	0	0	4	2	PC
15MSS25	Data Structures and Algorithms Lab	0	0	4	2	PC
15MSS26	Object Oriented Programming Lab	0	0	4	2	PC
15MSS27	Scripting Laboratory	0	0	4	2	PC
15MSS36	Advanced Datastructures and Algorithms Laboratory	0	0	4	2	PC
15MSS37	Visual Programming Laboratory	0	0	4	2	PC
15MSS38	Operating Systems Laboratory	0	0	4	2	PC

Course Code	Course Name	L	T	P	C	CAT
15MSS46	Microprocessors Laboratory	0	0	4	2	PC
15MSS47	Database Management Systems Laboratory	0	0	4	2	PC
15MSS48	Java Programming Laboratory	0	0	4	2	PC
15MSS54	Object Oriented Software Development Laboratory	0	0	4	2	PC
15MSS55	Network Programming Laboratory	0	0	4	2	PC
15MSS64	Mobile Application Development Laboratory	0	0	4	2	PC
15MSS65	Software Testing Laboratory	0	0	4	2	PC
15MSS83	Internet of Things Laboratory	0	0	4	2	PC
15MSS93	Information Security Laboratory	0	0	4	2	PC

EMPLOYABILITY ENHANCEMENT COURSE

Course Code	Course Name	L	T	P	C	CAT
15MSS49	Communication Skills & Personality Development*					EEC
15MSS71	Project Work and Viva Voce - I	0	0	0	18	EEC
15MSS92	Professional Ethics	3	0	0	3	EEC
15MSS101	Project Work and Viva Voce - II	0	0	0	18	EEC

CAT - Category, BS - Basic Sciences, HS - Humanities and Social Sciences,

ES - Engineering Sciences, PC - Professional Core, PE - Professional Elective,

EEC - Employability Enhancement Course, MC - Mandatory Course

15MSS11 -TECHNICAL ENGLISH

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given a technical paragraph, identify the topic sentence, infer meanings, lexical and contextual items, and find the supporting points and transitional tags.*
- *Given a communication context specify the barriers to listening and deduce solutions to overcome the barriers.*
- *For a given topic, introduce ideas, give opinions and justify your stance. For a given topic, argue for or against the topic for 5 minutes.*
- *For a given topic, write an argumentative, descriptive, biographical or autobiographical essay. Interpret the given technical graphical representation and compose passage. Summarise and paraphrase technical texts in about 200 to 300 words.*
- *Apply the rules of grammar viz, tenses, prepositions, subject-verb agreement adjectives and adverbs direct indirect speech and use appropriate patterns in a given sentence.*

FOCUS ON LANGUAGE

Synonyms - Antonyms - Forms of Words - One Word Substitutes - Word Formation - Contextual Meanings - Tenses - Prepositions - Subject-verb Agreement - Adjectives - Sequence Words - Wh-Questions - Direct Indirect Speech- Adverbs - Abbreviations and Acronyms. **(9)**

READING

Predicting the Content - Skimming the Text - Understanding the Gist -Topic Sentence and its Role - Scanning - Inferring Meanings: Lexical and Contextual - Note-Making - Interpreting Graphics in Technical Writing - Sequencing of Sentences - Reading Comprehension - Dictionary Skills - Itinerary **(9)**

WRITING

Filling Forms - Descriptive Writing - Autobiographical & Biographical Writing - Paragraph Writing - Academic Writing - Tweets - Paraphrasing - Channel Conversion - Essay Writing: Argumentative Writing - Poster Making - Recommendations - Dialogue Writing - Informal Letters **(9)**

LISTENING

Importance of Listening & Empathy in Communication - Reasons for Poor Listening - Traits of a Good Listener - Listening Mode - Note Taking - Listening to Short Dialogues - Listening to Long Conversations. **(8)**

SPEAKING

Describing Places - Giving Opinions - Narration - Introducing Ideas - Justifying Opinions - Formal Conversations - Telephonic Skill - Debating - Apologizing - Extempore - Effective Presentation Strategies - Planning - Outlining & Structuring - Nuances of Delivery - Controlling Nervousness & Stage Fright - Visual Aids in Presentation - Applications of MS Power Point. **(10)**

TOTAL : 45

TEXT BOOK

1. *Dr.K.Elango, "Resonance", Cambridge University Press, New Delhi, 2013.*

EXTENSIVE READING

2. *Dr.A.P.J.Abdul Kalam "India 2020" - Vision for the Millennium - Brooks/Cole Publishing Company, 2002. (Only Essay Questions)*

REFERENCE BOOKS

1. *Meenakshi Raman, Sangeeta Sharma, "Technical Communication - English Skills for Engineers", Oxford University Press, New Delhi, 2012.*
2. *Nagaraj Geetha, "A Course in Grammar and Composition", Cambridge University Press, 2012*
3. *Samson T, "Innovate with English", Cambridge University Press, 2012.*
4. *Mark Ibbotson. "Cambridge English for Engineering" Cambridge University Press, 2012.*
5. *B. Sai Lakshmi. "Poly Skills- A Course in Communication and Life Skills" Cambridge University Press, 2012.*
6. *Simon Sweeney, "English for Business Communication", Cambridge University Press, 2010.*

15MSS12 - ALGEBRA AND CALCULUS

L	T	P	C
3	2	0	4

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *To practice linear transformations, and to find its rank, basis and dimensions.*
- *To compute the inverse and higher powers of a non singular matrix of order three using Cayley-Hamilton Theorem. To convert the quadratic form of 3 unknowns in to canonical form. Also to discuss eigenvalue problems with applications.*
- *To solve algebraic equations using Newton Raphson method and Graeff's root squaring method. To solve linear system of equations using direct and indirect method with applications.*
- *To expand the function of two variables by using Taylor series. To determine the radius of curvature, evolute and envelope of a given plane curve. To practice multiple integrals and their applications in area and volume.*
- *To apply standard methods for curve fitting, interpolation, differentiation and integration for a given discrete data base using standard methods.*

ALGEBRA

VECTOR SPACES

Linear dependence and independence of vectors- dimension, basis - rank of a matrix - linear transformation. **(5)**

MATRICES

Eigenvalues and Eigenvectors - Cayley Hamilton theorem (without proof)- Application to find the inverse and higher powers of a matrix - Diagonalisation - Quadratic forms - Orthogonal reduction to Canonical form.

Applications of Eigenvalue problems: Stretching of an elastic membrane. **(11)**

SOLUTION OF EQUATIONS

Algebraic and transcendental equations - Newton Raphson method. Polynomial equations - Grafae's root squaring method.

Linear System of Equations: Gauss elimination, Gauss Jordan Method- Inverse of a matrix - Gauss Seidal iteration method.

Applications of Linear systems: A homogenous system in economics - non-homogenous system by matrix inversion. **(9)**

CALCULUS

Differential Calculus: Curvature - Envelopes - Evolutes, Functions of two variables - Expansions and extreme values.

Integral Calculus: Double and triple integrals - changing the order of integration. Applications: Area - Volume. **(12)**

EXPERIMENTAL DATA ANALYSIS

Curve fitting: Least Square Method

Interpolation : Newton's method - Lagrange's method

Numerical Differentiation : Application to Maxima and Minima of functions.

Numerical Integration : Trapezoidal rule- Simpson's 1/3rd rule. Applications to area, volume and linear motion.

Numerical Solutions of Ordinary Differential Equations: Taylor's Series - Runge Kutta Fourth order methods - Milne's Predictor - Corrector Method. **(8)**

TOTAL : 45+30=75

TEXT BOOKS

1. *Kandasamy, P.et al., "Engineering Mathematics", Volume - I & II (8th Fully Revised Edition), "S. Chand & Co, 2008.*
2. *Kandasamy .P et al., "Numerical Methods", (for first year), (First Revised Edition) Tata McGraw Hill Publishing company Ltd., 2008.(para 5)*
3. *Veerarajan T, "Engineering Mathematics (For First Year)", (first revised edition), Tata McGraw Hill Publishing company Ltd , 2008.*
4. *Venkataraman. M.K., "Engineering Mathematics", (First year), The National Publishing Company,2008.*
5. *David C Lay "Linear Algebra and its Applications", Fourth edition Pearson 2012*

REFERENCE BOOKS

1. *Erwin Kryszig, "Advanced Engineering Mathematics", 8th Edition John Wiley & Sons (Asia) Pvt. Ltd., 2008.*
2. *Grewal, B.S., "Higher Engineering Mathematics", (40th Edition), Khanna Publishers, 2007.*

15MSS13 - PROBLEM SOLVING AND PROGRAMMING IN C

L	T	P	C
3	2	0	4

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Recognize the role of computers and programming languages in solving the real world problems.*
- *Analyze the given problem statement and develop an algorithm with the properties of finiteness, completeness and correctness*
- *Use the suitable data type among Arrays, Pointers, Strings, Structure, Union and Files to store and manipulate data*
- *Analyze the given problem statement, divide it into modules and represent them using functions in C*
- *Develop a C program for a given problem statement by using the necessary program structure, data types and constructs to generate the correct output*

INTRODUCTION TO PROBLEM SOLVING

Algorithms: Definition, Pseudocode conventions, program development - program analysis. **(6)**

BASIC CONSTRUCTS

Introductory Concepts - Introduction to C programming - Operators and Expressions - Data Input and Output - Control Statements - Macros. **(6)**

FUNCTIONS AND STORAGE CLASSES

Overview - Defining and Accessing a Function - Prototypes - Passing Arguments - Recursion.

Storage classes - Automatic, External and Static Variables - Multifile Programs. **(8)**

ARRAYS, STRINGS AND POINTERS

Defining and Processing an Array - Passing Arrays to Functions - Multidimensional Arrays.

Defining a String - Null Character - Initialization - Reading and Writing - Processing - Character Arithmetic - Searching and Sorting.

Pointer Fundamentals - Declarations - Passing Pointers - Pointers and Arrays -Dynamic Memory Allocation - Operations on Pointers - Arrays of Pointers. **(4+4+6)**

STRUCTURES AND UNIONS, FILE HANDLING

Defining and Processing Structures - Typedef - Structures and Pointers - Passing Structures to Functions - Unions.

Data File Handling - Binary File Handling - Random Access. **(5+6)**

TOTAL : 45+30=75

TEXT BOOKS

1. *Ellis Horowitz, Sartaj Sahni "Fundamentals of Data Structures", Galgotia Publications, 2003.*
2. *Schaum's outline series, "Programming with C", Tata McGraw Hill Publication, 2nd Edition, 2010.*

REFERENCE BOOKS

1. *Herbert Schildt, "C- The Complete Reference", McGraw Hill, 4th edition, 2009.*
2. *Yashavant P. Kanetkar, "Let Us C", BPB Publications, 13th Edition, 2012.*
3. *R.G. Dromey, "How to solve it by Computer", Prentice Hall of India, 8th Edition, 2003.*
4. *Kernighan B.W. and Ritchie D.M., "C Programming Language (ANSI C)", Pearson Education, 2004*
5. *Herbert Schildt, Jean Paul Tremblay, Richard B Bunt, "Introduction to Computer Science - An Algorithmic Approach", McGraw Hill, 2nd Edition, 1985.*
6. *Terrence W Pratt, "Programming language - Design and Implementation", Prentice Hall of India, 4th Edition, 2001.*

15MSS14 - BASICS OF INFORMATION SYSTEMS

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given an organizational workflow, describe the various information systems used and indicate their unique functionalities*
- *Apply the knowledge of various hardware and software constituents of a computer system and indicate the hardware and software requirements for a home PC, a small business like a shop, an educational institution and a large business organization.*
- *Given a software project identify the data requirements and organize data in the form of a database using relational model, within the scope of the project*
- *Demonstrate the five phases of the system development life cycle and identify the major activities to be carried out in each phase, for a given information systems development project*
- *Analyse the impact of the Internet and distributed processing technology on business electronic commerce and mobile commerce*

INTRODUCTION TO INFORMATION SYSTEMS

Information concepts - System concepts - Information System definition - Business Information Systems - Organizations and Information Systems - Careers in Information Systems - Case study **(8)**

INFORMATION TECHNOLOGY

Hardware : Computer Systems - Processing and Memory devices - Secondary storage - Input and Output devices.

Software : An overview - Systems Software - Application Software - Programming Language - Software issues and trends. **(8)**

ORGANIZING DATA AND INFORMATION

Data Management - Data Modeling and Relational Database Model - Database Management Systems - Database Applications **(10)**

SYSTEMS DEVELOPMENT

Overview of Systems Development - Systems Development Life cycle - Systems Investigation - Systems Analysis - Systems Designs - Systems Information - Systems Operation and Maintenance. **(8)**

NETWORKS AND DISTRIBUTED PROCESSING

Functionality of the Internet - The World Wide Web - Internet and Web Application -Introduction to Electronic Commerce - Introduction to Mobile Commerce - Enterprise Systems : Overview of ERP, SCM, CRM - Overview of MIS - Overview of AI - Overview of Expert Systems. **(11)**

TOTAL : 45

TEXT BOOK

1. *Ralph M. Stair and George N. Reynolds, "Principles of Information Systems - A Managerial Edition", Eighth Edition, Thomson India Edition 2007.*

REFERENCE BOOKS

1. *James A. O' Brier, "Introduction to Information Systems", Tata McGraw - Hill Publishers Twelfth Edition, 2005.*
2. *S.A. Kelbar, "Information Systems - A Concise Study", PHI Learning, 2009.*

15MSS15 - DIGITAL ELECTRONICS

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Perform arithmetic operation on the various number systems and conversions among them.*
- *Design logic circuits using logic gates for a given problem.*
- *Apply Boolean algebra to solve logic functions.*
- *Identify, analyze and design simple combinational circuits.*
- *Design simple synchronous and asynchronous sequential circuits.*

NUMBER SYSTEMS AND CODES

Decimal, Binary, Octal and Hexadecimal Systems - Number base conversions-BCD (8421) code - Gray code and conversion- ASCII code - Error detecting and correcting codes: parity bit, block parity, Hamming code. **(8)**

BINARY ADDITION AND SUBTRACTION

1's, 2's, 9's, 10's, 15's, 16's Complement representation - 1's and 2's Complement subtraction - unsigned and signed numbers - BCD addition - 9's and 10's BCD subtraction - Binary Multiplication and Division **(8)**

BOOLEAN ALGEBRA AND LOGIC GATES

Laws of Boolean algebra - Basic theorem and properties - Boolean expression and function - Canonical and Standard forms - Minimization of Boolean expression - Karnaugh Map and Quine Mc-Cluskey Method - Basic logic gates and truth tables - universal gates implementation. **(10)**

COMBINATIONAL AND SEQUENTIAL LOGIC CIRCUITS

Combinational logic: Half Adder and Full Adder, Half Subtractor and Full Subtractor -Encoder and Decoder - Multiplexer and Demultiplexer.

Sequential logic: Latches and FlipFlops - Clocked RS, JK, T and D Flip-Flops. **(10)**

COUNTERS AND REGISTERS

Asynchronous and Synchronous : Up counter and Down counter - Mod 5, Mod 10 counters - Parallel / Serial In / Out Shift Registers - Ring Counter. **(9)**

TOTAL : 45

TEXT BOOK

1. *A.P.Godse and Dr. D.A. Godse, "Digital Electronics", Technical Publications, Pune, 2008.*

REFERENCE BOOKS

1. *Morris Mano.M., "Digital Logic and Computer Design", PHI, 2001.*
2. *Malvino PA and Leach BP, "Digital Principles and Applications", McGraw Hill Book Company, 5th Edition, 1994*
3. *Thomas C Bartee, "Digital Computer Fundamentals", McGraw Hill Book Company, 6th Edition, 1997.*
4. *Thomas L Floyd, "Digital Fundamentals", UBS, 10th Edition, 2008.*

15MSS16 - PROGRAMMING LABORATORY IN C

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Solve the given problem by devising an algorithm and converting it into C program*
- *Develop C programs with necessary data types to represent the data and manipulate them using appropriate operators and built-in functions*
- *Develop C programs with appropriate control structures to implement decision making*
- *Develop reusable and efficient solutions using functions and/or recursive functions in C*
- *Develop C programs to create and access the files for handling the persistent data*
- *Develop a simple project in application or system domain using C*

CONCEPTS TO BE COVERED

1. Simple programs to understand the concepts of data types.
2. Writing programs to get familiarity on using conditional, control and repetition statements.
3. Defining and creating one and two dimensional arrays- Matrix operations
4. Solving Systems of Linear Equations
5. Working with pointers.
6. Functions - call by value and call by reference
7. String manipulations.
8. Solving Recursive problems
9. Solving iterative problems - Trigonometric series evaluation.
10. Use dynamic memory allocation functions for storage allocation.
11. Defining and handling structures, array of structures, structure pointers, union and enumeration type.
12. Defining functions with structure.
13. Application Programs using file operations.

15MSS17 - DIGITAL ELECTRONICS LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *To emulate and understand the internal working of arithmetical, relational and logical circuits inside computer systems.*
- *To familiarize digital data processing and storage through combinational and sequential logic*
- *To Demonstrate serial and parallel data operations using shift registers and counters*
- *To comply data encryption and decryption methods using encoding and decoding*
- *To implement low level to high level digital computer systems using combinational and sequential logic*

CONCEPTS TO BE COVERED

1. Study of logic gates
2. Study of Flip-Flops
3. Design of binary counter & decade counter
4. Construction of Half-adder & Full-adder
5. Implementation of basic Logic gates using Universal gates.
6. Testing Left shift, Right shift and Parallel-In, Parallel-Out operation of the Shift registers.
7. Multiplexing and Demultiplexing.
8. Encoding and decoding
9. Conversion of binary into gray and gray into binary.

15MSS18 - COMPUTING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Compute Arithmetic and logical calculations and create graphical charts using EXCEL*
- *Manipulate files using appropriate UNIX filter commands such as sort, cut, find, uniq, cmp, comm, wc and grep for a given scenario.*
- *Use command line arguments and interactive inputs for implementing shell scripts in a Linux environment.*
- *Solve linear equations to solve for unknowns using MATLAB tool.*
- *Perform various operations on matrices using MATLAB tool.*

CONCEPTS TO BE COVERED

1. Introducing the features of EXCEL.
2. Arranging and formatting the set of elements using EXCEL.
3. Performing simple arithmetic and logical calculations using EXCEL.
4. Creating graphical charts using EXCEL.
5. Working with vi Editor in UNIX.
6. Learn the use of basic UNIX commands.
7. Learn the use of redirection and File access permissions.
8. Working with filters.
9. Working with commands such as find, cmp, comm, uniq.
10. Simple Shell Programs.
11. Solving numerical problems using MATLAB tool.
12. Solving linear equations using MATLAB tool.
13. Solving matrices using MATLAB tool.

15MSS19 - ENGLISH LANGUAGE LABORATORY

L	T	P	C
0	0	2	1

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *For a given 2 to5 minutes speaking activity like Extempore and Debate, produce language structures accurately and fluently.*
- *Construct dialogues for a given social scenario and interpret the given graphic information and write creative paragraphs.*
- *For a given technical topic, prepare a power point presentation for 15 minutes.*
- *Given short conversations and monologues for listening, specify appropriate responses and construct a summary.*
- *Given a technical paragraph for reading, specify correct responses by identifying the topic sentence, inferring meanings, lexical and contextual items, and finding the supporting points and transitional tags.*

LIST OF EXPERIMENTS

1. Speech Sounds
2. Word Vocabulary
3. Reading Comprehension
4. Listening Practice - I
5. Dialogue Writing
6. Conversational Exercise - I
7. Focus on Language
8. Creative Writing
9. Conversational exercise - II
10. Listening Practice-II

15MSSLE01 - PROFESSIONAL ENGLISH

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Apply the rules of the grammar viz, Confusing words, Verbs, Gerunds, Infinitives, Cause and Effect and use appropriate patterns in a given sentence or a passage.*
- *Given a passage or a technical topic, prepare a mind map, make notes and summarize.*
- *Given a Business Communication scenario, prepare Reports, Memos, Instructions, Minutes of the meeting, Emails and Business letters using appropriate format.*
- *Given a communication context, specify the type and barrier to listening, provide solutions and justify. Given short conversations and monologues for listening, specify appropriate responses and construct a summary.*
- *For a given HR topic, generate valid points for and against the topic and present them with group behavior. For any job requirement, plan and prepare a 20 minute Mock Interview.*

FOCUS ON LANGUAGE

Scientific Terminology - Homonyms - Homophones - Formal Vocabulary - Confusing Words - Idiomatic Expressions - Collocations - Regular and Irregular Verbs - Gerund - Voice - Infinitive - Modal Verbs - Phrasal Verbs - If Conditionals - Cause and Effect - Numerical Adjectival Phrases - Conjunctions - Clauses - Definitions - SMS Language. **(11)**

READING

Summarizing - SQ3R Reading Technique - Note Making: Outline/Linear Method- Sentence Method - Schematic Method - Understanding Discourse Coherence - Non-Verbal Signals - Cloze Comprehension - Mind Mapping. **(7)**

WRITING

Business Letters - Article Writing - Review of a Newspaper Report - Emails - Report Writing - Instructions - Vacancy Advertisements - Resume - Meetings: Agenda and Minutes of the Meeting - Writing Book Reviews - Memorandum - Essay Writing. **(11)**

LISTENING

Types of Listening- Barriers to Effective Listening- Intensive Listening - Listening to Podcast, Negotiation, Job Interviews, Group Discussions and Filling Gaps. **(7)**

SPEAKING

Interviews: Objectives of Interviews - Types of Interviews - Group Discussions - Organizational GD - GD as a Part of Selection Process - Role Play - Negotiation. **(9)**

TOTAL : 45

TEXT BOOK

1. *Dr.K.Elango, "Resonance", Cambridge University Press, New Delhi, 2013.*

REFERENCE BOOKS

1. *Meenakshi Raman, Sangeeta Sharma, "Technical Communication - English Skills for Engineers", Oxford University Press, New Delhi, 2012.*
2. *Nagaraj Geetha, "A Course in Grammar and composition", Cambridge University Press, 2012*
3. *Samson T, "Innovate with English", Cambridge University Press, 2012.*
4. *Mark Ibbotson. "Cambridge English for Engineering" Cambridge University Press, 2012.*
5. *B. Sai Lakshmi. "Poly Skills- A Course in Communication and Life Skills" Cambridge University Press, 2012.*

15FY22F - BASIC FRENCH

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

At the end of the semester the students will:

- *Use the basics of the Language in Social contexts.*
- *Write simple narration, description and speak to communicate ideas.*
- *Demonstrate confidence in Social Interactions.*

INTRODUCTION **(2)**

UNITÉ-1

Faire connaissance - inviter et répondre à une invitation - décrire les personnes- articles définis et indéfinis - genre etnombre des noms et des adjectifs- interrogation et négation - conjugaison du présent. Paris monuments et lieux publics - la vie de quatre parisiens de professions différentes. **(11)**

UNITÉ-2

Exprimer l' ordre et l'obligation demander et commander - evaluer et apprécier- féliciter et remercier - articles partitifs -adjectifs démonstratifs et possessifs prépositions et adverbes de quantité et de l'imperatif verbes pronominaux - une région deFrance la Bourgogne - vie quotidienne à la compagne. **(11)**

UNITÉ-3

Raconter et rapporter - donner son avis - se plaindre et réprimander - expliquer et justifier - pronoms compléments -futur proche - passé composé et imparfait. Plusieurs régions de France - différents univers sociaux. **(11)**

UNITÉ-4

Demander l'autorisation - interdire - formuler des projects - discuter et débattre. Pronoms < en > et < y > - pronoms relatifs et superlatifs - conjugaison du futur - présent continu et passé récent.La vie administrative et régionale - problems economiques et écologiques - traditions et modernité. **(10)**

TOTAL : 45

TEXT BOOK

1. *Le Nouveau Sans Frontières - Philippe Dominique, Jacky Girardet Michèle Verdelhan, Michel Verdelhan.*

REFERENCE BOOKS

1. *Dondo Modern French Course ---Mathurin Dondo*
2. *Modern French Grammar---Margaret Lang and Isabelle Perez.*

15FY22G - BASIC GERMAN

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

At the end of the semester the students will:

- *Use the fundamental concepts of the Language in social contexts.*
- *Write simple narration, description and speak to communicate ideas.*
- *Demonstrate confidence in Social Interactions.*

EINFUHRUNG

BegrU ung - Name - Vorname - Familienname - Anrede **(7)**

THEMA

Hallo ! Wie geht's?

Begegnungen

Guten Tag, ich suche…,

Im Supermarkt

Arbeit und Freizeit

Familie und Haushalt **(10)**

GRAMMATIK-I

Position des Verbs : Aussage, W - Frage und

Ja/Nein - Frage; Artikel die der das.

W - Frage; Konjugation in Prasens;

Nominativ : bestimmter, unbestimmter und negative Artikel

Akkusativ : unbestimmterundnegativer Artikel

Adjektive : Akkusativ-Erganzung **(18)**

GRAMMATIK-II

Artikel als Pronomen Dative - Erganzung : Personalpronomen und Ortsangaben; Imperativ Modalverben; Ortsangaben; Richtungsangaben; Zeitangaben; Ordinalzahlen Possessiv - Artikel; trennbare und nicht trennbareVerben; Wechselprapositionen. **(10)**

TOTAL : 45

TEXT BOOK

Studio d A1: Kurs - und Ubungsbuch (Deutsch alsFremdsprache) CornelsenVerlag.

REFERENCE BOOK

Tangarmaktuell1 : Kursbuch + Arbeitsbuch (Deutsch alsFremdsprache) Max HueberVerlag.

15MSS21 - PROBABILITY AND STATISTICS

L	T	P	C
3	2	0	4

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *To describe random variables, distributions and their properties.*
- *To analyze two dimensional random variables and the study of correlation and regression between them.*
- *To analyze the sampling theory using various tests of hypothesis.*
- *To describe ANOVA and experimental designs.*
- *To describe concepts of reliability of systems and to construct control charts for various statistical problems.*

RANDOM VARIABLES

Discrete and continuous random variables - Properties- Moments - Moment generating functions and their properties. Binomial, Poisson, Geometric, Negative binomial, Uniform, Exponential, Gamma, and Weibull distributions. **(9)**

TWO DIMENSIONAL RANDOM VARIABLES

Joint distributions - Marginal and conditional distributions - Covariance - Correlation and Regression - function of a random variable-Transformation of random variables - Central limit theorem. **(9)**

TESTING OF HYPOTHESIS

Sampling distributions - Testing of hypothesis for mean, variance, proportions and differences using Normal, t, Chi-square and F distributions - Tests for independence of attributes and Goodness of fit. **(9)**

DESIGN OF EXPERIMENTS

Analysis of variance - One way classification - CRD - Two - way classification - RBD - Latin square. **(9)**

RELIABILTY AND QUALITY CONTROL

Concepts of reliability-hazard functions-Reliability of series and parallel systems- control charts for measurements (x and R charts) - control charts for attributes (p, c and np charts) Note : Use of approved statistical table is permitted in the examination. **(9)**

TOTAL : 45+30=75

TEXT BOOKS

1. *J. S. Milton and J.C. Arnold, " Introduction to Probability and Statistics", Tata McGraw Hill, 4th edition, 2007. (For para 1 and 2)*
2. *R.A. Johnson and C.B. Gupta, "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 7th edition, (2007)*

REFERENCE BOOKS

1. *Walpole, R. E., Myers, R. H. Myers R. S. L. and Ye. K, "Probability and Statistics for Engineers and Scientists", Seventh Edition, Pearsons Education, Delhi, 2002.*
2. *Navidi, W, "Statistics for Engineers and Scientists", Special Indian Edition, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008.*
3. *Spiegel, M.R, Schiller, J and Alu Srinivasan, R, "Schaum's Outlines Probability and Statistics", Tata McGraw-Hill Publishing Company Ltd. New Delhi, 2007.*

15MSS22 - FUNDAMENTALS OF WEB TECHNOLOGY

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Describe the need for Internet Platform and its benefits over other technologies*
- *Demonstrate techniques for improving the accessibility of an HTML and XHTML document involving a variety of element types, including hyperlinks, images, lists, tables, and forms with CSS properties*
- *Employ Java Script for client side programming that uses a regular expression to validate form entry and processing*
- *Develop XML applications with DTD and style sheets that span various enterprises including Government, Industry, Academia and Society*
- *Establish PHP server side programming skills to work with form data, regular expressions, exception handling, validate data, cookies, sessions and to build interactive, data-driven sites*

INTRODUCTION

History of Internet : need for internet - W3C - Internet Languages - Browser Features - Internet Accounts - shell, PPP, SLIP - Web Server: Http Request Types - Accessing the server - Server Architecture - Client and Server side Scripting - server type - Requesting document under web.

HTML

Document Structure : Basic Tags - contents of header section - page formatting tags, text formatting tags - frames - tables - lists - image - Anchors - Forms - Hidden data in forms. **(9)**

XHTML AND CSS

XHTML Definition, Specifications, difference between HTML and XHTML - image maps - Meta elements. CSS: Web Typography - Page elements - Links and Navigation - Lists - Forms - Tables - Page Layouts - Box format - positioning - filters and alpha properties **(8)**

JAVA SCRIPT & DHTML

Introduction- Memory Concepts, Arithmetic, Decision Making, Control Structures - Functions - Arrays - Objects - Math, String, Date, Boolean and Number. DHTML - Object Model and Collections - Event Models. **(10)**

XML

Introduction - File Structure - XML Namespaces - XML Document Type Definition - XML Schema - need for schema - W3C Schema Documents - XML Vocabularies - Math ML - CML - Extended Style sheet. Parsers - DOM and SAX parsers. **(8)**

PHP

Introduction - Working with Strings, Numbers, Date and Time, Arrays. Php Functions and classes, HTML and Web pages, Forms, Sessions and Cookies, Form Input validation using Regular Expressions - Handling Databases. **(10)**

TOTAL : 45

TEXT BOOKS

1. *Paul Deitel, Harvey Deitel, Abbey Deitel, "Internet and World Wide Web How To Program", 5th edition, Pearson Education, 2011. (Para I - IV)*
2. *Vikram Vaswani "PHP Programming Solutions", Tata McGraw-Hill 2007(Para V).*

REFERENCE BOOKS

1. *Christopher Schmitt, "CSS Cookbook", Third Edition, 2009.*
2. *Paul Deitel, Harvey Deital, "JAVA How To Program" 9th Edition Pearson Education, 2011.*
3. *William R. Stanek, James O'Neill, Jeffrey Rosen, "Microsoft® PowerShell, VBScript, and JScript® Bible" Copyright © 2009 by Wiley Publishing, Inc.*

15MSS23 - DATA STRUCTURES AND ALGORITHMS

L	T	P	C
3	2	0	4

PRE-REQUISITES

15MSS13

ASSESSMENT : THEORY

COURSE OUTCOME

- *Design and implement abstract data types such as array, linked list, stack, queue, and tree to solve real world problems.*
- *Select and use suitable data structures for problem solving and programming*
- *Design substantial and complex data structures for a given real-life problem*
- *Evaluate algorithms and data structures in terms of time and space complexity of basic operations*
- *Compare and evaluate the searching and sorting techniques based on complexity measures*

INTRODUCTION TO DATA STRUCTURES

Primitive data structures - ADT

Arrays : Arrays as ADT, one dimensional array, two dimensional array, multidimensional array, representation. **(6)**

STACK

Definition - stack as ADT - sequential representation - operations, Applications: conversion & evaluation of expression.

Recursion : Definition, properties, examples, writing recursive program.

QUEUE

Definition - queue as ADT, sequential representation - operations - circular queue - priority queue. **(11)**

LINKED LISTS

Definition - operations - linked representation of stacks & queue - circular lists - operations - doubly linked list - Application: addition of polynomial. **(9)**

TREES

Terminologies - binary tree: operations, traversals, representation - threaded binary tree - properties. **(6)**

ALGORITHMS

Analysis: Algorithms: Algorithms as a technology, Insertions Sort, Analyzing algorithms, Designing algorithms - Growth of functions.

SORTING & SEARCHING

Bubble sort - quick sort - heap sort - radix sort - Searching: linear search, binary search. **(13)**

TOTAL : 45+30 =75

TEXT BOOKS

1. *Yedidyah Langsam, Moshe.J.Augenstein, Aaron.M.Tenenbaum, "Data structures using C & C++" Second Edition, PHI Publications.(para1 to para 4)*
2. *Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivert, Clifford Stein, "Introduction to Algorithms", Second Edition, PHI Publications, 2004.*

REFERENCE BOOKS

1. *Ellis Horowitz & Sartaj Sahni "Fundamentals of Data Structures", Galgotia Publications.*
2. *Richard F. Gilbery, Behrouz A.Forouzan, "Data structures - A Pseudocode Approach with C", 2002 Edition, Thomson Asia Pvt Ltd.*
3. *Krishnamoorthy.R,"Data Structures using C", Mc Graw-Hill Education (India) Pvt.Ltd, 2010.*

15MSS24 - OBJECT ORIENTED PROGRAMMING

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS13

ASSESSMENT : THEORY

COURSE OUTCOME

- *For a given scenario compare and criticize alternate implementations using functional programming and object oriented programming in view of privacy.*
- *Compare and contrast function overloading and default argument function for appropriate usage in an object oriented system.*
- *For a given scenario, construct an object oriented system using appropriate type of inheritance for realizing reusability.*
- *Construct and compare object oriented systems using static binding, dynamic binding and template classes for realizing polymorphism.*
- *Create persistent objects using stream class hierarchy incorporating exceptional handling.*

INTRODUCTION

Introduction to C++ - Programming Paradigms - Procedural Programming - Modularity - Separate compilation - Exception Handling - Data Abstraction- User Defined Types - Concrete Types - Abstract Types - Virtual Function - Object Oriented Programming - Generic Programming **(6)**

BASIC FACILITIES IN C++

Overview of C++ - Types and Declarations - Arrays, Pointers, Structures, References and Functions - Function Overloading - Name spaces - Source Files and Programs.

ABSTRACT DATA TYPE IN C++

Class - Class members and Access control - Constructors- Static members - Default copy constructor - Const member functions - this pointer - Structs - Inline function definition - Concrete classes - Destructors - new and delete - Member objects. **(11)**

OPERATOR OVERLOADING

Operator functions - Binary and unary operators - Member and non member operators - Friend functions - Large objects - Function call -Increment and Decrement - A string class - Dereferencing **(8)**

INHERITANCE

Derived Classes - Class Hierarchies - A virtual functions - Abstract classes. Templates: Function templates - Derivation and Templates. **(10)**

EXCEPTION HANDLING AND LIBRARY CLASSES

Grouping of exceptions - Catching exceptions - Exceptions that are not errors - Uncaught Exceptions - Standard exceptions - The standard library - I/O streams - File streams. **(10)**

TOTAL : 45

TEXT BOOK

1. *Bjarne Stroustrup, "The C++ Programming Language", 3rd edition, Pearson Education, 2000.*

RFERENCE BOOKS

1. *Ira Pohl, "Object Oriented Programming Using C++", 2nd Edition, Pearson Education, 2006.*
2. *Herbert Schildt, "The Complete Reference C++", 4th edition, Tata McGraw Hill, 2003.*
3. *Stanley B Lippman, Jove Lajoie, and Barbara Moo "C++ Primer", 5th Edition, Addison Wesley, 2012.*

15MSS25 - DATA STRUCTURES AND ALGORITHMS LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

15MSS13

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Choose the appropriate data structure for a specified application*
- *Demonstrate the abstract properties of various data structures such as stacks, queues, lists and trees in real world application*
- *Trace and code recursive methods and compare with iterative methods.*
- *Implement and compare the complexities of various sorting algorithms including bubble sort, heap sort and quick sort*
- *Demonstrate understanding of linear and binary search algorithms*

CONCEPTS TO BE COVERED

1. Applications of 2D, 3D arrays.
2. Evaluation of expression using stack.
3. Recursion - Towers of Hanoi, Ackermann's function, Fibonacci series.
4. Implementation of basic queue operations, priority queue, circular queue.
5. Implementation of self referential structures (FIFO, LIFO).
6. Applications of circular linked list.
7. Applications of doubly linked list.
8. Traversals of binary tree.
9. Implementation of sorting and searching techniques.

15MSS26 - OBJECT ORIENTED PROGRAMMING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Determine the visibility requirements for data members and member functions and communication requirements among objects while constructing classes for a given scenario.*
- *Demonstrate static binding using function overloading and operator overloading for manipulating real-life objects*
- *Design object oriented system for realizing reusability and run time polymorphism.*
- *Create persistent objects using iostream class hierarchy.*
- *Incorporate exceptional handling mechanism appropriately while building an object oriented systems.*

CONCEPTS TO BE COVERED

1. Identification, construction and destruction of objects
2. Overloading
3. Friend functions
4. Inheritance
5. Polymorphism
6. Exception handling
7. Using I/O Streams
8. File Operations
9. Generic Programming

15MSS27 - SCRIPTING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Develop static and dynamic web pages and enhance the pages using CSS properties*
- *Convert the existing web sites with better and generic style properties for the entire website*
- *Employ dynamic XML for client side data storage, construct processing codes for client and server side*
- *Design and add functionalities to web pages on client and server side with cookies, regular expressions, database connectivity and ActiveX controls*
- *Construct new web designs with emerging internet technologies*

CONCEPTS TO BE COVERED

1. Simple HTML programs with formatting tags, tables, images, lists and frames
2. Interactive pages using anchors, image maps and forms
3. XHTML representation of web pages.
4. Cascading Style Sheets - Dynamic properties for individual, group and random elements
5. JScript programs for simple arithmetic, string processing, arrays, built in and user defined functions, client side validations
6. XML - Database, DTD, XSD, XSL representation
7. PHP / Apache Tomcat- simple programs for embedding html and php, arrays, string processing
8. Server side validations, cookies, database connectivity.

15MSS31 - DISCRETE MATHEMATICAL STRUCTURES

L	T	P	C
3	2	0	4

PRE-REQUISITES

15MSS12

ASSESSMENT : THEORY

COURSE OUTCOME

- *Discover in the construction and understanding of mathematical proofs.*
- *Employ common mathematical arguments and proof strategies in function and relations.*
- *Define a sense of familiarity and ease in working with mathematical notation and common concepts in discrete mathematics.*
- *Express the basic results in groups, monoids and lattices.*

COMBINATORIAL MATHEMATICS

Basic counting principles, Permutations and combinatorics, Inclusion and Exclusion Principles, Pigeon Hole Principle, Recurrence relations, Application. **(7)**

SETS, RELATIONS AND FUNCTIONS

Set Theory - Basic concepts of set theory, Operations on sets, the power set, Relation - Basics of relations, Types, Representation of relations, Equivalence relation , Partial ordering relations. Functions - Introduction to functions, Types, Sequences, Indexed classification of sets, Recursively defined functions, Cardinality. **(10)**

ALGEBRIC SYSTEMS

Groups, Semigroups and monoids Cyclic semigraphs and submonoids, Subgroups and Cosets. Congruence relations on semigroups. Morphisms. Normal subgroups. Structure of Cyclic groups permutation groups, dihedral groups. Elementary applications in coding theory. Rings-Subrings -morphism of rings ideals and quotient rings. Euclidean domains, Integral domains and fields. **(10)**

MATHEMATICAL LOGIC AND SET THEORY

Propositions and Logical Operations, Quantifiers, Conditional Statements and tautologies, Methods of Proof , Principles of Mathematical Induction. **(8)**

LATTICES AND BOOLEAN ALGEBRA

Definition, Types of lattices, Hasse diagram, Partially ordered sets. Boolean Algebra - Basic definition, duality , Basic theorem ,Boolean algebra as Lattices, Representation, Theorem, Sum - of - products form for Boolean Algebra, Minimal Boolean Expression, Prime implicants, Logic gates and circuits. **(10)**

TOTAL : 45+30=75

TEXT BOOKS

1. *Lipschutz , "Discrete Mathematics -Schaum series", Mc Graw Hill Publication.*
2. *Alan Doerr and Kenneth Levarseur, "Applied Discrete Structures for Computer Science", free open book.*

REFERENCE BOOKS

1. *Tremblay & Manohar, "Discrete Mathematical Structures with Applications to Computer Science", Tata Mc Graw - Hill.*
2. *S. Arumugam, "Linear Algebra"*

15MSS32 - COMPUTER ARCHITECTURE

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS15

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given a computer organization, Demonstrate how the various computer system components work and justify why they perform so*
- *Given the instruction set of a processor, develop assembly language programs that meets the given requirements.*
- *Given a CPU organization, design a memory module for a given specification*
- *Given a CPU organization, design an I/O module for a device by choosing appropriate mode of transfer and justify choice.*
- *Given the instruction set, format of the instructions, and cycles needed for execution, can evaluate the execution time of a program*

BASIC COMPUTER ORGANIZATION

Stored program organization - registers - instructions - Timing and control - Instruction cycle - Memory reference instructions - input/output and interrupt - Design of Basic computer - design of accumulator logic - Programming the basic computer. **(9)**

MICROPROGRAMMED CONTROL

Control memory - Address sequencing - Microprogram example- Design of control unit. CENTRAL PROCESSING UNIT: General register organization - stack organization - Instruction formats - Addressing modes - Data transfer and manipulation - Program control- Reduced Instruction Set computer. **(9)**

COMPUTER ARITHMETIC

Addition - subtraction - multiplication and division algorithms - Floating point Arithmetic operations - Decimal arithmetic unit and operations. **(9)**

I/O ORGANIZATION

Peripheral devices - Input/output interface - Asynchronous Data Transfer - Modes of Transfer- Priority interrupt - Direct Memory Access - Input-output processor - Serial communication. **(9)**

MEMORY ORGANIZATION

Memory Hierarchy - Auxiliary memory -Associative memory - Cache memory - Virtual Memory - Memory management hardware. **(9)**

TOTAL : 45

TEXT BOOK

1. *M Morris Mano, "Computer system Architecture", Pearson Education, 2007.*

REFERENCE BOOKS

1. *John L Hennessy and David A Patterson, "Computer Architecture - A Quantitative Approach", V Edition, Morgan Kaufmann, 2007.*
2. *Carl Hamacher, Zuonko Uranesic & Safwat Zoky, "Computer Organization", 5th edition, McGraw Hill, 2002*

15MSS33 - OPERATING SYSTEMS

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS13, 15MSS14, 15MSS23

ASSESSMENT : THEORY

COURSE OUTCOME

- *Demonstrate the batch programming, system calls and virtual machines*
- *Demonstration of Kernel Management for Inter Process Communication systems*
- *Estimation of system performance through scheduling algorithms - FIFO, round robin, priority, shortest job first*
- *To gain the knowledge to handle the memory allocation and deallocation for both static and dynamic storage*
- *Design and Develop a new simple File System using Disk and File System Management*

INTRODUCTION

System Software - Macro Processor - Loader - Linker - Operating systems -objectives and functions. Evolution of Operating system - serial processing, simple batch systems, multi- programmed batch system, time sharing systems.

Process Description And Control

Process status, Process description, Process control - Processes and threads. **(10)**

CONCURRENCY

Principles of concurrency, mutual exclusion - software support, Dekker's Algorithm - mutual exclusion - hardware support, mutual exclusion - Operating System support - Semaphore - Monitors - Implementation - Message Passing. Deadlock - deadlock prevention, deadlock detection, deadlock avoidance. An integrated deadlock strategy. **(8)**

MEMORY MANAGEMENT

Memory management requirements. Fixed partitioning, placement algorithm. Dynamic partitioning placement algorithm. Replacement algorithm. Relocation. Simple paging - Simple segmentation.

VIRTUAL MEMORY

Paging - address translation in a paging system. Segmentation - organization. Address translation in a segmentation system. Combined paging and segmentation. Virtual memory - Operating System software - fetch policy, placement policy and replacement policy. Page buffering. Resident set management.**(12)**

SCHEDULING

Types of scheduling, scheduling algorithms, scheduling criteria, FIFO, Round Robin, Shortest process next, Shortest remaining time, Highest response ratio and Feedback scheduling. Performance comparison. Fair - share scheduling. **(6)**

I/O MANAGEMENT AND DISK SCHEDULING

Organization of the I/O function - evaluation of the I/O function. Logical structure of the I/O function, I/O buffering. Disk I/O - Disk scheduling algorithms. Disk cache.

File Management

Files, File management systems, File system architecture, Functions of File management - File directories - File sharing - secondary storage management. File allocation. **(9)**

TOTAL : 45

TEXT BOOKS

1. *William Stallings, "Operating systems Internals and Design Principles", 4th edition, PHI, 2001.*

REFERENCE BOOKS

1. *Silberschatz A., Peterson J.L and Galvin P., "Operating System Concepts", John Wiley Publishing Company, 2002.*
2. *H.M.Deital, " An introduction to Operating System", Pearson Education, 2001*
3. *Charles Crowley, "Operating System a Design Oriented Approach", Tata McGraw Hill, 2000.*
4. *Milankovic M, "Operating System Concepts & Design", McGraw Hill,1999.*
5. *Armass Danesl, "Mastering Linux", Premium Edition, BPB Publications, 1999*
6. *Robert Cowart, Boyd waters "Windows NT 4 ", BPB Publications, 1997.*

15MSS34 - ADVANCED DATA STRUCTURES AND ALGORITHMS

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS23

ASSESSMENT : THEORY

COURSE OUTCOME

- *Design, implement, test and debug programs using a variety of data structures including binary and general tree structures, search trees, B-trees, Tries, graph , heaps,hash tables and buffer pools.*
- *Describe and implement a variety of advanced data structures (AVL Tree, Multiway Tree, B+Tree, Red Black Tree).*
- *For a given data structure, a student will be able to classify best, average, worst and amortized scenario with respect to a problem.*
- *Identify the problem given and design the algorithm using various algorithm design techniques like Divide and Conquer, Greedy method, Dynamic Programming, Backtracking and Branch and Bound Technique*
- *Recognize and apply design techniques and make judgements about which particular design technique will improve performance of a problem*

TREES

Binary search tree: Definition, operations - AVL Tree: Balancing trees, node operations. **(6)**

MULTIWAY TREES

Definition - m-way search trees - B-trees - Red Black tree - operations - Trie Structures - B+ trees. **(11)**

GRAPHS

Representation - Breadth first search - Depth first search - Topological Sort **(5)**

HEAP

Definition - heap data structures - heap algorithms - applications.

HASHING

Basic concepts - hashing methods - hashing algorithms - collision resolution methods. **(10)**

ALGORITHM DESIGN TECHNIQUES

DIVIDE & CONQUER

General method - Merge sort.

GREEDY METHOD

General method - Knapsack problem -Prim's & Kruskal's algorithm.

DYNAMIC PROGRAMMING

General method - Multistage graph- Travelling Salesperson Problem.

BACK TRACKING

General method - Eight queen's problem. **(13)**

TOTAL : 45

TEXT BOOKS

1. *Richard F. Gilbery, Behrouz A.Forouzan, "Data structures - A Pseudocode Approach with C", 2002, Thomson Asia Pvt Ltd. (Trees, Multiway trees, Heap, Hashing)*
2. *Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Fundamental of Computer Algorithms", Galgotia Publications, 1998. (Algorithm Design Techniques)*
3. *Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivert, Clifford Stein "Introduction to Algorithms", Second Edition, Prentice Hall of India, Publications, New Delhi, 2007. (Graphs, Red Black Trees).*

REFERENCE BOOKS

1. *Anany Levitin, "Introduction : The Design & Analysis of Algorithm", 2003 Edition, Pearson Education Inc.*
2. *S.K.Basu, "Design Method & Analysis of Algorithm", PHI, 2005.*

15MSS35 - SOFTWARE ENGINEERING

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS14

ASSESSMENT : THEORY

COURSE OUTCOME

- *Choose applicable software life-cycle model to develop software for given customer need and justify choice with reference to complexity, cost and time.*
- *Analyze software requirements based on customer need and develop industry standard Software Requirement Specification (SRS) document*
- *Construct models using functional and object oriented design principles and concepts based on SRS document.*
- *Prepare suitable structural and behavioural analysis models based on SRS document.*
- *Design and develop test cases for given software requirement.*

SOFTWARE ENGINEERING OVERVIEW

Introduction - Socio-technical Systems - Software Process - Project Management. **(8)**

REQUIREMENTS

Software Requirements - Requirements Engineering Process - System Models. **(10)**

SOFTWARE DESIGN

Architectural Design - Application Architectures - User Interface Design. **(12)**

DEVELOPMENT AND TESTING

Rapid Software Development -Verification and Validation- Software Testing. **(8)**

EVOLUTION AND CONFIGURATION

Software Maintenance - Configuration Management. **(7)**

TOTAL : 45

TEXT BOOK

1. *Ian Somerville, "Software Engineering" , 8th edition, Pearson, 2011.*

REFERENCE BOOKS

1. *Roger S.Pressman "Software Engineering -A Practitioner's approach", 7th edition, McGraw Hill International edition 2010.*
2. *Pankaj Jalote, "An integrated approach to software Engineering", 3rd edition Narosa publishing house, reprint 2013.*

15MSS36 - ADVANCED DATA STRUCTURES AND ALGORITHMS LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

15MSS23

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Ability to apply suitable data structure for the given real world problem*
- *Understand the importance of abstract data type, and their basic usability in different applications through different programming languages.*
- *Use various algorithmic design techniques including divide-and-conquer, greedy, dynamic and back tracking for efficient algorithm design*
- *Design and analyze the algorithm to identify time and space complexity of the data structure*
- *Able to implement various kinds of searching and sorting techniques.*

CONCEPTS TO BE COVERED

1. Operations on binary search tree.
2. Operations on AVL tree
3. Hash Table implementation
4. Construction of heap & its operation
5. Implementation of Divide & Conquer Method
6. Implementation of Greedy Method
7. Implementation of Dynamic Method
8. Implementation of Back tracking Method.

15MSS37 - VISUAL PROGRAMMING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Design a windows software solution by identifying attributes and behaviour and grouping them into user interfaces using appropriate controls and UI components, for a given set of user requirements*
- *Design and develop interactive applications using standard tool box, advanced controls like progressbar, menubar, etc, event handling and ADO for a given user specification*
- *Design a web software solution by identifying attributes and behaviour and grouping them into user interfaces using appropriate controls and UI components using ASP.NET, for a given set of user requirements*
- *Design and develop interactive web applications using ASP.NET and ADO.NET*
- *Organize the written set of application programs into packages and deploy using appropriate tools*

CONCEPTS TO BE COVERED IN LAB

1. Simple Windows applications using standard tool box controls (Button, Label, Text, Drop Down List, etc) with event handling
2. Windows application using advanced controls (FileDialog, ProgressBar, etc)
3. Design and develop database applications using ADO.NET library (MSAcess/MySql)
4. Use of stored procedures in database applications
5. Design simple web applications using ASP.NET Server controls
6. Web applications with database

CONCEPTS TO BE COVERED IN TUTORIALS

1. Introduction to VS.NET IDE and framework components
2. Exercise in basic C# /VB.Net language primitives

a. Basic data types, arrays, control structures, Loops, functions

3. Exercise in basic ASP.Net language primitives
4. Exercise on database connectivity code using ADO.NET

15MSS38 - OPERATING SYSTEMS LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

15MSS16, 15MSS25

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Ability to handle the shell commands, functionaly and scripts.*
- *To Create batch programming, system calls and virtual machines*
- *To develop Kernel Management programs for Inter Process Communication systems*
- *To evaluate system performance through scheduling algorithms - FIFO, round robin, shortest job first*
- *Ability to handle effectively memory allocation and deallocation for both static and dynamic storage*

CONCEPTS TO BE COVERED

1. Shell Basics
    a. Types of shells
    b. Shell functionality
    c. Environment
2. Writing first script
    a. Writing script and executing basic script
    b. Debugging script
    c. Making interactive scripts
    d. Variables(default variables)
    e. Mathematical expressions
3. Conditional Statements
    a. if -else-elif
    b. test command
    c. Logical operators - and, or, not
    d. case - esac

4. Loops
    a. while
    b. for
    c. until
    d. break and continue
5. Command Line arguments
    a. Positional parameters
    b. set and shift
    c. IFS
6. Functions and file manipulations
    a. Processing file line by line
    b. Functions
7. Regular Expression & Filters
    a. grep, cut, sort
    b. grep patterns
8. SED & AWK
9. Processes
    a. Concept of process in Unix
    b. Background processes
    c. Scheduling processes - At, batch & cron
10. Misc
    a. Trapping signals
    b. String substitutions / manipulations
11. Advanced Scripting Techniques
    a. Providing command line options to scripts
    b. Shell and Sub shells
    c. Exporting variables
    d. Arrays
12. Implement CPU Scheduling Algorithms : FIFO, SJF, Round Robin
13. Implement Bankers Algorithm to avoid deadlock
14. Implement the Producer - Consumer problem using semaphores
15. Implement Page Replacement algorithms

15MSS41- RESOURCE MANAGEMENT TECHNIQUES

L	T	P	C
3	2	0	4

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *To solve the Linear programming Problem, Transportation and Assignment problem.*
- *To discuss the elementary Inventory models, Price break models and Safety stock problems.*
- *To categorize the Queuing models and also simulate the problems using Monte - Carlo Technique.*
- *To analyze the network models using CPM and PERT and to discuss the replacement problems.*

LINEAR PROGRAMMING

Linear programming problem - canonical and standard forms- formulation - graphical solution - simplex method. **(9)**

DUALITY

Definition of duality - primal - dual relationships - assignment model - Hungarian Technique-transportation model - Vogels approximation method - degeneracy - unbalanced problems. **(9)**

SEQUENCING AND REPLACEMENT

Sequencing - Basic assumptions - sequencing n jobs on 2 machines (Johnson's procedure)

Replacement - need for replacement of equipments - failure mechanism of items - Replacement policy - Replacement of items that deteriorates gradually - Replacement of items that fail suddenly. **(9)**

INVENTORY

Need for the inventory - Costs involved in inventory - Concepts of average inventory, economic order quantity - Deterministic model: Fixed ordering quantity models - EOQ model with uniform demand, finite / infinite replacement with / without shortages -EOQ with one price break. Inventory control - Buffer stock - Determination of optimum buffer stock - EOQ system of ordering - Multi item order model - ABC analysis. **(9)**

QUEUING THEORY AND SIMULATION

Characteristics of queuing systems, steady state M/M/1 model.

Simulation-Monte Carlo method-applications to queuing and inventory problems

PERT & CPM NETWORKS

Critical path method- network - calculations - floats - critical path(cost analysis-crashing-Least cost schedule algorithm).

PERT- Network - critical path. Probability of meeting a scheduled date of completion of the project. **(9)**

TOTAL : 45+30=75

TEXT BOOK

1. *Hamdy, A Taha, "Operations Research - An introduction", Pearson Education India ,2004.*

REFERENCE BOOKS

1. *S. D. Sharma "Operations Research ", Kedar Nath ram Nath & co publishers, 10th edition, 1995.*
2. *Kanti Swarup, P.K. Gupta, Mani Mohan, "Operations Research", Sultan Chand & Sons, 2001.*
3. *Hillier & Lieberman, "Operations Research - An Introduction", Tata McGrawHill, 2004*

15MSS42 - THEORY OF COMPUTING

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS31

ASSESSMENT : THEORY

COURSE OUTCOME

- *Demonstrate the role of different types of compution models*
- *Construct regular expressions and finite state mechine for a given set of languages.*
- *Contruct pushdown automata and context free grammars for a given set of languages.*
- *Design Turing machine for a given language.*
- *Describe Fundamental principles underlying various programming languages features.*

MACHINES

Basic machine - FSM - Deterministic & Non deterministic finite Automata Equivalence of DFA & NFA - Applications of finite automata - finite automata with €- transitions. **(8)**

REGULAR EXPRESSIONS AND GRAMMARS

Definition - Equivalence of regular expression and finite automata-Applications of regular expressions. Grammars: Definition - Types - Leftmost , Rightmost Derivations - Syntax trees - Ambiguity. **(10)**

PUSH DOWN AUTOMATA

Deterministic & Non deterministic - Acceptance by empty stack and final state. one stack and two stack. **(8)**

THEORY OF COMPUTATION

Turing machine - Types - Universal TM- Halting problem - Recursive and recursively enumerable languages- Rice theorem - Linear bounded TM **(9)**

LANGUAGE DESIGN

Evolution of programming languages - criteria for language design - defining syntax : character set, BNF - variable , expressions and statements - types - abstract data type -inheritance - polymorphism - procedures. **(10)**

TOTAL : 45

TEXT BOOKS

1. *Hopcroft J.E., Motwani R. and Ullman J.D, " Introduction to Automata Theory, Languages and Computations" , Second Edition , Pearson Education , 2008(Para 1 to Para 4)*
2. *Ellis Horowitz, "Fundamentals of programming language" Galgotia publications , 2nd edition 1997. (Para 5)*

REFERENCE BOOKS

1. *John C Martin, "Introduction to Languages and the Theory of Computation" , Third Edition , TataMcGraw Hill Publishing Company, New Delhi, 2007.*
2. *Kamala Krithivasan and Rama . R. "Introduction to formal languages, Automata theory and Computation", Pearson Education 2009.*

15MSS43 - MICROPROCESSORS AND ASSEMBLY LANGUAGE PROGRAMMING

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS15, 15MSS32

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given a program segment, demonstrate how the various units of 8086 interact in executing it.*
- *Given a set of requirements, develop assembly language program using 8086 instruction set.*
- *Design memory modules for a 8086 based system for a given specification.*
- *Illustrate how a simple sensor / actuator can be interfaced to 8086 based system.*
- *Differentiate a given processor architecture with 8086 in terms of operating modes, support for multitasking operating system and exception handling.*

INTRODUCTION

Computer architecture and advances - classes of computers - 8086/8088 Microprocessor: Internal architecture - addressing modes - assembler directives - instruction format- instruction set and assembly language programming. **(9)**

MEMORY INTERFACING

Types of Memories - ROM and static RAM Interfacing Techniques - Dynamic Memories - DRAM Interfacing - Error detecting and correcting in DRAM arrays. **(9)**

PERIPHERAL DEVICES AND THEIR INTERFACING

Data transfer schemes - Input and Output modes - 8086 interrupts and interrupt responses - 8259 programmable interrupt controller - 8254 programmable counter/interval timer - Direct Memory Access mode I/O - 8237 programmable DMA controller. **(9)**

DIGITAL AND ANALOG INTERFACING

DIGITAL : Programmable Parallel ports (8255) - interfacing simple devices. ANALOG : Sensors and Transducers - Case Study: A microcomputer based scale. **(9)**

HIGH END PROCESSORS

Issues in building a multitasking operating system - Architecture of 80386 processor - Operating modes - 80386 segment privilege levels protection - interrupt and exception handling - Task switching - Architecture of Pentium processor - operating modes. **(9)**

TOTAL : 45

TEXT BOOK

1. *Douglas V Hall, SSSP Rao, "Microprocessors and its Interfacing", 3rd Edition, TMH, 2012.*

REFERENCE BOOKS

1. *Yn-cheng Liu,Glenn A.Gibson, "Microcomputer systems: The 8086 / 8088 Family architecture, Programming and Design", second edition, Prentice Hall of India, 2006.*
2. *Barry B. Brey, "The Intel Microprocessors 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, and Pentium Pro Processor Architecture, Programming, and Interfacing", Seventh Edition, 2006, Prentice Hall.*

15MSS44 - DATABASE MANAGEMENT SYSTEMS

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS13, 15MSS23, 15MSS33

ASSESSMENT : THEORY

COURSE OUTCOME

- *Describe the purpose and architecture of database systems from the perspective of persistent storage of real world data.*
- *Analyse the problem statement, construct the Entity Relationship model and map it into relational model by applying normalization.*
- *Generate Relational Algebra, Relational Calculus and SQL statements to perform queries of real world applications*
- *Evaluate the indexing techniques and choose the suitable technique by analyzing the given application*
- *Determine the concurrency control and recovery mechanisms based on the criticality of the transaction*

INTRODUCTION

Database System Applications, Purpose of Database Systems, View of Data, Database Languages, Relational Databases, Database Architecture, Database Users and Administrators.

Relational Model: Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Operations. **(4+6)**

DATABASE DESIGN

Database Design and the E-R Model, Overview of the Design Process, The Entity-Relationship Model, Constraints, Removing Redundant Attributes in Entity Sets, Entity-Relationship Diagrams, Reduction to Relational Schemas, Extended E-R Features.

Relational Database Design: Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Functional-Dependency Theory. **(6+5)**

INTRODUCTION TO SQL

Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Subqueries, Modification of the Database.

Intermediate SQL : Join Expressions, Views, Transactions, Integrity Constraints, SQL Data Types and Schemas, Authorization

ADVANCED SQL

Accessing SQL from a Programming Language, Functions and Procedures, Triggers

Formal Relational Query Languages : The Relational Algebra, Tuple Relational Calculus, Domain Relational Calculus. **(10)**

DATA STORAGE AND INDEXING

File Organization, Organization of Records in Files, Data-Dictionary Storage, Database Buffer. Indexing and Hashing: Basic Concepts, Ordered Indices, Overview of B+-Tree Index Files and Hashing Comparison of Ordered Indexing and Hashing, Bitmap Indices, Index Definition in SQL. **(7)**

TRANSACTION, CONCURRENCY CONTROL AND RECOVERY

Concept, Simple Transaction Model, Atomicity and Durability, Isolation, Serializability, Isolation and Atomicity, Isolation Levels. Lock-based Concurrency Control, Time Stamp based Concurrency Control, Failure Classification, Recovery and Atomicity. **(7)**

TOTAL : 45

TEXT BOOK

1. *Abraham Silberschatz, Henry F.Korth and S.Sudarshan, "Database System Concepts", Sixth Edition, McGraw Hill, 2010.*

REFERENCE BOOKS

1. *Ramez Elmasri, Shamkant B. Navathe Durvasula, V.L.N. Somayajulu, Shyam K. Gupta, " Fundamentals of Database Systems", Fourth Edition, Pearson Education, 2006.*
2. *Christopher Allen, Simon Chatwin, Catherine A. Creary, "Introduction to Relational Databases and SQL Programming", Tata McGraw-Hill,2003.*

15MSS45 - JAVA PROGRAMMING

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS24

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given a software requirement, design an object oriented software solution by discovering appropriate classes and objects and identifying attributes, behaviour and hierarchy among the classes.*
- *Write java programs by employing the object oriented constructs of inheritance and polymorphism for a given software requirement*
- *For a given software solution, organize the application programs into packages and prepare a deployable application*
- *Generate robust java applications for a given user requirement by employing applicable object oriented concepts and handling all possible exceptions*
- *Design and develop interactive two tier or three tier web applications using Swings, Applets and JDBC for a given user specification*

INTRODUCTION

The Object Model - The Evolution of the Object Model - Elements of the Object Model - Applying the Object Model

An Introduction to Java - The Programming Environment - Fundamental Programming Structures in Java - Static fields and methods - Method Parameters - Object Construction - Packages - The Class Path. **(7)**

BASICS

INHERITANCE :

Classes, Super Class and Subclass Objects - The Cosmic superclass - Generic Array Lists - Object Wrappers and AutoBoxing - Methods with a variable number of parameters - Enumeration Classes.

INTERFACES AND INNER CLASSES

Interfaces - Object Cloning - Interfaces and callbacks - InnerClasses. DEPLOYING APPLICATION : JAR Files - EXCEPTIONS - Dealing with Errors - Catching Exceptions. **(10)**

USER INTERFACE COMPONENTS WITH SWING

Swing - Introduction to Layout Management - Text Input - Text Fields - Labels and Labelling Components - Password fields - Text areas - Scroll Panes. Choice Components - check boxes, Radio Buttons and combo boxes. Dialog Boxes - Option Dialogs and Creating Dialogs. **(6)**

APPLETS

Types of Applets- Applet Basics - The applet Class - Applet Architecture - An applet Skeleton- Applet Initialization and Termination - Display Methods- Requesting Repainting - Using the Status Window - Passing parameters - Applet Context and Show document **(5)**

COLLECTIONS

Collection Interface - Concrete collections - The Collections Framework - Legacy Collections - The Hashtable Class **(9)**

MULTITHREADING - Threads - Interrupting Threads - Thread states.

Database Connectivity : JDBC **(8)**

TOTAL : 45

TEXT BOOKS

1. *Grady Booch "Object - Oriented Analysis and Design with Applications" , Second Edition, Pearson Education, 2004*
2. *Gary Cornell and Cay S.Horstmann, "Core Java Volume1", Eighth Edition, Pearson Education 2013*
3. *Y.Daniel Liang "JAVA PROGRAMMING", 7th Edition, Pearson Education 2009.*

REFERENCE BOOKS

1. *Herbert Shiltz, "Java: The Complete Reference", Seventh Edition, Tata McGraw Hill, 2007.*
2. *Schaum's OuTlines " Programming With Java", Second Edition, Tata McGrawHill, 2004*

15MSS46 - MICROPROCESSORS LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Use DOS and BIOS interrup handlers to develop assembly language programs.*
- *Develop assembly language programs exploiting the instruction set of 8086 to meet the given requirements.*
- *Use assembler directives and macros to develop assembly language programs.*
- *To handle software interrupts, Develop interrupt service routines for X86 based system.*
- *Design and develop terminate and stay Resident programs for X86 systems.*

STUDENTS MUST BE TRAINED FOR

1. Using DOS and BIOS interrupts
2. Using Assembler Directives
3. Writing programs exploiting all instructions of 80X86
4. Writing macros
5. Writing interrupt service routines
6. Writing FAR and NEAR procedures
7. Writing Terminate and Stay Resident programs

15MSS47 - DATABASE MANAGEMENT SYSTEMS LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Design the conceptual data model as Entity Relationship diagram and create the database using DDL statements for a given application*
- *Formulate simple DML SQL queries to retrieve the required data for real world applications*
- *Generate DML queries with Subqueries, Joins, Group By, Order By and Aggregate functions to filter and aggregate the data of the real world applications*
- *Construct reusable PL/SQL blocks with Functions, Procedures, Packages, Triggers, Exception Handling, and Cursors as required by OLTP applications*
- *Develop a database project by constructing the ER model, creating Tables and generating SQL and PL/SQL blocks using RDBMS platform*

CONCEPTS TO BE COVERED

1. Designing a database for an application and representing it through ER diagram
2. Creating and managing tables
3. Basic SQL SELECT statements
4. Restricting and sorting data
5. Single row functions
6. Displaying data from multiple tables
7. Aggregating data using Group function - Group By
8. Subqueries
9. Views, Sequence, Index, Synonym
10. SET operators, Date and Time functions
11. PL / SQL Programs
12. Exception Handling, Cursors, Functions, Procedures, Package, Triggers

15MSS48 - JAVA PROGRAMMING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Design an object oriented software solution by discovering appropriate classes and objects and identifying attributes, behaviour and hierarchy among the classes, for a given set of user requirements*
- *Write java programs by identifying the appropriate data structures and employing the object oriented constructs of inheritance, abstract class, interfaces and run-time and compile-time polymorphism, where applicable, for a given software requirement*
- *Generate robust multithreaded java applications that can handle all possible exceptions for given set of user requirements*
- *Organize the written set of application programs into packages and prepare a deployable jar using appropriate jdk tools*
- *Design and develop interactive applications using Swings, Applets, event handling and JDBC for a given user specification*

CONCEPTS TO BE COVERED

1. Creating Classes and Objects
2. Inheritance
3. Polymorphism
4. Runtime Polymorphism using Abstract Class and Interface
5. Packages
6. Exceptions
7. Multithreading
8. Collections
9. Swings and Applets
10. Event Handling
11. JDBC

CASE STUDY ON

1. Linear Programming using Simplex Method
2. Sequence Problem using Johnson's Procedure
3. Cost Analysis using Least cost Schedule Algorithm
4. Inventory Problem using Monte Carlo Method

15MSS49 - COMMUNICATION SKILLS & PERSONALITY DEVELOPMENT

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

Communication Skills - 50 marks

Personality Development - 50 marks

COURSE OUTCOME

- *Conceive appropriate verbal responses from the learners to a given social situation, using the guidelines to effective speaking skills and body language.*
- *Generate trouble shooting solutions to develop team building and interpersonal skills with case studies that focus on body language and empathy.*
- *Develop appropriate responses for business phone calls and formulate effective resolutions to professional conflicts that arise out of cross cultural communication gaps in a given managerial context.*
- *Compose appropriate written responses to professional problems faced by a team at the workplace arising out of ineffective communication skills.*
- *Ascertain the various concepts of Self like the Physical Self - Energy Self - Intellectual Self - Mental Self - Blissful Self with respect to the Western(Occidental) and Eastern(Oriental) theories of the Self and Personality Development.*
- *Outline the significant effects of Self Confidence to build team confidence, given the foundation principles of Self Motivation and Confidence.*
- *Assess the various personalities and attitudes and choose the best attitude for making bold decisions in personal and professional contexts.*
- *Project the appropriate grooming and the right etiquette in the corporate context to excel in professional life.*

INTRODUCTION

Introduction - Code and Content - Stimulus and Response: Source - The Encoding Process - The Channel - The Decoding Process - The Receiver - Speaking Skills - Effective Speaking Guidelines - Communicating Soft Skills: A Self-assessment - ClosingTips **(6)**

SOFT SKILLS

Introduction to Soft Skills - Lessons from the Three Case Studies - Change in Today's Workplace: Soft Skills as a Competitive Weapon - Antiquity of Soft Skills - Classification of Soft Skills: Time Management - Attitude - Responsibility - Ethics, Integrity, Values and Trust - Self-confidence and Courage - Consistency and Predictability - Teamwork and Interpersonal Skills - Communication and Networking - Empathy and Listening Skills - Problem Solving, Troubleshooting and Speed reading - Leadership - Body Language

TELEPHONING SKILLS & NEGOTATIONS

Preparing to make a telephone call - Receiving calls - Taking and leaving messages - Asking for and giving repetition - The secretarial barrier - Cross-cultural communication on the telephone - Setting up appointments - Changing arrangements - Ending a call - Cross-cultural communication on the telephone - Problem-solving on the telephone - Complaints - Negotiations: Types of negotiation - Preparation for a negotiation - Making an opening statement - Bargaining and making concessions - Accepting and confirming - Summarizing and looking ahead - Types of negotiator - Dealing with conflict - Rejecting - Ending the negotiation **(10)**

WRITING SKILLS TO CREATE AN IMPRESSION

Introduction- Fifteen Principle to Increase Clarity in Communication - Edit-Edit-Edit: The Reader's Perspective - Clarity of Thought - Clarity of Text. **(7)**

PERSONALITY DEVELOPMENT

One's Personality Sends Out a Signal That Others Read - Same Person: Consciously Different Personalities can be Powerful - There isn't One Right Personality; It Differs by Role - Learning about Personality Development from the Three Cases - Personality Analysis - Freudian Analysis of Personality Development - Swami Vivekananda's Concept of Personality - Development: Physical Self - Energy Self - Intellectual Self - Mental Self - Blissful Self - Personality Begets. **(9)**

LEADERSHIP QUALITIES & INTERPERSONAL SKILLS

Resolving Conflict - A Smiling Face - Appreciative Attitude - Assertive Nature - Communication Skills - Listening Skills - Developing Empathy - The Personality Attribute of Taking Bold Decisions - Personality Types and Leadership Qualities - Mapping the Different Personality Types - Personality Tests: Example of a Personality Test: Jung Typology Test - Personality Assessment **(9)**

ETIQUETTE

Social Etiquette - Corporate Etiquette - Personal Grooming - Using minimal Body Language - Leadership and Entrepreneurship : Corporate Training - Professionalism - Self awareness - Creativity skills - Cognitive Development - Assertiveness - Positive Thinking and Attitude. **(10)**

TOTAL : 60

REFERENCE BOOKS

1. *Mitra K.Barun, "Personality Development and Soft Skills", Oxford University Press, 2011.*
2. *Krishna Mohan, Meera Banerji. "Developing Communication Skills" Mac Million Publishers, 2012.*
3. *Sai Lakshmi. B, "Poly Skills- A Course in Communication and Life Skills" Cambridge University Press, 2012.*

15MSS51 - COMPUTATIONAL INTELLIGENCE

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *To solve a given application, can apply Evolutionary programming techniques.*
- *To solve a given application, can apply swarm intelligence techniques.*
- *Develop and implement a basic trainable neural network for a computing application*
- *Develop and implement a basic fuzzy logic system for a typical computing application*
- *Analyze a given problem, and identify and define the computing requirements appropriate to its solution.*

INTRODUCTION

Introduction to Artificial Intelligence - Intelligent agents - Introduction to Computational Intelligence - Computational Intelligence Paradigms **(9)**

ARTIFICIAL NEURAL NEWORKS

Artificial Neuron - Supervised Learning Neural Networks - Unsupervised Learning Neural Networks - Radial Basis Function Networks - Reinforcement Learning **(9)**

EVOLUTIONARY COMPUTATION

Introduction - Genetic Algorithms - Genetic programming - Evolutionary Programming **(9)**

COMPUTATIONAL SWARM INTELLIGENCE

Basic Particle swarm optimization - Social Network Structure - Basic variations - Basic PSO parameters - Single solution Particle optimization - Applications **(9)**

ARTIFICIAL IMMUNE SYSTEM and FUZZY SYSTEMS

AIS: Natural Immune system - Artificial immune models. Fuzzy Systems: Fuzzy sets - Fuzzy logic reasoning - Fuzzy controllers - Fuzzy Sets **(9)**

TOTAL : 45

TEXT BOOKS

1. *Andries P. Engelbrecht, Computational intelligence: an introduction, edition 2, John Wiley and Sons, 2007. (para 2, para 3, para 4 and para 5)*

2. *Stuart Russell, Peter Norvig, "Artificial Intelligence- A modern Approach", Pearson Education, 3rd Edition, 2010.(para 1)*

REFERENCE BOOKS

1. *Eberhart, E. and Y. Shi., Computational Intelligence:Concepts and Implementations, Morgan Kaufmann, San Diego, 2007*
2. *Konar, A., Computational intelligence : Principles, Techniques, and Applications , Springer, Berlin, Germany, 2005.*

15MSS52 - OBJECT ORIENTED SOFTWARE ENGINEERING

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS24, 15MSS35

ASSESSMENT : THEORY

COURSE OUTCOME

- *Describe the role of unified process in object oriented software development*
- *Draw the usecase model by identifying the actors and usecases from the given requirements.*
- *Analyze the given requirements and generate the analysis class and interaction models from usecase model*
- *Generate the structural, behavioral and deployment design models using design patterns for object oriented systems*
- *Evaluate the correctness of the developed system by testing the system at various levels*

THE UNIFIED PROCESS

Use-Case Driven, Architecture-Centric, Iterative and Incremental - Phases of Unified Process - Modeling with UML **(7)**

REQUIREMENTS ELICITATION

Introduction - Overview - Concepts - Activities. **(6)**

ANALYSIS

Introduction - Overview - Concepts - Activities. **(8)**

SYSTEM DESIGN

Decomposing the System - Addressing Design Goals **(8)**

OBJECT DESIGN

Reusing Pattern Solutions - Specifying Interfaces - Mapping Models to Code **(12)**

TESTING

Introduction - Overview - Concepts - Activities. **(4)**

TOTAL : 45

TEXT BOOKS

1. *Bernd Bruegge& Allen H. Dutoit, "Object-Oriented Software Engineering Using UML, Patterns, and Java", Prentice Hall, Third Edition, 2010*

2. *Ivar Jacobson, Grady Booch, James Rumbaugh, "The Unified Software Development Process", Pearson Education, Sixth Impression, 2011.*

REFERENCE BOOK

1. *Grady Booch, James Rumbaugh and Ivar Jacobson, "The Unified Modeling Language User Guide", Addison Wesley, Eighth Printing, 2001.*

15MSS53 - COMPUTER NETWORKS

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given an inter-network topology configuration, can demonstrate how a packet reaches the destination*
- *For a given inter-network specification, choose appropriate inter-networking devices.*
- *For given requirements, can develop simple network applications using Socket API*
- *For a given inter-network, find the best route to a destination by applying the various routing protocols*
- *For a given network application, can identify the protocols involved at the various layers and demonstrate the role of the protocols*

BASICS

Building a Network: Applications - Requirements - Network architecture - Implementing Network Software - Performance. Connecting to a network: Perspectives on Connecting - Framing - Error Detection - Reliable Transmission - Ethernet and Multiple Access Networks **(10)**

INTERNETWORKING

Switching and Bridging - Basic Internetworking - Routing - Implementation - IPv6 **(10)**

END -TO - END PROTOCOLS

Simple demultiplexer - Reliable Byte Stream - Remote Procedure call - Transport for Real-Time Applications **(9)**

CONGESTION CONTROL AND RESOURCE ALLOCATION

Issues in Resource allocation - Queuing Disciplines - congestion control - Congestion Avoidance - Quality of Service **(8)**

APPLICATIONS

Traditional Applications - Web services - Multimedia applications - Infrastructure services. **(8)**

TOTAL : 45

TEXT BOOK

1. *Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Morgan Kaufmann, 5th Edition, 2012.*

REFERENCE BOOKS

1. *Larry L Peterson, Bruce S Davis, Computer Networks, 5th Edition, Elsevier, 2012.*
2. *Andrew S. Tanenbaum, David J Wetherall, Computer Networks, 5th Edition, Pearson Education, 2010.*
3. *Behrouz Forouzan, "Introduction to Data communication and networking", Tata McGraw Hill 1998.*
4. *William Stallings, "Data communication", Pearson Education Asia 2004.*

15MSS54 - OBJECT ORIENTED SOFTWARE DEVELOPMENT LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

15MSS48

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Construct Use Case model, which includes Actors(primary and secondary), Usecases (Precondition, Post Condition, Successful and Alternative Scenario)to describe the requirements of a given problem using Requisite Pro*
- *Generate Software Requirements Specification Document to specify the system requirements using Requisite Pro*
- *Design the Analysis Class model that consists of classes/objects and their basic attributes, methods and relationships among them by realizing the usecases using Rational Rose.*
- *Design the Structural model as Class Diagrams with refined attributes, methods and relationships of analysis classes/objects to describe the structure of the software system*
- *Design the Behavioral model as Interaction Diagrams with set of objects and the message communications among them to describe the processes of the given system*
- *Evaluate the software system design models(structural and behavioral) by implementing and executing in Java platform*

LABORATORY PROBLEMS TO COVER THE FOLLOWING :

1. Determining the scope of the problem.
2. Requirement Analysis and generating usecase model *
    a. Identifying actors
    b. Identifying usecases
    c. Writing usecase description (detailed usecase)
3. Analysis class/object identification and generating analysis model **
    a. using noun phrase analysis
    b. use case realization(using sequence or collaboration diagram for usecases)
    c. Finding attributes
    d. Performing classification(generalization/specialization)
    e. Relating classes/objects (links, association)

4. Design class model creation **
    a. Finding methods
    b. Refining attributes and associations
    c. Generating behavioral model **
5. Writing JAVA code to implement the above model.

* Using Rational Requisite Pro

** Using Rational Rose

15MSS55 - NETWORK PROGRAMMING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

15MSS16

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Develop and implement TCP based distributed applications using Socket API for a given set of requirements*
- *Develop and implement UDP based distributed applications using Socket API for a given set of requirements*
- *Develop network debug tools such as ping, trace-route etc using SOCK_PACKET and SOCK_RAW options*
- *Demonstrate the functioning of the various network protocols using ns2 simulation tool.*
- *Develop new simple protocols for given requirements and demonstrate its working using ns2*

THE STUDENTS MUST BE TRAINED TO DEVELOP

1. TCP and UDP applications by exploiting Socket API - concurrent and iterative
2. Applications making use of the various socket options
3. Debugging and maintenance tools with the help of RAW sockets and SOCK_PACKET
4. Programs using SIGALRM, SO_RCVTTIMEO, non-blocking sockets
5. I/O multiplexing
6. Simple scenarios using NS-2 and study the operation of various Internet work protocols

15MSS61 - SOFTWARE ARCHITECTURE

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS35, 15MSS52

ASSESSMENT : THEORY

COURSE OUTCOME

- *Describe the need for creating the decomposition, process and allocation architectural views of the software systems*
- *Choose the patterns for designing the architecture of the software system based on the type of the system*
- *Design the architecture of the system using attribute driven technique.*
- *Evaluate the correctness of the software system architecture using ATAM method*
- *Specify the architecture of the system using z-notation*

INTRODUCTION TO SOFTWARE ARCHITECTURE

Software Architecture Definition and Needs - Architectural Patterns - Reference Models - Reference Architecture - Architectural Structures and Views **(8)**

ARCHITECTURAL PATTERNS

From Mud to Structure: Layers, Pipes and Filters and Object-Oriented- Database Systems: Blackboard- Distributed Systems: Broker - Interactive Systems: Model View Controller and Presentation Abstraction Control - Adaptive Systems: Microkernel and Reflection- Case Studies: Key Word in Context and Instrumentation Software. **(12)**

THE ARCHITECTURAL BUSINESS CYCLE

Creating an Architecture-Understanding Quality Attributes - Achieving Qualities - Designing the Architecture **(10)**

ARCHITECTURE DOCUMENTATION AND EVALUATION

Documenting Architectures - Analyzing Architectures: ATAM - Software Product Lines - Case Study in Product Line Development. **(8)**

FORMAL SPECIFICATION

The Value of Architectural Formalism - Introduction to z-notation - Formalizing the Architecture of a Specific System - Formalizing the Architectural Style. **(7)**

TOTAL : 45 + 15 = 60

TEXT BOOKS

1. *Frank Buschmann, RegineMeunier, Hans Rohnex, Peter Sommerland and Michael Stal, "Pattern - Oriented Software Architecture - A Systems of Patterns Volume - I", (Reprint 2010) (Para - II)*
2. *Mary Shaw and David Garlan, "Software Architecture - Perspectives on an Emerging Discipline", PHI,1996 (Para V)*
3. *Len Bass, Paul Clements and Rick Kazman, "Software Architecture in Practice", 2nd Edition, Pearson Education, First Indian Reprint, 2003. (Para I, III & IV)*

15MSS62 - MOBILE COMPUTING

L	T	P	C
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PRE-REQUISITES

15MSS53

ASSESSMENT : THEORY

COURSE OUTCOME

- *Identify the basic problems, limitations, and strengths of various wireless technologies*
- *Differentiate the roles of the protocols at various layers of WLAN protocol stack from that of wired LAN stack*
- *Illustrate the roles of the protocols and architectural components employed in cellular networks.*
- *Justify the need to modify the existing Internet and Transport layer protocols to support mobility*
- *Identify the challenges in developing mobile application for a given set of requirements*

INTRODUCTION

Vision of Next generation Mobile computing - Challenges.

Layer 1 and 2

Wireless Communication : Frequency Spectrum - Signal propagation - Modulation - Multiplexing - Spread Spectrum

Medium Access Control: Motivation for a specialized MAC - Accessing the medium: SDMA - FDMA - TDMA- CDMA **(9)**

WIRELESS TECHNOLOGIES

GSM : Services - architecture - radio interface - Protocols - Localization - Handover - Security - Data Services - 3G Cellular System: UMTS **(9)**

WIRELESS LAN TECHNOLOGIES

Infrastructure and ad-hoc networks - IEEE 802.11: Architecture - Physical Layer - MAC layer - MAC Management - Newer developments- Security in wireless LAN.

Bluetooth : Architecture - Protocols - Security. **(9)**

HIGHER LAYERS

Mobile Network Layer : Mobile IP - Dynamic host configuration Protocol - Mobile ad-hoc networks - ad-hoc network security.

Mobile Transport Layer : Traditional TCP -Classical TCP Improvements to support mobility- TCP over 2.5G/3G wireless Networks **(9)**

MOBILE APPLICATION DEVELOPMENT

Mobile hardware - Software Platforms - Comparison of software platforms - mobile development supporting tools

Mobile Application Challenges: Location Aware mobile computing - Mobile Messaging **(9)**

TOTAL : 45

TEXT BOOKS

1. *Jochen Schiller, "Mobile Communications", Addison-Wesley, 2004.*
2. *Pei Zheng and Lionel Ni, "Smart Phone and Next Generation Mobile Computing", Elsevier Inc, 2006. (para 5).*

REFERENCE BOOKS

1. *Asoke K Talukder and Roopa R Yavagal, "Mobile computing: technology, applications, and service creation", Tata McGraw Hill, 2005.*
2. *Raj Kamal, Mobile Computing, Oxford university press, 2nd edition, 2012.*

15MSS63 - SOFTWARE TESTING AND QUALITY ASSURANCE

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS35

ASSESSMENT : THEORY

COURSE OUTCOME

- *Analyze different approaches to test software, and select applicable techniques for different situations and projects.*
- *Design test plans, create test procedures and define criteria for adequacy.*
- *Apply black box and white box testing techniques at various testing levels for given requirements.*
- *Examine standards, models and techniques aimed at achieving quality in different software development environments.*
- *Prepare a software quality plan for a software project considering process evaluation models including issues related to change management, configuration management, validation and verification and measurement.*

INTRODUCTION

The Role of Process in Software Quality - Testing as a Process - Overview of the Testing Maturity Model (TMM)-Basic definitions-Software Testing Principles-Origin of Defects-Defect Classes, the Defect Repository ad Test Design - Defect examples: the coin problem. **(8)**

TESTING STRATEGIES

Test case design strategies-Black Box Approach-Random Testing - Equivalence Class Partitioning-Boundary Value Analysis-Cause and Effect Graphing-State Transition Testing - Error Guessing - White Box Approach-Test Adequacy Criteria-Coverage and Control Flow Graphs-Covering Code Logic-Data Flow and White Box Test Design-Loop Testing-Mutation Testing. **(10)**

LEVELS OF TESTING

Unit Test: Functions, Procedures, Classes and Methods as Units-Unit Test Planning - Designing the Unit Tests - The Class as a Testable Unit - The Test Harness - Integration Test: Goal - Integration Strategies for Procedures and Functions - Integration Strategies for Classes - Designing Integration Test. **(10)**

SYSTEM TEST AND TESTING ARTIFACTS

System Test- The Different Types-Regression Testing -Alpha, Beta and Acceptance Tests-Test Planning - Test Plan Components-Test Plan Attachments- Reporting Test Results **(9)**

SOFTWARE QUALITY

Defining Quality-Importance of Quality- Quality Assurance at each Phase of SDLC-Managing Software Quality in an Organization-Quality Management System-Product Quality and Process Quality **(8)**

TOTAL : 45

TEXT BOOKS

1. *Ilene Burnstein, "Practical Software Testing", Springer International Edition, First Indian reprint, 2004. (para 1, para 2, para 3 and para 4)*
2. *Nina S Godbole "Software quality Assurance, Principles and Practice", Narosa Publishing House,2004 (para 5)*

REFERENCE BOOKS

1. *C.Jorgensen,"Software Testing-A Craftman'sApproach",CRC press,1995.*
2. *Boris Beizer,VanNostrandReinhold."Software Testing Techniques", 2ndEdition, 1990.*
3. *GlenfordJ.Myers,"The Art of Software Testing", Wiley, 3rd edition, 2011.*

15MSS64 - MOBILE APPLICATION DEVELOPMENT LABORATORY

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PRE-REQUISITES

15MSS22

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Use the concept and functionalities of scripting language.*
- *Apply mobile application models/architectures and patterns to the development of a mobile application*
- *Design and develop sophisticated mobile user Interfaces for the Android platform.*
- *Develop mobile applications for the Android operating system that use basic and advanced mobile features*
- *Demonstrate the application to handheld devices.*

Students must be trained for

HTML5

Creation of fully functional HTML5 app

Android

Building a basic UI-driven App

Using PhoneGap to package HTML5 apps into native apps

Creating Android services

Applications carrying out data management with SQLite3

Basic Networking using WebKit

Image manipulation

Proximity and Location services (Android NFC, Bluetooth, Google Maps)

15MSS65 - SOFTWARE TESTING LABORATORY

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PRE-REQUISITES

15MSS35

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Analyze given requirements, identify suitable testing techniques and develop test cases and test data for testing.*
- *Given requirements and executable code, write test cases in JUnit, execute test cases and interpret results.*
- *Given a business need, use Rational Suite to develop requirements, UML design and develop test related artifacts applicable across the SDLC.*
- *Design and develop test cases using Selenium for web based testing.*

INTRODUCTION AND PROJECT DEFINITION

Introduction of tools used in the lab-Discussion on various projects and learn to write problem definition.

SOFTWARE REQUIREMENT SPECIFICATION

Learn how to write requirements and specifications-Gain exposure to requirements management using Requisite pro.

RATIONAL SUITE

Benefits of using Rational suite-Rational Administrator-Rational Test Manager-Rational Clear Quest-Rational Pure Coverage-Rational Purify-Rational Requisite pro-Rational Robot.

WIN RUNNER

Identifying GUI objects-Spying on GUI Objects-choosing GUI Map mode-The GUI Map File per Test Mode-The Global GUI Map File Mode-Creating Data Driven Test-Creating Batch Test-Running the test-Analyzing test results-Recording the test-Synchronizing the test-Running the synchronized test .

Open source testing software to be used.

Tools : J Unit, Selenium

15MSS81 - SOFTWARE PROJECT MANAGEMENT

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PRE-REQUISITES

15MSS35

ASSESSMENT : THEORY

COURSE OUTCOME

- *Demonstrate working knowledge to define scope of project , project objective, estimation of project's size, cost and effort for the successful completion of given software project*
- *Develop project planning activities using Critical path method or Goldratt's critical chain method that accurately forecast project cost, required resources and timeline.*
- *Calculate effort and cost required to complete the given project by choosing from effort estimation technique, function point analysis, wide band Delphi, COCOMO, and effort estimation techniques iterations model based planning , and Cost estimation technique cost factor analysis, activity based cost estimation, cost estimation for iterations based planning.*
- *Given a project examine the categories of risk associated for the project , perform risk analysis and enumerate its related risk management. Examine associated configuration management.*
- *Classify different types of Project monitoring and project control techniques*

INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT

Project initiation management: Define project scope, define project objective, Estimate initial project size, estimate effort and cost, estimate project schedule, create initial project plan, project initiation in iterative model. **(9)**

SOFTWARE PROJECT EFFORT AND COST ESTIMATION

Effort estimation techniques - function point analysis, wide band Delphi, COCOMO, effort estimation for iterations model based planning - Cost estimation: cost factor analysis, activity based cost estimation, cost estimation for iterations based planning, schedule estimation. **(9)**

RISK MANAGEMENT

Causes of risk, risk categories, risk analysis, artifacts of project risk management. Configuration Management : configuration management techniques , artifacts of configuration management **(9)**

PROJECT PLANNING

Project planning fundamentals, project planning techniques - critical path method, Goldratt's critical chain method, planning at project management office **(9)**

PROJECT MONITORING AND CONTROL

Project monitoring, project control techniques, project monitoring and control artifacts, project monitoring and control in iterative model. **(9)**

TOTAL : 45

TEXT BOOKS

1. *Ashfaque Ahmed, "Software Project Management: A process Driven Approach ",CRC Press, 2011. (para 1, para 2 and para 3)*
2. *Andrew Stellman and Jennifer Greene, "Applied Software Project Management", OReilly Media Inc., Indian Reprint, Sep 2010. (para 4, para 5)*

REFERENCE BOOK

1. *"Introduction to Information System Project management", David L. Olson, Mc Graw Hill 2nd, 2003.*

15MSS82 - INTERNET OF THINGS

L	T	P	C
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PRE-REQUISITES

15MSS53, 15MSS62

ASSESSMENT : THEORY

COURSE OUTCOME

- *Recognize the challenges for smart object*
- *Given an application, assess the different IoT technologies that suits the application*
- *Demonstrate knowledge of MAC and routing protocols developed for Low Power and Lossy networks.*
- *Design simple IoT systems comprising sensors, edge devices, wireless network connections and data analytics capabilities.*
- *Demonstrate knowledge of main architectures and paradigms for the Internet of Things*

INTRODUCTION

Smart Objects - Challenges for Smart Objects - IP for Smart Objects: motivation and main challenges - Security for Smart objects - Web services for Smart Objects - Connectivity models for Smart Object Networks - Introduction to the Internet of Things: application scenarios, current solutions. **(9)**

SMART OBJECTS AND LLNS

Hardware and Software - Energy Management - Communication for Smart Objects: IEEE 802.15.4: main features, topologies, addressing and MAC frame format - Low Power and Lossy Networks (LLN): Introduction to 6LoWPAN - 6LoWPAN architecture: simple, extended and ad-hoc networks - 6LoWPAN adaptation layer -Issues in determining IPv6 links in LLNs - IPv6 addressing in 6LoWPAN- 6LoWPAN forwarding: route-over and mesh under approaches - Neighbour Discovery optimizations and extensions to the ND protocol for 6LoWPAN networks. **(11)**

ROUTING IN LOW POWER AND LOSSY NETWORKS

Mesh-under and route-over solutions - Routing Requirements - Routing metrics - The IPv6 Routing Protocol for LLNs (RPL)- Protocol operation - use of destination oriented directed acyclic graphs - DODAG formation - RPL Messages **(9)**

CoAP

Interaction model - Messages and Request/Response Model - Resource observing - Service discovery - Resource discovery - CORE Link Format **(9)**

APPLICATIONS

Smart Cities and Urban automation - Home Automation - Building Automation - Structural Health Monitoring **(7)**

TOTAL : 45

TEXT BOOK

1. *J.-P. Vasseur, A. Dunkels, "Interconnecting Smart Objects with IP: The Next Internet", Morgan Kaufmann, 2010.*

REFERENCE BOOKS

1. *Z. Shelby, C, "Bormann. 6LoWPAN: The Wireless Embedded Internet", Wiley, 2009*
2. *Z. Sahelby, K. Hartke, K. Hartke, "The Constrained Application Protocol (CoAP)", RFC 7252, 2014.*

15MSS83 - INTERNET OF THINGS LABORATORY

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PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *For a given requirement, choose the required sensor and calibrate.*
- *Devise interface circuit for connecting a chosen sensor to Galileo board.*
- *Develop software for Galileo board to interact with the sensor to meet the requirements*
- *Develop software to interact (send/receive data) with Web/Application server located in the Internet*
- *Use data analytics tool to analyze the data collected and present the report to the end user.*

THE STUDENTS MUST BE TRAINED FOR

1. Deploying CoAP servers on motes
2. Developing applications using Galileo board, exploiting all features of the board.

15MSS91 - INFORMATION SECURITY

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PRE-REQUISITES

15MSS33, 15MSS44, 15MSS53

ASSESSMENT : THEORY

COURSE OUTCOME

- *Illustrate the principles of information security and employ them to secure the information.*
- *Identify and prioritize assets and threats to secure the assets in the event of attacks.*
- *Practice professional, and ethical attitude and aware of legal issues in the context of information security.*
- *Choose suitable risk management strategies for the organization's information security requirements.*
- *Discuss policies, standards, models and technologies for the given scenario related to information security.*

INTRODUCTION

Security : Goal, Vulnerabilities, threats, attacks, and controls, Methods of Defense; Cryptography: Terminology and Background, Substitution Ciphers, Transpositions, DES, AES Encryption Algorithms **(7)**

NUMBER THEORY

Number Theory - Modular Arithmetic, Euler's Theorem, Euclid's Algorithm, Prime test, Chinese Remainder Theorem, Discrete Logarithm, Public Key Encryption - RSA Algorithm, Diffie-Hellman Key Exchange, Elliptic Curve Cryptography, Message Authentication Code, Secure Hash Algorithm, Digital Signature Algorithm. **(9)**

PROGRAM SECURITY AND TRUSTED OPERATING SYSTEMS DESIGN

Program Security : Secure Programs, Non-malicious Program Errors, Viruses and Other Malicious Code, Controls against Program Threats

Designing Trusted Operating Systems : Trusted System, Security Policies, Models of Security, Trusted Operating System Design **(7)**

DATABASE AND DATA MINING SECURITY

Security Requirements, Reliability and Integrity, Sensitive data, Inference, Multilevel Databases -Security Issues, Data Mining - Privacy and Sensitivity, Data Correctness and Integrity, Availability **(7)**

SECURITY IN NETWORKS

Threats in networks, Network Security Controls : Encryption: Virtual Private Networks- PKI-SSH -

SSL - IPSec, Content Integrity, Access Controls, Wireless Security, Honeypots, Traffic Flow Security, Firewalls - Intrusion Detection Systems - Secure e-mail. **(8)**

ADMINISTRATION, LEGAL AND ETHICAL ISSUES

Security Planning : Contents of a Security Plan, Risk Analysis

Legal and Ethical Issues : Protecting Programs and Data, Information and the Law, Computer Crime, Case Studies of Ethics **(7)**

TOTAL : 45

TEXT BOOKS

1. *Charles P. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", Fourth Edition, Pearson Education, 2007. (para 3, para 4, para 5 and para 6)*
2. *William Stallings, "Cryptography and Network Security: Principles and Practices", Fifth Edition, Prentice Hall, 2010.(para1 and para2)*

REFERENCE BOOKS

1. *Michael Whitman, Herbert J. Mattord, "Management of Information Security", Third Edition, Course Technology, 2010.*
2. *Matt Bishop, "Introduction to Computer Security", Addison-Wesley, 2004.*
3. *William Stallings, Network Security Essentials, Applications and Standards, 3rd Edition, Pearson Education, 2007.*

15MSS92 - PROFESSIONAL ETHICS

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given a problem scenario, analyse the situation and suggest solutions based on human values like honesty, courage, empathy, character and morality*
- *When presented with a moral dilemma, critically analyse and present solutions using theories of moral autonomy and theories of right action.*
- *Examine a given scenario in the professional life of an Engineer and present a critical note on possible behaviours using professional codes of conduct of Engineers*
- *Engage in informed critical reflection on the nature of professionalism and ethical challenges inherent in professionalism in matters relating to collegiality, loyalty, occupational crime, confidentiality and conflicts of interest*
- *When presented with case on moral issues relating to weapons development or such matters of conflicting interest, critical evaluation of the case using the various professional codes of conduct and present ethical solutions*

HUMAN VALUES

Morals, Values and Ethics - Integrity - Work Ethic - Honesty - Courage -Empathy - Self-Confidence - Character **(8)**

ENGINEERING ETHICS

Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - Consensus and Controversy - Models of Professional Roles - Theories about Right Action - Self-interest - Customs and Religion - uses of ethical theories. Valuing Time - Co-operation - Commitment **(10)**

ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study **(8)**

SAFETY, RESPONSIBILITIES AND RIGHTS

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - Collegiality and Loyalty - Respect for Authority - Collective Bargaining - Confidentiality - Conflicts of Interest - Occupational Crime - Professional Rights - Employee Rights - IPR - Discrimination **(10)**

GLOBAL ISSUES

Multinational corporations - Environmental Ethics - Computer Ethics - Weapons Development - Engineers as Managers-Consulting Engineers-engineers as expert witnesses and advisors -moral leadership - sample code of conduct. **(9)**

TOTAL : 45

TEXT BOOKS

1. *Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York 1996. (para 2,3,4,5)*
2. *M. Govindarajan, S. Natarajan, V. S. Senthilkumar, "Professional Ethics and Human Values", Prentice Hall, 2013. (para 1)*

REFERENCE BOOKS

1. *Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.*
2. *Charles D. Fleddermann, "Engineering Ethics", Pearson Education / Prentice Hall, New Jersey, 2004*
3. *Charles E Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics - Concepts and Cases", Wadsworth Thompson Learning, United States, 2000*
4. *John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.*

15MSS93 - INFORMATION SECURITY LABORATORY

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PRE-REQUISITES

15MSS48

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Determine the security threats, attacks and controls on information resources*
- *Construct symmetric and asymmetric algorithms to preserve confidentiality, integrity and authenticity of information*
- *Demonstrate network security tools including Packet capturing, Port scanning, Firewall, Intrusion detection, Mac Spoofing and full disk encryption*
- *Implement Steganography under various media including text, images and audio*
- *Devise own defensive measures for securing information resources for different enterprises including Government, Industry, Academia and Society*

LIST OF PROGRAMS

1. Implementing Substitution cipher
2. Implementing Transposition cipher
3. Implementing DES, BLOWFISH, AES algorithms
4. Implementing RSA, DIFFIE-HELLMAN key exchange algorithm, ECC algorithm
5. Implementing MAC, SHA, MD5 algorithms
6. Learning to install and work with Packet capturing tool Wireshark
7. Learning to install and work with Port scanning tool Nmap
8. Learning to install and work with Packet filtering firewall Retina
9. Learning to install and work with Intrusion Detection tool Snort
10. Learning to install and work with MAC Spoofing tool Smac
11. Learning to install and work with Disk encryption software TrueCrypt / VeraCrypt
12. Mini project on - Steganography, Visual Cryptography

15MSSE01 - SOFTWARE USER INTERFACE DESIGN

L	T	P	C
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PRE-REQUISITES

15MSS35

ASSESSMENT : THEORY

COURSE OUTCOME

- *Devise the design procedure for both heterogeneous and homogeneous user populations*
- *Choose UI frameworks for both object and task based interfaces as a User- Centred design*
- *Compose models for any scenarios and be able to design from prototypes.*
- *Identify the issues surrounding user-centered design of software applications.*
- *Pronounce themselves as an experienced interface designer.*

Good Interface design - The Gap - Bridge the gap - Bridging user needs to Object Oriented GUI prototype - Introduction - Pervasive Techniques (PANDA) - explicit steps - Mapping task flows to task objects - steps-Mapping task objects to GUI Objects. **(10)**

Gap - Representations in User Centered Design - links among representation - Psychology of the designer - Decision making - Heuristics and Meta heuristics - UI Design. Models and transformations - the essential and user model - the user interface design **(9)**

Light Weight Techniques - design context - Representing top-level concerns, work as objectives - problems and Interruptions - Scenarios - Need for dialogue model. Interaction design - Bridging the gap - Design Context - Bubbling technique **(8)**

Surviving the dangers of UI design - delta method - TSS 2000 case study - Before crossing the gap - Conceptual design - User interface design - after the bridge. Redesign of complex legacy systems - characteristics of projects - Planning the construction of bridge - Laying the foundation - Building - Documenting. **(10)**

Bridge Gap in software development process - the problem - the gap - systematic creativity - interview, using the systematic creativity - bridge the gap - directions. New generation products - examples - exploratory design stage - refinement and analysis stage - design stage - documenting and iterative process. **(8)**

TOTAL : 45

TEXT BOOK

1. *Larry E. Wood, "User Interface Design - Bridging the Gap from User Requirements to Design", CRC Press, First Edition, 1997.*

REFERENCE BOOKS

1. *Allen Cooper, Robert Reimann, "The Essentials of Interaction Design", Willey, Fifth Edition, 2007.*
2. *Jenifer Tidwell, "Designing Interfaces", Second Edition, O'Reilly Media, 2011.*
3. *Steven Hoober, Eric Berkman "Designing Mobile Interfaces" O'Reilly Media, First Edition, 2011.*

15MSSE02 - SOFTWARE LANGUAGE ENGINEERING

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS23, 15MSS32

ASSESSMENT : THEORY

COURSE OUTCOME

- *Conceive the syntax and semantics of control structures and data abstractions for programming languages.*
- *Conceive the features such as un-typed and simply-typed in functional and imperative languages.*
- *Describe the features of Lambda Calculus including type systems.*

Notions of syntax and semantics of programming languages, introduction to operational/natural semantics of functional and imperative languages **(9)**

Data abstractions and control constructs; block-structure and scope, principles of abstraction, qualification and correspondence **(9)**

Parameter passing mechanisms; runtime structure and operating environment; practical and implementation issues in run-time systems and environment **(9)**

Abstracts machines; features of functional and imperative languages; the untyped and simply-typed **(9)**

Lambda calculus, type systems for programming languages including simple types and polymorphism; objects, classes and inheritance in object-oriented languages **(9)**

TOTAL : 45

TEXT BOOK

1. *Michael Scott, Morgan Kaufmann, "Programming Language Pragmatics", 2000*

REFERENCE BOOKS

1. *Friedman, Wand and Haynes, "Essentials of Programming Languages", Prentice-Hall International, 1998*
2. *Tennant, "Principles of Programming Languages", Prentice-Hall International, 1981*

15MSSE03 - ENTERPRISE APPLICATION DEVELOPMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS22, 15MSS45

ASSESSMENT : THEORY

COURSE OUTCOME

- *Describe the role of Component Technologies in developing reusable and easy accessible enterprise application*
- *Develop the client applications (browser / Java client) using J2EE platform by analyzing the requirements of the given system*
- *Design and Develop the web tier components of an enterprise application using Servlet*
- *Construct the application components includes Process and Data components using Enterprise Java Bean Technologies*
- *Integrate the client, web and application components using web 2.0 to generate rich internet applications*

USING J2EE PLATFORM

INTRODUCTION

Challenges of Enterprise Application Development - The Platform for Enterprise Solutions - Enterprise Application Scenario - J2EE platform Technologies: Component Technologies, Platform Roles, Platform Services, Service Technologies, Communication Technologies - Java Database Connectivity Framework- Java Naming and Directory Interface. **(9)**

THE CLIENT TIER AND THE WEB TIER

Client Considerations - Design Issues and Guidelines for Browser Clients - Design Issues and Guidelines for Java Clients.

Web Tier Technologies - Web Tier Application Structure - Web Tier Application Framework Design - Programming Servlets **(10)**

THE ENTERPRISE JAVA BEAN TIER

Business Logic and Business Objects - Enterprise Beans as J2EE Business Objects - Remote and Local Client Views - Entity Beans - Session Beans - Message Driven Beans - Design Guidelines - Portability Guidelines - Programming Enterprise Java Beans. **(10)**

INTEGRATING WITH THE ENTERPRISE INFORMATION SYSTEM TIER

Integration Scenarios - J2EE Integration Technologies - Application Integration Design Approaches - Developing an Integration Layer- Packaging and Deployment: Roles and Tasks - Packaging J2EE Application - Deployment Description - Deployment Tools **(6)**

USING WEB 2.0, USER GENERATED CONTENTS AND RICH INTERNET APPLICATIONS

Introduction to Web 2.0: Web 2.0 Definition - Web 2.0 Versions and Generations - Characteristics and Memes of Web 2.0.

Wikis - Blogs - Communities - Collaborations and Collaborative Technologies.

Practices, Technologies and Frameworks - Content Aggregation, Syndication and Federations using RSS and Atom - Web 2.0 Architecture Case Studies. **(10)**

TOTAL : 45

TEXT BOOKS

1. *Sing.I, Stearns. B, Johnsons. M and The Enterprise Team, "Designing Enterprise Applications with the J2EE Platform", Addison Wesley, Boston, 2002. (Para I, II, III, IV)*
2. *Stephen Asbury and Scott R.Weiner, "Developing Java Enterprise Applications", Wiley Publications, Second Edition, Reprint, 2008. (Para II, III)*
3. *Krishna Sankar and Susan A Bouchard, "Enterprise Web 2.0 Fundamentals", Cisco Press, First Edition, 2009. (Para V)*

15MSSE04 - DATA CENTRIC COMPUTING

L	T	P	C
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PRE-REQUISITES

15MSSPE18, 15MSSE19

ASSESSMENT : THEORY

COURSE OUTCOME

- *Describe large scale distributed systems used for storing and processing massive data and using large-scale computing systems to solve data-intensive real-world problems in scientific and engineering disciplines*
- *Explain the architecture and properties of the computer systems needed to store, search and index massive data*
- *Demostrate the computational models such as MapReduce and High Performance techniques for processing large data sets*
- *Design efficient algorithms for processing massive data in a distributed computing setting and implement analytics on massive data using computational engines*
- *Design the models for load balancing, scheduling and resource allocation computational tasks on large computing clusters*
- *Evaluate the requirements of adequate security in Data-Intensive Computing and protecting the data*

DATA-INTENSIVE COMPUTING - INTRODUCTION

A Challenge for the 21st century - Characterizing Data-Intensive Applications - Anatomy of Data-Intensive Computing Applications **(8)**

DATA-INTENSIVE COMPUTING ARCHITECTURE

Hardware Architectures - Data Management Architecture - Overview of Cloud Computing - Large-scale Data Management Techniques in Cloud Computing Platform - Data-Intensive applications with MapReduce, High Performance Network Architecture for Data-Intensive Computing. **(9)**

DATA-INTENSIVE SOFTWARE SYSTEMS

Architecting Data-Intensive Computing software systems - ECL/HPCC: A unified approach to Big Data - Scalable Storage for Data-Intensive Computing **(9)**

TECHNOLOGIES AND TECHNIQUES

Load Balancing Techniques for Data-Intensive Computing - Parallel Processing, Multiprocessors and Virtualization in Data-Intensive Computing **(9)**

SECURITY IN DATA-INTENSIVE COMPUTING

Security in Data-Intensive Computing systems - Data Security and Privacy in Data-Intensive Computing clusters - Information Security in large scale distributed systems - Privacy and Security requirements of Data-Intensive Computing Clouds **(10)**

TOTAL : 45

TEXT BOOKS

1. *Ian Gorton, Deborah K. Gracio, "Data-Intensive Computing - Architectures, Algorithms and Applications", Cambridge University Press, 2013. (para 1 and para 2)*
2. *BorhoFurht, Armando Escalante, "Handbook of Data-Intensive Computing", Springer.(para 3, para 4 and para 5)*

REFERENCE BOOK

1. *Frederic Magoules, Jie Pan, FeiTeng, "Cloud Computing - Data-Intensive Computing and Scheduling", CRC Press, Taylor & Francis Group .*

15MSSE05 - AGILE PROCESS MODELS

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS35, 15MSS52

ASSESSMENT : THEORY

COURSE OUTCOME

- *Ascertain the need of software development methodologies with agility and self adaptability features for developing the software to meet the user needs.*
- *Compare the practices followed in different agile methodologies and choose the suitable methodology for a given project*
- *Synthesize the various agile methodology practices to produce a methodology for a project*
- *Develop the system by employing test first programming concept using Junit framework.*
- *Develop a simple application using Scrum or XP methodology*

INTRODUCTION TO AGILE DEVELOPMENT

Agile and Self Adapting : The Cooperative Game Principle - Agile Overview-Evolution of Agile Methodologies-Agile outside Software Development **(9)**

AGILE SOFTWARE DEVELOPMENT ECOSYSTEMS (ASDE)

The Scrum Process - Scrum's Contributions - Dynamic Systems Development Method (DSDM) Principles - The DSDM Process - DSDM's Contributions-Crystal Methodology Design Principles - The Crystal Framework - Crystal Method - Crystal's Contributions. **(9)**

The Feature Driven Development(FDD) Process Model - Beyond the FDD process Description - Conceptual Similarities and Differences - FDD's Contributions - Extreme Programming(XP) Basics - XP values and Principles - XP's Contributions - Adaptive Software Development Life Cycle - Leadership-Collaboration Management -ASD's Contributions. **(9)**

DEVELOPING AN ASDE

Articulating Ecosystem - Designing Agile Methodology - The Agile Metamorphosis **(8)**

J UNIT FRAMEWORK

Automatic Tests - Goal -Fixtures-Testing Exceptions - Junit's Implementation - Junit API - Test First Programming - Stub - Other Uses for Tests - Extending Junit - Junit and Ant - Running Junit Standalone - Junit and IDEs. **(10)**

TOTAL : 45

TEXT BOOKS

1. *Alistair Cockburn, "Agile Software Development: The Cooperative Game", Addison-Wesley, Second Edition, 2007. (Para I)*
2. *Jim Highsmith, "Agile Software Development Ecosystems", Addison Wesley, 2002. (Para II, III, IV)*
3. *Kent Beck, "Junit Pocket Guide", O'Reilly Media, First Edition, 2004. (Para V)*

REFERENCE BOOK

1. *Craig Larman, "Agile & Iterative Development - A Manager's Guide", Pearson Education, 2004.*

15MSSE06 - SOFTWARE REQUIREMENTS ENGINEERING

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Demonstrate how prototypes may be used in the RE process.*
- *Analyze of user and system requirements.*
- *Examine how software requirements may be organized in a requirements document.*
- *Describe and develop the activities in the requirements engineering process.*

INTRODUCTION

Importance of Requirements Engineering, Misconceptions, Industrial Challenges, Key Success Factors, Definition, Relationship to Business Processes Characteristics, Requirements and Project Failure, Quality and Metrics. **Requirements Engineering Artifact Modeling:** Re Taxonomy, Artifact Model, Templates, Artifact Model Tailoring, System Life Cycle Process. **Elicting Requirements:** Issues and Problems, Methods, Customer-Specific Business Rules, Managing Customer Relationship, Managing and Planning Elicitation, Cost Estimation, Customer Relationship, Elicitation for Incremental Product Development. **(10)**

REQUIREMENTS MODELING

MDRE, Advantages, Prerequisites, Processes, Elicitation and Analysis Model Heuristics, Determining Model Completeness, Analysis to Design, Model Conversion Heuristics, Design Model Structure, Tooling **(9)**

QUALITY ATTRIBUTE REQUIREMENTS

Integrated Model, Requirements, Selecting Stakeholders, Methods, Testing ASRs, Case Study **(8)**

RE FOR PLATFORMS AND REQUIREMENTS MANAGEMENT

Challenges, Practices, Experiences. **Requirements Management:** Change Management, Routine Activities, Traceability, Measurements and Metrics, Scalability, Requirements Management Process, Measuring Savings, Organizational Issues. **(9)**

REQUIREMENT DRIVEN SYSTEM TESTING AND REQUIREMENTS EVOLUTION

Inputs, Model Based Testing, Testing Performance and Scalability, Requirements, Best Practices

Requirements Evolution Techniques: Prototyping, Practices and Experience. Distributed RE Hazard Analysis and Threat Modeling. **(9)**

TOTAL : 45

TEXT BOOK

1. *Brian Berenbach, Daniel J. Paulish, Juergen Kazmeier, Arnold Rudorfer, "Software and Systems Requirements Engineering in Practice", Tata McGraw Hill Edition, 2009.*

15MSSE07 - SOFTWARE RELIABILITY

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS63

ASSESSMENT : THEORY

COURSE OUTCOME

- *Define the basic concept of software reliability and software reliability model*
- *Describe fault detection and correction approaches*
- *Apply Software Reliability Growth Models in Software Development.*
- *Analyze the design principles for achieving higher reliable software system.*
- *Design the scientific concepts of Software and Hardware Reliability.*

INTRODUCTION

Need and Concepts of Software Reliability, Failure and Faults - Prevention, Removal, Tolerance, Forecast, Dependability Concept- Failure Behaviour, Characteristics, Maintenance Policy, Reliability and Availability Modeling, Reliability Evaluation. **(9)**

SOFTWARE RELIABILITY MODELS

Historical Perspective and Implementation, classification, limitations and issues, Exponential Failure Models - Jelinski moranda model, Poisson, Musa, Exponential models, Weibull Model, Musa(okumoto Model, Bayseian Model - Littlewood verral Model, Phase Based Model **(9)**

PREDICTION ANALYSIS

Model Disagreement and Inaccuracy - Short & Long Term Prediction, Model Accuracy, Analyzing Predictive Accuracy - Outcomes, PLR, U & Y Plot, Errors and Inaccuracy, Recalibration - Detecting Bias, Techniques, Power of Recalibration, Limitations in Present Techniques, Improvements. **(9)**

THE OPERATIONAL PROFILE

Concepts and Development Procedures - Customer Type, User Type, System Mode, Functional and Operational Profile, Test Selection ,Selecting Operations, Regression Test, Special Issues - Indirect Input Variables, Updating, Distributed system, CASE STUDY (Application of DEFINITY & FASTAR, Power Quality Resource System) **(9)**

TESTING FOR RELIABILITY MEASUREMENT

Software Testing - Types, White and Black Box, Operational Profiles - Difficulties, Estimating Reliability, Time/Structure based software reliability - Assumptions, Testing methods, Limits, Starvation, Coverage, Filtering, Microscopic Model of Software Risk. **(9)**

TOTAL : 45

TEXT BOOKS

1. *Patric D. T.O connor, "Practical Reliability Engineering", 4th Edition, John Wesley & sons, 2003.*
2. *John D. Musa, "Software Reliability Engineering", Tata McGraw Hill, 1999.*
3. *Michael Lyu, "Handbook of Software Reliability Engineering", IEEE Computer Society Press, 1996.*

15MSSE08 - OPEN SOURCE SOFTWARE DEVELOPMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Identify the advantage of using open source software in application development*
- *Choose appropriate open source software during different stages of software development life cycle*
- *Modify the existing open source software and customize according to different user requirement.*
- *Assess the viability of using licensed versus open source software in developing solution to real time problems in various domains*
- *Justify the need to have open source community through active participation in open source code development.*

INTRODUCTION

Software source code definition- Open source definition- Examples of open source software products. History of open source software: The Berkeley software distribution-tex-the free software foundation-Linux-Apache-Mozilla-Advocacy groups-FSF and OSI-Project coordinators and hosts-OSS companies. **(9)**

OPEN SOURCE SOFTWARE PROCESS

Framework for analyzing open source software: zachman's framework for IS architecture CATNOE and soft systems method- Deriving an analytical framework for OSS. Qualification to define a software system as open source: defining open source software-categorizing open source software-Specific characteristics of open source software. Transformation: OSS developing process-Taboos and harms in OSS development-OSS development life cycle **(9)**

OSS STAKEHOLDERS AND ENVIRONMENT

Stakeholders : OSS stake holders-OSS developers communities-OSS user communities-OSS commercial organizations-OSS non-commercial organizations. Open source development environment. **(9)**

WORLD VIEW

A framework for classifying OSS motivations-Technological micro level motivations-technological macrolevel motivations-economic macro level motivations-social political micro level motivations **(9)**

OPEN SOURCE LICENSING

Contract and copyright law-Basic principles of copyright law-Contracts and copyright-open source software licensing-Issues with copy rights and patents-Examples: The Apache license V1.1 and V2.0, the academic free license and the Mozilla public license 1.1.Non open source license: Classic proprietary license-Sun community source license-Microsoft shared source Initiative. **(9)**

TOTAL : 45

TEXT BOOKS

1. *Joseph Feller and Brain Filzgerald, "Understanding open source software development", Pearson education limited (Addison Wesley) 1st Edition, 2000. (Para I to IV).*
2. *Andrew M ST Laurent, "Understanding open source and free software licensing", O'Reilly media inc, 1st Edition,2004. (Para V).*

REFERENCE BOOKS

1. *Lawrence E.Rosen, "Open source Licensing: Software Freedom and Intellectual Property, Law", Prentice Hall, 2005.*
2. *Van Lindberg, "Intellectual Property and Open Source: A Practical Guide to Protecting Code, 2008.*

15MSSE09 - GRAPHICS AND MULTIMEDIA TECHNOLOGIES

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Recognize the need for graphical systems*
- *Deduce the primitive graphical operations*
- *Differentiate the various Multimedia file formats*
- *Develop graphical applications with animations*
- *Assess on the latest graphical issues*

INTRODUCTION

Graphics hardware - raster and random scan - display devices - input devices -hard copy devices. Implementation algorithms for graphic primitives - line, poly line, circle, ellipse, curves - attributes - fill Styles **(8)**

TRANSFORMATIONS AND VIEWING

Two dimensional geometric transformations - translation - scaling - rotation - reflection - shearing - composite transformations. Two dimensional viewing - window port, viewport - clipping - point - line - Cohen-Sutherland, Liang-Barsky, Nicholl-Lee-Nicholl. Three-Dimensional Geometric Transformations - Translation - Scaling - Rotation - reflection - shearing - affine transforms **(10)**

COMPUTER ANIMATIONS

Raster methods - double buffering - raster operations - morphing - simulating accelerations - motion specifications - character animations - motion capture - OpenGL animation procedures **(8)**

INTRODUCTION TO MULTIMEDIA

Multimedia Applications - Multimedia Systems Architecture - evolving technologies - defining objects - Compression and Decompression - Binary image compression - Color , gray scale, Still-video images - JPEG compression - video Image Compression **(10)**

FILE FORMATS AND MULTIMEDIA I/O

Flich - text format - TIFF - RIFF - MIDI file formats, JPEG DIB, MPEG, AVI file formats. TWAIN - architecture - setting up new WAVE type. Pen Input, Video image display systems, Print output, Image Scanners, Digital Video and Audio, Video images and animation, Full-Motion video. **(9)**

TOTAL : 45

TEXT BOOKS

1. *Donald D. Hearn, M. Pauline Baker, Warren, "Computer Graphics with Open GL",4th Edition, 2010, Prentice Hall. (para 1, para2 & para3)*
2. *Prabhat K. Andleigh, KiranThakrar "Multimedia Systems Design", Prentice - Hall of India Pvt. Ltd. 2007. (para 4 & para 5)*

REFERENCE BOOKS

1. *James D. Foley, Andries Van Dam, Steven K. Feiner, F. Hughes John, "Computer Graphics Principles and Practices in C", Second Edition, Pearson publications.*
2. *Ralf Steinmetz and KlaraNahrstedt, " Multimedia: Computing, Communications and Applications", 2009, Pearson Educations.*

15MSSE10 - IT INFRASTRUCTURE MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSSPE27, 15MSSPE18

ASSESSMENT : THEORY

COURSE OUTCOME

- *Plan the Strategy to manage the Storage Space for the project*
- *Devise the IT service delivery process based on the customer's requirements*
- *Apply the IT Ethics to handle the privacy and security issues of Software Projects.*

INTRODUCTION

Computing Resources - Information Technology - IT Infrastructure Management. IT Infrastructure: IT Infrastructure Management - Challenges - Design Issues of IT Organizations and IT Infrastructure - Determining Customers' Requirements - IT Systems Management Process - IT Service Management Process - Information Systems Design Process - Patterns of IT Systems Management - IT Infrastructure Library. **(13)**

SERVICE DELIVERY PROCESS

Service Level Management - Financial Management - IT Service Continuity Management - Capacity Management - Availability Management. Service Support Process: Configuration Management - Incident Management - Problem Management - Change Management - Release Management

Storage Management : Backup and Storage - Archive and Retrieve - Disaster Recovery - Space Management - Database and Application Protection - Bare Machine Recovery - Data Retention. **(12)**

SECURITY MANAGEMENT

Computer Security - Internet Security - Physical Security - Identity Management - Access Control Systems - Intrusion Detection

IT Ethics - Intellectual Property - Privacy and Law - Computer Forensics - Ethics and Internet - Cyber Crimes. **(10)**

Emerging Trends in IT: E- Commerce - Electronic Data Interchange - Global System for Mobile

Communications - Bluetooth - Infrared Technology **(10)**

TOTAL : 45

TEXT BOOKS

1. *Phalguni Gupta, Surya Prakash, UmaraniJayaraman, "IT infrastructure and its management", Tata McGraw Hill, Second Print 2010.*
2. *Rich Schiessor, "IT Systems Management", Prentice Hall Professional, January 2010.*

15MSSE11 - BIO-INFORMATICS

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Identify the basic principles and concepts of biology, computer science and mathematics*
- *Classify tools for representing and analyzing sequences similarity and variations in medical science*
- *Choose mechanisms to support effective approaches for producing robust, exportable software that can be widely shared*
- *Analyze knowledge in bioinformatics with database creation, data analysis and modeling*
- *Develop problem-solving skills, including the ability to develop new algorithms and analysis methods.*

INTRODUCTION

System approach in molecular biology, Central dogma of molecular biology, Important definitions, bioinformatics approach, Applications, European molecular biology network - national center for bio technology information **(7)**

CODING

Common health care language, coding techniques - coded and quasi-coded data - Medical vocabulary - industry wide communication standards HL7 - unified medical language system - quality of care paradigms, risk management bioethics **(8)**

PATIENT RECORD MAINTENANCE

Electronic patient record - models or ERP - environmental services - metrics - telemedicine - community networks - telemedicine peripherals and equipment selection - anatomy of video conferencing technology **(8)**

PROTEIN INFORMATION RESOURCES

Biological data basics - primary and secondary data basics - protein pattern data basics - DNA sequences data basics, DNA analysis, Genes structure and DNA sequences - interpretation of EST structures - different approach to EST analysis **(8)**

ALIGNMENT TECHNIQUES

Data base searching, comparison of two sequences - identity and similarity - global and global similarity - global and local alignment, multiple sequence alignment - data basis of multiple alignments - secondary Database. **(7)**

PROBLEM SOLVING IN BIOINFORMATICS

Gnome analysis for DNA sequences, protein sequences, Strategies and options for similarity search, Practical considerations in sequence analysis, Flow chart for protein structure prediction -Illustrations

(7)

TOTAL : 45

TEXT BOOK

1. *Teresa Attwood, David Parry-Smith, "Introduction to Bioinformatics", Pearson Education, New Delhi, 2001.*

REFERENCE BOOKS

1. *Arthur M. Lesk, "Introduction to Bio-Informatics", Oxford Press, New Delhi, 2004.*
2. *Pierre Baldi, Soren Brunak, "Bioinformatics - The Machine Learning Approach", East-West Press, New Delhi, 2003.*
3. *Rastogi.S.C, NamitaMendiratta, ParagRastogi, "Bioinformatics - Concepts, Skills, Applications", CBS Publications & Distributors, New Delhi, 2003.*

15MSSE12 - ACCOUNTING AND FINANCIAL MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given a set of business transactions, prepare books of accounts and verify correctness using trial balance, for any business organization*
- *For a given trial balance, prepare statements of financial accounting to ascertain the profit, for any trading or manufacturing organization*
- *For the given production and cost data, Perform Cost estimation and determine the optimum units of products for a firm using CVP analysis and Marginal Costing Techniques*
- *Prepare Financial statements using ratio analysis, budgeting, working capital management, capital budgeting and budgetary control Techniques and present facts to assist in strategic decision making, given a set of investment options for a business*
- *Develop software solutions to automate a given accounting, costing or financial process, using MS-Excel*

FINANCIAL ACCOUNTING

Introduction - Definition, need, merits, demerits, stakeholders. Principles of financial accounting - concepts, conventions. Types of Accounting - Financial, Cost, Management. Types of Accounts - Principles ofDouble Entry book keeping. Procedure for accounting - Journal - Ledger - Trial Balance **(10)**

FINAL ACCOUNTS

Final Accounts - method of preparation - Manufacturing/Trading Account - Profit and Loss Account - Balance sheet format - classification of Assets and Liabilities. Final accounts - without and with adjustments-adjustments for provision. Depreciation - theory - methods of calculating depreciation. **(8)**

COSTING AND ANALYSIS OF COSTING

Introduction - definition - costing methods - techniques - Classification of costs - Cost curves - Cost sheet analysis - statement of cost - specimen format. Marginal costing and Cost Volume Profit Analysis - meaning - objectives - marginal cost equation - contribution - break even point - break even chart - P/V Ratio - Margin of Safety - Combined break even point - Cash break even point. **(8)**

BUDGETING AND BUDGETARY CONTROL

Definition - Essentials - difference between budgeting and forecasting.Budgetary Control - objectives - scope - requisites for effective Budgetary Control.Organization for budgetary control - Budget officer -

Budget chart - Budget Committee - Budget Manual - Budget Period - advantages - limitations. Basis of classification of budgets. Functional Budgets - material purchase, labour, Overhead, flexible overhead rate budget, fixed overhead budgets, production and production cost, sales budget, cash budget, budget ratios. **(8)**

FINANCIAL STATEMENTS ANALYSIS AND INTERPRETATION

Financial statements - nature - objective - limitations. Methods and Analysis of Financial Statements - Ratio analysis - Profitability ratios - turnover ratios - Liquidity ratios - leverage ratios - Working capital Management - theory - Capital Budgeting - Methods of Investment Decision - ARR - pay-back period -IRR - NPV. **(11)**

TOTAL : 45

TEXT BOOK

1. *Dr. S.N. Maheshwari, "Principles of Management Accounting Vol I and II", S. Chand & Company Ltd, Seventeenth Revised Edition 2012.*

REFERENCE BOOKS

1. *I M Pandey "Financial Management", 10th Edition Vikas Publishing House Pvt. Ltd.*
2. *Sharma R K, Shashi K Gutpa, "Management Accounting and Financial Management", Kalyani Publishers, 1996.*

15MSSE13 - GEOGRAPHIC INFORMATION SYSTEM

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Differentiate the concepts of geographic information systems from other types of information systems*
- *Use modern industry-standard GIS software for conducting basic GIS analysis and producing cartographic output*
- *Apply GIS analysis to address geospatial problems*
- *Apply mathematical concepts, including statistical methods, to data to be used in geospatial analysis*

INTRODUCTION

Systems, Sciences and Society - Applications **(9)**

PRINCIPLES

Nature of Geographic Data - Representing Geography - Geo referencing - Uncertainty - The GeoWeb **(9)**

TECHNIQUES

GI System software - Geographic modeling - GIS Data collection - Creating and maintaining Geographic databases- Geo Web **(9)**

ANALYSIS

Cartography and Map Production - Geovisualization - Spatial Data Analysis - Spatial Analysis and Inference- Spatial Modeling with GI System **(9)**

MANAGEMENT AND POLICY

Managing GI Systems - Information and Decision making - The Risks **(9)**

TOTAL : 45

TEXT BOOK

1. *Longley, P.A., Goodchild, M.F., Maguire, D.J., and Rhind, D.W., "Geographic Information Systems and Science", New York, John Wiley & Sons, 2015.*

REFERENCE BOOK

1. *Gorr and Kurland, "GIS Tutorial: Basic Workbook 1", ESRI Press, 2011.*

15MSSE14 - DESIGN THINKING

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS35

ASSESSMENT : THEORY

COURSE OUTCOME

- *Analyze and determine the drivers and target groups of the given problem*
- *Generate an idea for addressing the issues based on the problem study*
- *Design and Present the creative ideas in an understandable way using appropriate methods*
- *Modify the generated ideas based on thinking in visual forms*
- *Develop the prototype for the generated idea and implement it using appropriate techniques*

OVERVIEW OF DESIGN PROCESS

Stages of thinking: The design process - Define - Research - Ideate - Prototype - Select-Implement-Learn - Example project. Research-Identifying drivers - Information gathering - Target groups - Samples and Feedback **(10)**

IDEA GENERATION

Basic design directions- Themes of thinking - Inspiration and references-Brainstorming -Value - Inclusion - Sketching -Presenting ideas **(12)**

REFINEMENT

Thinking in images - Thinking in signs - Appropriation - Humour - Personification - Visual metaphors - Modification - Thinking in words - Words and language - Thinking in shapes - Thinking in proportions - Thinking in color **(12)**

PROTOTYPING AND IMPLEMENTATION

Prototyping: Developing of designs - Types of prototype - Vocabulary. Implementation: Format - Materials-Finishing - Media-Scale - Series. **(11)**

TOTAL : 45

TEXT BOOK

1. *Gavin Ambrose and Paul Haris, "Basic Design 08 Design Thinking", AVA Publishing, 2010.*

15MSSE15 - BUSINESS PROCESS MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Discover the processes associated with the given business problem*
- *Analyze the business process and identify the issues of the process.*
- *Design the business process by applying the necessary changes.*
- *Develop the IT solution to automate the business process*
- *Infer Business Process Management as a cross-disciplinary field, striking a balance between business management and IT aspects*

INTRODUCTION TO BUSINESS PROCESS MANAGEMENT (BPM)

Business Process Definition - Origin and History of BPM - The BPM Lifecycle **(7)**

PROCESS IDENTIFICATION AND MODELING

Focusing on Key Processes - Designing a Process Architecture - BPMN Initiation - Branching and Merging - Information Artifacts - Resources. **(9)**

ADVANCED PROCESS MODELING

Process Decomposition - Process Reuse - Rework and Repetition - Handling Events - Handling Exceptions - Processes and Business Rules. **(10)**

PROCESS DISCOVERY

The Setting of Process Discovery - Discovery Methods - Process Modeling Method - Process Model Quality Assurance. **(9)**

PROCESS ANALYSIS AND REDESIGN

Qualitative Process Analysis: Value-Added Analysis - Root Cause Analysis - Issue Documentation and Impact Assessment. Quantitative Process Analysis: Performance Measures - Flow Analysis - Queues - Simulation. Redesign: Definition and Need - Heuristic Process Redesign - The Case of a Health Care Institution - Product-Based Design. **(10)**

TOTAL : 45

TEXT BOOK

1. *Marlon Dumas, Marcello La Rosa, Jan Mendling and Hajo A. Reijers, "Fundamentals of Business Process Management", Springer-Verlag Publication, 2013.*

REFERENCE BOOK

1. *Forrest W. Breyfogle III, " The Business Process Management Guidebook: An Integrated Enterprise Excellence BPM System", Citius Publishing, 2013.*

15MSSE16 - HUMAN RESOURCE MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *State the foundations of Human Resource Management*
- *Explain the various techniques of Human Resource Management*
- *Discuss the problems in organizations in managing people*
- *Give examples:-- Give example case studies of organizations facing issues on Human Resources*
- *Generalize the procedures for best human resource practices*

INTRODUCTION

HRM - definition, features, Model, Objectives, Importance, System Approach. History - Origin and growth of personnel functions in India - factors impeding the growth of HR Management - Role of HR professional - Future HTM in India. **(6)**

PLANNING, RECRUITMENT AND TRAINING

Need for HR planning, - Integrated strategic vs HR planning - significance - nature - planning at different levels - process - limitations - guideline for making planning effective - responsibilities - HRIS - HR forecast. Recruitment - definition, sources, policy. Selection - definition, steps in selection procedure - interview process. Training - meaning and purpose, importance - benefits to - organization, employees - types of training. Executive development - need, importance, objective, methods. **(10)**

PERFORMANCE

Appraisal - definition, objectives, use, purpose, process and essentials of good appraisal system. Methods or techniques of Performance Appraisal. Post appraisal analysis. Counselling and monitoring - definition, characteristics, need, causes, functions - mentoring. Motivation - nature, importance, types. Requirements for a sound motivation system. Morale - wage incentive schemes. **(10)**

INFORMATION SYSTEM AND AUDITING

HR Records - objective, significance, purpose. Essentials of Good HR Record. Fundamental principles of record keeping. Essentials of good report. Human Resource Information System - information needs in HRM - objectives - Personnel inventory. Definition of HR accounting - objectives - methods of HR valuation - Human capital reporting - controlling costs. **(9)**

RESEARCH AND POLICIES

Personnel Research - Meaning and Characteristics - objectives - techniques and tools.

Developing HR policies - Factors influencing HR Policies - Essential Characteristics of Sound HR Policies - principles and types. Employee welfare - Employee Discipline - grievances handling - Collective Bargaining. Current Issues and Trends in HRM. **(10)**

TOTAL : 45

TEXT BOOK

1. *P.G Aquinas "Human Resource Management - Principles and Practice" ,Reprint, Vikas Publishing House Pvt. Limited, 2011.*

REFERENCE BOOKS

1. *M N Mishra, "Organizational Behaviour", Vikas Publishing House Pvt. Limited, 2010.*
2. *Alan Price, "Principles of Human Resource Management: An Active Learning Approach", Paperback (June 2000) Blackwell (Oxford).*

15MSSE17 - INTERNETWORKING PROTOCOLS

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS53

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given an inter-network topology configuration, can demonstrate how a packet reaches the destination*
- *Given a protocol of TCP/IP stack, explain how the protocol is used in forwarding the packets across networks.*
- *Given the assigned addresses, able to design an inter-network utilizing the given set fully.*
- *Given a protocol implementation, analyze and identify the possible threats and specify solutions*
- *Given a network topology with internetworking devices, demonstrate how the devices obtain their network configuration*

INTRODUCTION

Architectural Principles - Design and Implementation- The Architecture and Protocols of the TCP/IP Suite. The Internet Address Architecture: Basic IP Address Structure - CIDR and Aggregation - Special-Use Addresses - Unicast Address Assignment- Attacks Involving IP Addresses. **(9)**

LINK LAYER

Ethernet - Full Duplex, Power Save, Auto-negotiation, and 802.1X Flow Control - Bridges and Switches - Wireless LAN- Point-to-Point Protocol - Loopback - tunneling - Attacks on the Link Layer. **(8)**

INTERNET LAYER

Address Resolution Protocol : Operation and frame Format - Internet Protocol: Introduction - IPv4 and IPv6 Headers - IPv6 Extension Headers - IP Forwarding - Mobile IP - Host Processing of IP Datagrams - Attacks Involving IP - System configuration : DHCP and Auto configuration. Internet control Message Protocols: ICMPv4 and ICMPv6 Broadcasting and Local Multicasting. **(9)**

TRANSPORT LAYER

User Datagram Protocol: Header - checksum - UDP and IPv6 - UDPLite - Translating UDP/IPv4 and UDP/IPv6 Datagrams - Name resolution and Domain Name system. Transmission Control Protocol: Introduction - connection management - TCP Timeout and Retransmission - TCP data flow and window management - classic congestion control algorithms. **(8)**

APPLICATION LAYER

HTTP - DNS - E Mails - SNMP **(11)**

TOTAL : 45

TEXT BOOKS

1. *Kevin R. Fall, W. Richard Stevens, "TCP/IP Illustrated, Volume 1", Pearson Education, 2nd edition, 2012.*
2. *James F Kurose, "Computer networking: A top-down approach Featuring the Internet", 3rd edition, Pearson Education, 2006*

REFERENCE BOOKS

1. *Behrouz A. Forouzan, "TCP/IP Protocol Suite", Tata McGRAW-HILL edition, 4th edition, 2009*
2. *Ed Tittel, Laura Chappell,Guide to TCP/IP, Cengage Learning, Third Edition 2006.*
3. *Douglas E. Comer, "Internetworking with TCP/IP- Volume One", 6th Edition, Addison-Wesley, 2013.*

15MSSE18 - DISTRIBUTED COMPUTING

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS33, 15MSS45, 15MSS53

ASSESSMENT : THEORY

COURSE OUTCOME

- *Describe the hardware and software concepts needed for distributed system model*
- *Compare Remote Procedure Call and Remote Method Invocation from the perspective of developing distributed applications*
- *Describe the role of the components of distributed Operating System*
- *Explain the concurrency control mechanism for distributed transactions*

INTRODUCTION

Definition, Goals, Hardware Concepts, Software Concepts, The Client-Server Model. **(4)**

COMMUNICATION

Layered Protocols, Remote Procedure Call, Remote Object Invocation - Java RMI - Distributed Objects - The Roles of Client and Server, Remote Method Calls, The RMI Programming Model, Parameters and Return Values in Remote Methods, Remote Method Activation. Message-Oriented Communication, Stream-Oriented Communication. **(12)**

PROCESSES

Threads, Clients, Servers, Code Migration, Software Agents, Naming - Naming Entities, Locating Mobile Entities, Removing Unreferenced Entities **(10)**

SYNCHRONIZATION

Clock Synchronization, Logical Clocks.Distributed Transactions.Consistency and Replication - Introduction, Distributed Protocols. **(12)**

EXAMPLES OF DISTRIBUTED SYSTEMS

CORBA, Sun Network File System, Jini. **(7)**

TOTAL : 45

TEXT BOOKS

1. *Distributed Systems - Principles and Paradigms, Andrew S. Tanenbaum, Maarten van Steen, Prentice Hall of India, 2007*
2. *Core Java - Volume II - Advanced Features, Cay S.Horstmann, Gary Cornell, Eighth Edition, Prentice Hall, 2008*

15MSSE19 - SOA AND WEB SERVICES

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS45, 15MSSPE3, 15MSS61

ASSESSMENT : THEORY

COURSE OUTCOME

- *Examine the requirements of distributed applications and design web services*
- *Apply the concepts of Service Oriented Architecture in designing platform independent real time distributed applications*
- *Design and develop simple to complex web services that meet the specified requirements*
- *Develop web services based on requirements of the web application using Java APIs and also consume them in web applications*
- *Determine the security requirements of web services and incorporate them in building web application*

INTRODUCTION TO SOA

Fundamental SOA - Common Characteristics of Contemporary SOA - Evolution of SOA **(7)**

WEB SERVICES AND SOA

The Web Service Framework - Services - Service Descriptions - Messaging - Message Exchange Patterns - Service Activity: Coordination; Atomic Transactions; Business Activities; Orchestration; Choreography. **(10)**

SOA AND SERVICE-ORIENTATION

Anatomy of a Service-Oriented Architecture - Common Principles of Service-Orientation and Their Inter-Relationships - Service Layers **(8)**

BUILDING SOA

Service Oriented Analysis: Introduction, Guidelines - Service Oriented Design: Introduction, WSDL-Related XML Schema Language, WSDL Language Basics, SOAP Language Basics, SOA Composition Guidelines, Service Design Overview, Business Process Design: WS-BPEL Languages Basics, WS-Coordination Overview, Service-Oriented Business Process Design-WS-Security Language Basics. **(10)**

WEB SERVICES IN JAVA

Building Web Services with JAX-WS - Binding between XML Schema and Java Classes - Streaming APIfor XML - SOAP with Attachments API for Java - Generating Client-Support Code from a WSDL - Building RESTful Web Service with JAX-RS. **(10)**

TOTAL : 45

TEXT BOOKS

1. *Thomas Eri, "Service-Oriented Architecture- Concepts, Technology and Design", Pearson Education, Second Edition, 2008*
2. *Eric Jendrock, Jennifer Ball, Debbie Carson, Ian Evans and Kim Haase, "The Java EE5 Tutorial", Oracle Corporation Press, 2010*
3. *Eric Jendrock, Ricardo Cervera-Navarro, Ian Evans, Devika Gollapudi, Kim Haase, William Markito and Chinmayee Srivarthsa, "The Java EE6 Tutorial", Oracle Corporation Press, 2013*
4. *Martin Kalin,"Java Web Services: Up and Running", O'Reily Media Inc., First Edition, 2009.*

15MSSE20 - CLOUD COMPUTING

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS22, 15MSS32, 15MSS33

ASSESSMENT : THEORY

COURSE OUTCOME

- *Choose the technologies required to perform scalable and distributed computing over the Internet.*
- *Recognize the levels and mechanisms of resource virtualization applicable for scalable computing.*
- *Compare the service models offered by different service providers and choose appropriate platform for implementing cloud computing solution considering management, security and trust requirements.*
- *Use suitable programming tools and platform to develop and deploy applications on cloud environment.*
- *Demonstrate the cloud enabling technologies for ubiquitous computing through case studies related to social and professional networking.*

DISTRIBUTED SYSTEM MODELS AND ENABLING TECHNLOGIES

Scalable Computing over the Internet - Technologies for Network-based Systems - System Models for Distributed and Cloud Computing - Software Environments for Distributed Systems and Clouds - Performance, Security, and Energy Efficiency **(9)**

CLUSTERS, VIRTUALIZATION AND DATA CENTERS

Clustering for Massive Parallelism - Computer Clusters and MPP Architectures - Design Principles of Computer Clusters - Implementation Levels of Virtualization - Virtualization Structures/Tools and Mechanisms - Virtualization of CPU, Memory, and I/O Devices - Virtual Clusters and Resource Management **(9)**

CLOUD PLATFORM ARCHITECTURE

Cloud Computing and Service Models - Architectural Design of Compute and Storage Clouds - Public Cloud Platforms: GAE, AWS and Azure - Inter - Cloud Resource Management - Cloud Security and Trust Management **(9)**

SOFTWARE ENVIRONMENTS FOR CLOUD PROGRAMMING

Services and Service-Oriented Architecture - Message Oriented Middleware -Features of Cloud and Grid Platforms - Parallel and Distributed Programming Paradigms - Programming Support of Google AppEngine - Programming on Amazon AWS and Microsoft Azure - Emerging Cloud Software Environments. **(9)**

UBIQUITOUS CLOUDS AND INTERNET OF THINGS

Case Studies: Cloud Trends in Supporting Ubiquitous Computing - Performance of Distributed Systems and the Cloud - Enabling Technologies for the Internet of Things - Innovative Applications of the Internet of Things - Online Social and Professional Networking **(9)**

TOTAL : 45

TEXT BOOK

1. *Kai Hwang, Geoffrey C.Fox, Jack J Dongarra, "Distributed and Cloud Computing", Morgan Kaufmann Publishers, Elsevier, 2012*

REFERENCE BOOKS

1. *Chris Wolf, Erick M. Halter, "Virtualization: From the Desktop to the Enterprise", Apress Series 2005.*
2. *James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005*
3. *Anthony T. Velte, Toby J. Velte, and Robert Elsenpeter, "Cloud Computing - A practical Approach", Tata McGrawHill, 2010*

15MSSE21- PARALLEL COMPUTING

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS32

ASSESSMENT : THEORY

COURSE OUTCOME

- *Describe different parallel architectures; inter-connect networks, programming models, and algorithms for common operations such as matrix-vector multiplication.*
- *Given a problem, develop an efficient parallel algorithm to solve it.*
- *Given a parallel algorithm, analyze its time complexity as a function of the problem size and number of processors*
- *Given a parallel algorithm, an input to it, and the number of processors, show the steps performed by that algorithm on that input.*
- *Given a parallel algorithm, develop message-passing parallel programs with MPI*

PARALLEL COMPUTING : Motivation - Scope

PARALLEL PROGRAMMING PLATFORMS

Implicit Parallelism - Limitations of Memory System Performance - Dichotomy - Physical Organization - Communication Costs - Routing Mechanisms for Interconnection Networks - Impact of Process-Processor Mapping and Mapping Techniques **(9)**

PRINCIPLES OF PARALLEL ALGORITHM DESIGN

Decomposition Techniques - Characteristics of Tasks and Interactions - Mapping Techniques for Load Balancing - Methods for Containing Interaction Overheads - Parallel Algorithm Models **(9)**

BASIC COMMUNICATION OPERATIONS

One-to-All Broadcast and All-to-One Reduction - All-to-All Broadcast and Reduction - All-Reduce and Prefix-Sum Operations - Scatter and Gather - All-to-All Personalized Communication - Circular Shift - Improving the Speed of Communication Operations. **(9)**

ANALYTICAL MODELING OF PARALLEL PROGRAMS

Sources of Overhead - Performance Metrics - Scalability of Parallel Systems - Execution Time and Cost-Optimal Execution Time - Asymptotic Analysis of Parallel Programs - Other Scalability Metrics **(9)**

PROGRAMMING USING THE MESSAGE-PASSING PARADIGM

Principles of Message-Passing Programming - MPI: the Message Passing Interface - Topologies and Embedding - overlapping communication and computation - Collective communication and computation operations. **(9)**

TOTAL : 45

TEXT BOOK

1. *AnanthGrama, Anshul Gupta, George Karypis and Vipin Kumar, "Introduction to Parallel computing", Pearson Education, 2012.*

REFERENCE BOOKS

1. *M.J. Quinn, "Parallel Programming in C with MPI and OpenMP", McGraw-Hill, 1st Edition, 2003.*
2. *Peter S. Pacheco, "An Introduction to Parallel Programming", Morgan Kaufmann, 2011.*

15MSSE22 - SOFTWARE DEFINED NETWORKS

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS53

ASSESSMENT : THEORY

COURSE OUTCOME

- *Explain how historical switching and networks work and the need for SDN*
- *Describe the key benefits of SDN, which are brought by the separation of data and control planes*
- *Describe the working of SDN control plane*
- *Describe the working of SDN Data plane*
- *Describe techniques to enable applications to control the underlying network using SDN*

INTRODUCTION

Basic packet-switching Technology - Modern Data Center - Switch architecture - Need for SDN - Genesis of SDN. **(9)**

CONTROL AND DATA PLANES

Centralized and distributed control and Data planes - OpenFlow - SDN Controllers: General Concepts - Plexxi - CoscoOnePK **(9)**

Network programmability - Data Center concepts and constructs: Multitenant Data Center - virtualized Multitenant data center - SDN solutions for the Data Center Network **(9)**

Network Function virtualization - Network Topology and Topological Information - Building an SDN framework **(9)**

USE CASES

Bandwidth scheduling, Manipulation, and calendaring - Data Center overlays, Big Data, and Network Function Virtualization - Traffic Monitoring, Classification and Triggered actions. **(9)**

TOTAL: 45

TEXT BOOK

1. *Thomas D. Nadeau and Ken Gray, " SDN: Software Defined Networks", 1st Edition, O'Reilly, 2013.*

REFERENCE BOOKS

1. *Paul Goransson and Chuck Black, "Software Defined Networks: A Comprehensive Approach", Morgan Kaufmann, 2014.*
2. *William Stallings, "Foundations of Modern Networking: SDN, NFV, QoE, IoT, and Cloud", Pearson Education, 2016.*

15MSSE23 - AUTONOMIC COMPUTING

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given an autonomous system, can describe how a system adapts itself to dynamic needs*

INTRODUCTION

Software Complexity - Software Development cycle - Maintenance challenges - Autonomic computing - Motivation - Self.* properties and qualities - Benefits, Challenges and Degrees of Autonomy - Similar Initiatives, current status and Relation to Software Engineering -Sources of Inspiration: Influences - Biology - Control System - Artificial Intelligence **(10)**

ARCHITECTURES

Autonomic Elements - Architecture of Autonomic Elements - Autonomic Manager Reference Architecture - Architecture with Multiple Autonomic Elements.

Monitoring Function: Performance Monitoring - Monitoring Overheads - Profiling - Building probes - Examples of Monitoring tools - Monitoring the Monitors. **(12)**

ADAPTATION FUNCTION

Software Adaptation - Code adaptation - OSGi - iPOJO.

Decision Function: Knowledge - Knowledge in Autonomic computing - Model Driven Autonomicity - Reasoning Techniques **(11)**

EVALUATION ISSUES

Evaluation Elements - Evaluation metrics for Emergent System.

Autonomic Mediation in Cilia: Software Integration - Cilia - Autonomic Cilia - Autonomic Life-cycle management of Cilia chains **(12)**

TOTAL : 45

TEXT BOOK

1. *Lalanda, Philippe, McCann, Julie A. and Diaconescu, Ada, "Autonomic Computing: Principles, Design and Implementation", Springer Book Series, 2013.*

REFERENCE BOOKS

1. *Richard Murch, "Autonomic Computing", IBM Press, March 2004.*
2. *Yan Zhang, Laurence Tianruo Yang and Mieso K. Denko, "Autonomic Computing and Networking", Springer Book Series, 2009.*

15MSSE24 - REAL TIME SYSTEMS

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS33, 15MSS44,15MSS53

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given the requirements and timing constraints, develop hard and soft real time systems*
- *Given the requirements and timing constraints, choose appropriate scheduling algorithm to meet the requirements and justify the selection.*
- *For a given set of requirements, develop real-time applications exploiting the features of the given Real-Time operating system.*
- *For a given requirements, compare the real-time communication protocols and choose one to meet the timing constraints.*
- *Re-cast practical design problems into real time task models for the purpose of analysis, evaluation or implementation*

INTRODUCTION

Real-Time Scheduling: characteristics of Real-Time tasks - Task Scheduling - Clock driven - Event-Driven -Rate Monotonic algorithm **(9)**

RESOURCE SHARING AND SCHEDULING

Resource Sharing among Real-Time Tasks - Scheduling Real-Time Tasks in Multiprocessor and Distributed systems: Multiprocessor task allocation - Dynamic allocation of Tasks - Centralized and Distributed Clock synchronization **(9)**

REAL-TIME OPERATING SYSTEMS

Time Services - Feature of RTOS - UNIX as a RTOS - UNIX based RTOS - VxWorks. **(9)**

REAL-TIME COMMUNICATIONS

Real-Time communication in LANs - Soft Real-Time and Hard real-time communication in LANs - Bounded Access Protocols for LANs - Real-Time communication over packet switched Networks - Routing - Resource Reservation - Rate Control - QoS Models. **(9)**

REAL-TIME DATABASES

Example Applications - Real-Time Database Application design issues - Characteristics of Temporal data - Concurrency Control in Real-Time Data bases - Commercial Real-Time Databases **(9)**

TOTAL : 45

TEXT BOOK

1. *Rajib Mall, "Real-Time Systems: Theory and Practice," Pearson, 2008.*

REFERENCE BOOKS

1. *Jane W. Liu, "Real-Time Systems", Pearson Education, 2001.*
2. *Krishna and Shin, "Real-TIme Systems", Tata McGraw Hill. 1999.*

15MSSE25 - ANALYSIS AND DESIGN OF REAL TIME SYSTEMS

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS35

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given a real-time application, can apply real-time extensions to software requirements analysis.*
- *Given the real-time requirements of a system, analyse, design and implement a small scale real-time system*
- *Evaluate the implications of design choices on real time system implementation*
- *Given a real-time solution, can analyze the performance and can optimize the solution*

REQUIREMENTS

Requirements Engineering for Real-Time Systems - Formal Methods in System Specification - Semiformal Methods in System Specification - The Requirements Document. **(9)**

DESIGN

Software Design Approaches - Software Engineering Principles - Procedural Design Approach - Object-Oriented Design Approach - Life Cycle Models. **(9)**

ANALYSIS

Performance Analysis Techniques - Applications of Queuing Theory - Input/ Output Performance - Analysis of Memory Requirements. **(9)**

Metrics - Predictive Cost Modeling - Uncertainty in Real-Time Systems - Design for Fault Tolerance - Software Testing and Systems Integration - Performance Optimization Techniques. **(9)**

CASE STUDY

Software Requirements Specification - Designing Real - Time Software - Future Visions on Real - Time Systems. **(9)**

TOTAL : 45

TEXT BOOK

1. *Phillip Laplante, "Real-Time Systems Design and Analysis", Wiley-IEEE Press, 2012.*

REFERENCE BOOK

1. *Alan C. Shaw, “Real-Time Systems and Software”, Wiley, 2001.*

15MSSE26 - EMBEDDED PROCESSORS

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS32, 15MSS43

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given PIC Microcontroller architecture, describe PIC registers, data format and directives*
- *Develop ALP and embedded C programs using PIC Microcontroller instruction set.*
- *Develop ALP and C programs using appropriate PIC microcontroller timer, counter and serial port*
- *Design embedded software based on timer, external hardware and serial communication interrupts*

PIC MICROCONTROLLER

History and features - Microcontrollers and Embedded processors - Overview of PIC18 family - PIC architecture and Assembly language programming: WREG register - File register - Status register - Data format and directives - program counter and program ROM space - RISC architecture - PIC Assembly programming **(11)**

PIC18 INSTRUCTIONS AND ASSEMBLY LANGUAGE PROGRAMMING

Branch, Call and Time delay loop - PIC I/O Port programming - Arithmetic and Logic instructions - Programs - Bank switching - Table processing - macros - modules. **(9)**

PIC18 PROGRAMMING IN C

Data types and time delays - I/O programming - Logic operations - Data serialization - Program ROM allocation - Data RAM allocation in C18 **(9)**

PIC18 TIMER AND SERIAL PORT PROGRAMMING

Programming timer0, timer1, timer2 and timer3 - counter programming - basics of serial communication - PIC18 serial port programming in assembly and C. **(8)**

PIC18 INTERRUPT PROGRAMMING

PIC18 interrupts - programming timer interrupts - programming external hardware interrupts - programming serial communication interrupts - PortB change interrupt - Interrupt priority in PIC18 **(8)**

TOTAL : 45

TEXT BOOK

1. *Muhammad Ali Mazidi, Rolin D. Mckinlay and Danny Causey "PIC Microcontroller and Embedded Systems using Assembly and C for PIC18", Pearson Prentice Hall, 2008.*

REFERENCE BOOKS

1. *R. Barnett, L O' Cull and S. Fox, "Embedded C Programming and The Microchip PIC", Thomson, 2004.*
2. *Barry B. Brey, "Applying PIC18 Microcontrollers: Architecture, Programming, and Interfacing Using C and Assembly", Prentice Hall, 2007.*
3. *Sid Katzen, "The Essential PIC18 Microcontroller", Springer, 2010.*
4. *Microchip Technology Data Sheet for PIC18.*

15MSSE27 - COMPUTER VISION

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS12

ASSESSMENT : THEORY

COURSE OUTCOME

- *Understand and use the vision technology in conjunction with real world applications*
- *Detecting features, discuss feature correspondences across different images and review image segmentation techniques like Active contours, Split and merge, Mean shift and mode finding*
- *Investigate techniques like shading and focus, merging multiple range or depth images into 3D models, and reconstructing them.*
- *Perform pose estimation, camera's intrinsic calibration, estimate 3D point structure from 2D matches, 3D geometry, camera motion and the motion between two or more images.*
- *Reconstructing the 3D shape of a scene from images taken from different views.*

INTRODUCTION, IMAGE FORMATION AND FILTERING

What is computer vision?, Photometric image formation, The digital camera, Point operators, Linear filtering, neighbourhood operators, Fourier transforms, Pyramids and wavelets. **(9)**

FEATURE DETECTION AND SEGMENTATION

Feature Detection: Points and patches, Edges, Lines.

Segmentation: Active contours, Split and merge, Mean shift and mode finding **(8)**

3D RECONSTRUCTION

Shape from X, Active range finding, Surface representations, Point-based representations, Volumetric representations, Model-based reconstruction, Recovering texture maps and albedos. **(8)**

MOTION ESTIMATION

Feature-based alignment: 2D and 3D feature-based alignment, Pose estimation, Geometric intrinsic calibration.

Structure from motion: Triangulation, frame structure from motion, Factorization, Bundle adjustment, Constrained structure and motion.

Dense motion estimation: Translational alignment, Parametric motion, Spline-based motion, Optical flow, Layered motion. **(12)**

RECOGNITION

Object detection, Face recognition, Instance recognition, Category recognition, Context and scene understanding. **(8)**

TOTAL : 45

TEXT BOOK

1. *Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer-Verlag London Limited 2011.*

REFERENCE BOOKS

1. *Forsyth, D. and Ponce, J, "Computer Vision: a modern approach", Prentic Hall, 2002.*
2. *Rafael C.Gonzalez and Richard E.Woods, "Digital Image Processing", Third Edition, Pearson Education, 2008.*
3. *Rafael C.Gonzalez, Richard E.Woods and Steven L. Eddins, "Digital Image Processing Using MATLAB", First Edition, Pearson Education, 2004.*

15MSSE28 - SENSING AND SENSORS

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given an application, identify the sensors needed to meet the given requirements*
- *Given a sensor, give examples depicting its use to meet a requirement*
- *Given a sensor, determine the calibration points to satisfy the requirements.*
- *Given the sensing requirements, design circuits to interface sensor to the system to meet the requirement*
- *For a given sensor, derive transfer function for the sensor from the specification sheet*

SENSOR CHARACTERISTICS

Introduction - Transfer Function - Calibration - Computation of Stimulus - Static and Dynamic characteristics and errors **(7)**

PHYSICAL PRINCIPLES OF SENSING

Electric Charges, Fields, and Potentials - Magnetism - Induction - Resistance - Piezoelectric Effect - Pyroelectric Effect - Hall Effect - Sound Waves - Temperature and Thermal Properties of Materials - Heat Transfer - Light - Dynamic Models of Sensor Elements **(11)**

INTERFACING SENSORS TO THE SYSTEM

Optical Components of Sensors - Interface Electronic Circuits **(8)**

DYNAMIC CHARACTERISTICS MEASUREMENT

Occupancy and Motion Detectors - Position, Displacement and Level Detectors - Force, Strain and Tactile sensors **(10)**

RADIATION AND CHEMICAL SENSORS

Radiation Detectors: Scintillating Detectors - Ionization Detectors - Cloud and Bubble Chambers - Chemical Sensors: Characteristics - classes - Biochemical sensors - Multisensor arrays - Difficulties **(9)**

TOTAL : 45

TEXT BOOK

1. *Jacob Fraden, "Handbook of Modern Sensors: Physics, Designs, and Applications", 4th Edition, Springer, 2010.*

REFERENCE BOOKS

1. *John Vetelino and Aravind Reghu, "Introduction to Sensors", CRC press, 2011.*
2. *D. Patranabi, "Sensors and Transducers", PHI,2003.*

15MSSE29 - MECHANICS OF ROBOTIC MANIPULATION

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *To understand Velocities, Static force and Singularities*
- *To know about Dynamic Equation-Computational considerations.*
- *To analyze the robotic Force Analysis and Design*
- *To learn the applications Mechatronics and Automation Applications*
- *To evaluate the locomotion strategies in Determining Locations during Locomotion-Motion Control*

MANIPULATOR KINEMATICS

Introduction - Link Description - Link Connection Description - Convention for Affixing Frames to Links - Actuator , Joint and Cartesian Space - Frames with Standard Names - Computational Considerations of Industrial Robot PUMA 560 - Forward and Inverse Kinematics of Manipulators with Velocities , static force and Singularities. **(9)**

MANIPULATOR DYNAMICS

Introduction- Mass Distribution -Newton's Equation -Euler's Equation - Structure of a Manipulator's Dynamic Equation -Computational Considerations. **(8)**

MANIPULATOR CONTROL

Stepper Motor - Principle of Operation - Drive Circuit - Interfacing with a Microprocessor - Drive Mechanisms - Rack and Pinion Movement - Ball Screens - Gear Trains - Harmonic Drive Robot End - Effectors - Introduction - Classification of End Effectors -Drive System for Grippers - Mechanical Grippers -Force Analysis and Design. **(9)**

COMPUTER INTERFACING AND FLEXIBLE AUTOMATION IN MANIPULATION OF ROBOTS

Components - Mechatronics and Automation Applications - Basic Structure of PLC (Programmable Logic Controllers) - Example Loading and Unloading Parts by a Robot -Activity Chart-Modeling Development of Actuators and Sensors using MEMS Technology. **(9)**

ROBOT PROGRAMMING FOR LOCOMOTION

Robot Languages - WAVE and AL, VAL , AML ,MCL, RAIL, HELP,JARS,RPL, Autopass - Classification of Robot Languages -Computer Control and Robot Software - VAL System and Language - Trajectory Control - Monitor Commands - Determining Locations during Locomotion -Motion Control. **(10)**

TOTAL : 45

TEXT BOOKS

1. *S.R. DEB / S. DEB, "Robotics Technology and Flexible Automation" McGraw - Hill Professional, 2nd Edition, 2011.*
2. *John J.Craig," Introduction to Robotics - Mechanics and Control" Pearson, Third Edition, 2013.*

REFERENCE BOOKS

1. *Robert J.Schilling, "FUNDAMENTALS OF ROBOTICS-Analysis & Control" PHI Learning, Indian Edition. 2010.*
2. *Mickell P Groover et al. "INDUSTRIAL ROBOTICS" McGraw Hill Education, Second Edition. 2012.*
3. *Reza N. Jazar, "THEORY OF APPLIED ROBOTICS - Kinematics, Dynamics, and Control" Springer International Edition First Indian Reprint. 2010.*

15MSSE30 - ADVANCED DATABASE CONCEPTS

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS44

ASSESSMENT : THEORY

COURSE OUTCOME

- *Outline the influence of Data Base Systems on the centralized, Client/Server and Parallel and Distributed Computer System Architecture*
- *Apply variety of Parallelization techniques including I/O parallelism, inter query and intra query parallelism, inter operation and intra-operation parallelism.*
- *Analyse the issues of data base design, transaction management, query evaluation and optimization in the context of distributed databases, heterogeneous data base and cloud based data bases.*
- *Construct Object based database, object relational data base, spatial and temporal database*
- *Use XML in exchange and storage of complex data.*

DATABASE-SYSTEM ARCHITECTURES

Centralized and Client -Server Architectures, Server System Architectures, Parallel Systems, Distributed Systems, Network Types.

Parallel Databases : Introduction, I/O Parallelism, Interquery Parallelism, Intraquery Parallelism, Intraoperation Parallelism, Interoperation Parallelism, Query Optimization, Design of Parallel Systems, Parallelism on Multicore Processors

Distributed Databases : Homogeneous and Heterogeneous Databases, Distributed Data Storage, Distributed Transactions, Commit Protocols, Concurrency Control in Distributed Databases, Availability Heterogeneous Distributed Databases, Cloud-Based Databases **(12)**

SPECIALITY DATABASES

Object-Based Databases - Overview, Complex Data Types, Structured Types and Inheritance in SQL,Table Inheritance, Array and Multiset Types in SQL, Object-Identity and Reference Types in SQL,Implementing O-R Features, Persistent Programming Languages, Object-Relational Mapping, Object-Oriented versus Object-Relational **(9)**

XML- Motivation, Structure of XML Data, XML Document Schema, Querying and Transformation,

Application Program Interfaces XML, Storage of XML Data, XML Applications **(5)**

SPATIAL AND TEMPORAL DATA AND MOBILITY

Motivation, Time in Databases, Spatial and Geographic Data Multimedia Databases, Mobility and Personal Databases **(6)**

NoSQL: Why NoSQL?, Aggregate Data Models, More Details on Data Models, Distribution Models, Consistency, Version Stamps, Map-Reduce

Implementation : Key-Value Databases, Document Databases **(13)**

TOTAL : 45

TEXT BOOKS

1. *Abraham Silberschatz, Henry F.Korth and S.Sudarshan, "Database System Concepts", Sixth Edition, McGraw Hill, 2010.*
2. *Pramodkumar J. Sadalage and Martin Fowler. "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison Wesley Professional,1st Edition, 2012.*

REFERENCE BOOK

1. *Ramez Elmasri, Shamkant B. Navathe Durvasula, V.L.N. Somayajulu, Shyam K. Gupta, "Fundamentals of Database Systems", Fourth Edition, Pearson Education, 2006*

15MSSE31 - DATA MINING

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS44

ASSESSMENT : THEORY

COURSE OUTCOME

- *Demonstrate the need for data preprocessing and suggest appropriate methods to produce proper data sources for mining.*
- *Analyze the suitability of design technique to find mining solution with efficient time, cost and memory requirement.*
- *Interpret optimized decisions by employing the mining concepts in business intelligence problems.*
- *Construct a legitimate mining solution with the help of design technique guidelines and validate the suitability of the techniques applied.*
- *Devise efficient managerial decisions based on mathematical models for real time business intelligence applications*

INTRODUCTION

Definition and need of data mining - Kinds of data and patterns - Applications and Issues. Types of data: Data objects and attribute types - Measuring data similarity and dissimilarity. Data Preprocessing: Overview - Data cleaning - Data integration - Data reduction - Data transformation and Data discretization. **(16)**

DATA MINING TECHNIQUES

Mining Frequent Patterns and Associations: Basic concepts - Frequent item set mining methods.

Classification and Prediction: Basic concepts - Decision tree induction - Bayes classification methods. Prediction: Linear and Non-linear regression - Accuracy and error measures.

Cluster Analysis : Basic concepts and methods - Partitioning methods. Hierarchical methods : Agglomerative and Divisive hierarchical clustering and BIRCH. **(10)**

DATA MINING TRENDS

Mining Sequence data - Mining other kinds of data - Visual and Audio data mining - Web mining **(6)**

DATA MINING FOR BUSINESS INTELLIGENCE APPLICATIONS

BI-definition-Effective and timely decisions-data, information and knowledge-role of mathematical models-BI architectures. Applications: Balanced Scorecard, Fraud Detection, Clickstream Mining, Market Segmentation, Retail industry, Telecommunications industry, Banking & Finance and CRM. **(13)**

TOTAL : 45

TEXT BOOKS

1. *Jiawei Han, Micheline Kamber and Jian Pei, "Data Mining - Concepts and Techniques", 3rd Edition, Elsevier Publications, 2012.*
2. *Efraim Turban, Ramesh Sharda, DursunDelen and Janine E. Aronson, "Business Intelligence - A Managerial Approach", 2nd Edition, Pearson Prentice Hall, 2010.*

REFERENCE BOOKS

1. *Arun K Pujari, "Data Mining Techniques", Universities Press.*
2. *Carlo Vercellis, "Business Intelligence: Data mining and Optimization for Decision Making", John Wiley and Sons, 2009.*

15MSSE32 - BIG DATA ANALYTICS

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSSE31, 15MSSE33

ASSESSMENT : THEORY

COURSE OUTCOME

- *Relate the concepts of big data, analytics and their financial value in various business domain*
- *Apply the tools, frameworks and techniques of data streams, predictive analytics and visualization for the given problem*
- *Apply data analysis techniques in given use cases from various business domains.*
- *Construct efficient solutions using mining algorithm guidelines from large volumes of given data.*
- *Create different models using analytics frameworks and tools to gain faster insights.*

INTRODUCTION TO BIG DATA

Analytics - Big data characteristics - Volume, Veracity, Velocity, Variety, Value - Issues - Case for Big data - Big data options. Team challenge - Big data sources - Acquisition - Nuts and Bolts of Big data. Features of Big data - security, compliance, auditing and protection - Evolution of Big data - Best practices for Big data analytics. **(10)**

DATA ANALYSIS

Evolution of analytic scalability - Convergence - Parallel processing systems - Cloud computing -Grid computing - Enterprise analytic sand box - Analytic data sets - Analytic methods -analytic tools - Cognos - Microstrategy - Pentaho. Analysis approaches - Statistical significance -Business approaches - Analytic innovation - Traditional approaches - Iterative approaches. **(9)**

STREAM COMPUTING

Introduction to Streams Concepts - Stream data model and architecture - Stream computing - Sampling data in a stream - Filtering streams - Counting distinct elements in a stream - Estimating moments - Counting oneness in a window - Decaying window. Case studies: Real time sentiment analysis, Stock market predictions. **(9)**

PREDICTIVE ANALYTICS

Predictive analytics - Supervised - Unsupervised learning - Mining Frequent itemsets - Market based model - Apriori algorithm - Handling large data sets in Main memory - Limited pass algorithm - Counting frequent itemsets in a stream - Clustering techniques - Hierarchical - K- Means - Clustering high dimensional data. **(9)**

FRAMEWORKS AND VISUALIZATION

MapReduce - Hadoop, Hive, MapR - Sharding - NoSQL Databases - S3 - Hadoop Distributed File Systems - Visualizations - Visual data analysis techniques - Interaction techniques **(8)**

TOTAL : 45

TEXT BOOKS

1. *Frank J Ohlhorst, "Big Data Analytics: Turning Big Data into Big Money", Wiley and SAS Business Series, 2012.*
2. *Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012.*
3. *Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.*

REFERENCE BOOKS

1. *Jiawei Han, MichelineKamber and Jian Pei, "Data Mining - Concepts and Techniques", 3rd Edition,Elsevier Publications, 2012.*
2. *Michael Minelli, Michelle Chambers and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.*
3. *P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.*
4. *Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.*
5. *E. Capriolo, D. Wampler and J. Rutherglen, "Programming Hive", O'Reilley, 2012.*

15MSSE33 - BUSINESS INTELLIGENCE

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSSE31

ASSESSMENT : THEORY

COURSE OUTCOME

- *Apply Engineering approach to make better business decisions by analyzing risk factors*
- *Devise efficient managerial decisions based on mathematical models for real time business intelligence applications*
- *Develop strategic project planning by analyzing customer requirements in various dimensions with cost and time efficiency.*
- *Differentiate various prototyping models and their applicability for data modeling based on real time requirements and infrastructure.*
- *Specify ETL operations for real time business intelligence projects using tools and analyze the feasibility in terms of strengths and weaknesses.*

BASICS OF BUSINESS INTELLIGENCE

Decision Support Systems : Definition - Representation of the decision making process - Evolution of information systems - Development of DSS. Mathematical models for decision making: Structure - Development of a model - Classes of models. **(10)**

BUSINESS INTELLIGENCE STAGES AND STEPS

BI definition - BI decision support initiatives - Development approaches - Engineering stages and the development steps - Parallel development tracks - BI project team structure.

Business Case Assessment : Justification - Drivers - Business Analysis issues - Risk assessment - Activities - Deliverables - Roles **(9)**

BI PROJECT PLANNING AND REQUIREMENTS DEFINITION

BI project: managing - Defining - Planning - Activities - Deliverables - Roles. Project Requirements Definition: General and specific requirements - Activities - Deliverables - Roles **(8)**

DATA ANALYSIS AND APPLICATION PROTOTYPING

Data Analysis: Business focused data analysis - Top-down logical data modeling - Bottom-up source data analysis - Data cleansing - Activities - Deliverables-Roles.

Prototyping: Purpose - Best practices - Types - Building successful prototypes - Application prototyping Activities - Deliverables - Roles. **(9)**

DATABASE DESIGN AND ETL DESIGN

Differences in database design - Logical and physical database design - Activities - Deliverables - Roles. ETL Design: Implementation strategies - Preparing for ETL process - Designing the extract programs, Transformation programs, Load programs, ETL process flow - Evaluating ETL tools - Activities - Deliverables - Roles. **(9)**

TOTAL : 45

TEXT BOOKS

1. *Carlo Vercellis, "Business Intelligence: Data mining and Optimization for Decision Making", John Wiley and Sons, 2009. (Unit 1)*
2. *Larissa T.Moss and Shaku Atre, "Business Intelligence Roadmap: The Complete project life cycle for decision support applications", Addison Wesley, 2003. (Units II, III, IV & V).*

REFERENCE BOOK

1. *Efraim Turban, Ramesh Sharda, DursunDelen and Janine E. Aronson, "Business Intelligence - A Managerial Approach", 2nd Edition, Pearson Prentice Hall, 2010.*

15MSSE34 - MACHINE LEARNING

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Describe and design the concepts of learning, and the perspectives and issues in machine learning.*
- *Apply the machine learning techniques - Clustering, Induction, Bayesian, Decision Tree, Analytical, Instance based learning and to apply the techniques in computing.*
- *Compare the various machine learning techniques and design issues in machine learning.*
- *Perform evaluation of learning algorithms, model selection, and how to apply a variety of learning algorithms to data.*
- *Development of new machine learning algorithms that learn more accurately, utilize data from dramatically more diverse data sources available over the Internet.*

INTRODUCTION

Designing a learning system - Perspectives and Issues in machine learning - Concept learning task - Concept learning as search - Version spaces - Candidate Elimination learning algorithm - Inductive Bias. **(9)**

DECISION TREE LEARNING

Decision Tree representation - Appropriate Problems for Decision Tree Learning - Basic Decision tree learning algorithm - Hypothesis space search and Inductive Bias in Decision tree learning - Issues in Decision Tree Learning. **(7)**

ANN

Perceptrons - Back propagation Algorithms. Evaluating Hypothesis: Deriving confidence intervals - Hypothesis testing - comparing learning algorithms. **(5)**

BAYESIAN LEARNING

Bayes Theorem and Concept learning - Maximum Likelihood and Least Squared error hypothesis - Maximum Likelihood hypotheses for predicting probabilities - Minimum description Length principle - Bayes optimal classifier - Gibbs algorithm - Naïve Bayes classifier - Bayesian Belief networks -EM algorithm. **(9)**

ANALYTICAL AND COMBINING ANALYTICAL & INDUCTIVE LEARNING

Analytical learning - Explanation based learning - Inductive Analytical approaches to learning - Using prior knowledge to, initialize the hypothesis, alter the search objective and augment search operators. **(6)**

INSTANCE-BASED AND REINFORCEMENT LEARNING

K - nearest neighbour learning -Locally weighted regression - Radial Basis functions - Case based reasoning - Reinforcement learning: Learning task-Q Learning-Q function - Algorithm for learning Q-convergence - updating sequence - Temporal difference learning - Non deterministic rewards and actions. **(9)**

TOTAL : 45

REFERENCE BOOKS

1. *Tom M Mitchell, "Machine Learning", McGraw Hill, 1st Edition, 2003.*
2. *EthemAlpaydin, "Introduction to Machine Learning", MIT Press, 2nd Edition, 2010.*
3. *Stephan Marsland, "Machine Learning - An Algorithmic Perspective", Chapman and Hall, 1st Edition, 2009.*
4. *Nils Nilsson, "Introduction to Machine Learning", MIT Press, 1997.*
5. *Jude Shavil, Thomas G Dietterich, "Readings in Machine Learning", Morgan Kaufmann Publishers, 1990.*

15MSSL01 - SOFTWARE LANGUAGE ENGINEERING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Practice with tools such as LEX for identifying tokens.*
- *Integrate tools such as YACC for parsing.*
- *Experiment the techniques involved in translating high level languages to abstract machine instructions.*

CONCEPTS TO BE COVERED

PROGRAMMING EXERCISES WILL INCLUDE

1. Use of tools for lexical analysis and parsing
2. Representation of abstract syntax
3. Abstract machines for imperative and functional languages
4. Translations from high-level languages to abstract machine instructions
5. Implementation of run-time structures and parameter-passing
6. Type checking and type-inference
7. Term reduction

15MSSL02 - ENTERPRISE APPLICATION DEVELOPMENT LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

15MSSPE3

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Develop the client application using HTML or Java Server Page*
- *Construct web components to process the client request and generate response in online using Java Servlet*
- *Design and Develop reusable business logic using Session EJB framework*
- *Generate persistent entities using Entity EJB frameworks*
- *Construct web feed to improve the user accessibility of the web application using web 2.0 framework*

THE FOLLOWING TO BE PRACTICED IN THE LAB SESSIONS

1. Understand and design the generic business process model of an enterprise.
2. Design and implement online business processing through Servlet components.
3. Develop reusable business logics using Session EJB components.
4. Develop persistent entity objects using Entity EJB components.
5. Improve the business through developing enterprise blogs.
6. Improve the user accessibility of the application by creating web feeds.

15MSSL03 - GRAPHICS AND MULTIMEDIA LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

15MSSPE9

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Examine the efficiency for drawing graphics primitives such as line, circle, ellipse and polygon using DDA, Midpoint and Bresenham's algorithms.*
- *Demonstrate 2D transformations such as translation, scaling, rotation, reflection and shearing for a given application.*
- *Develop an interactive multimedia presentation by using multimedia devices and identify theoretical and practical aspects in designing multimedia applications surrounding the emergence of multimedia technology.*

I Computer Graphics

1. Primitive Algorithms

   Line - Bresenham, DDA, Midpoint. Circle - Midpoint, Trigonometric Ellipse - Midpoint, Trigonometric
2. Polygon, Polygon Filling.
3. Transformations - 2D Translations, Scaling, Rotation

II Multimedia and Animations:

Flash Programming (OR) Maya

1. Creating Layers, Symbol objects, effects for objects
2. Creating scene by combining objects and layers
3. Creating Animations using various technologies
4. Creating Interactive Animation.
5. Adding audio to animations.
6. Creating small animation projects.

15MSSL04 - ACCOUNTING SOFTWARE LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor.

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Employ suitable tool for generating complete accounting statements*
- *Identify the technologies needed to implement accounting practices as a developer.*
- *Create Statements of Financial accounting for a profit organization to ascertain profits.*
- *Develop simple models of decision making techniques like capital budgeting and ratio analysis.*
- *Interpret the results of problems in decision making techniques.*

CONCEPTS TO BE COVERED

1. Creating company profiles and configuring the system for the present assessment year.
2. Creating all basic account groups and accounts relevant to the companies created.
3. Handling transaction processing systems.
4. Design reports as per the conventional formats for each statement.
5. Creating Analysis models for budget, ratio and Capital budgeting.
6. Creating decision support reports on various transaction data and analysis data.
7. Provide statistical analysis for required DSS

15MSSL05 - WEB SERVICES LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

15MSS48

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Demonstrate the use of web service in real time web application development*
- *Design and develop appropriate web services according to the requirements of given web application*
- *Ability to select the right web service component to be used in applications wherever required to reduce development time of the web application*
- *Develop new web service based on the user requirements and consume them in web and mobile applications.*

THE FOLLOWING TO BE PRACTICED IN THE LAB SESSIONS

- Modeling the business services.
- Implement the Service Interface and Service Implementation Classes with Java-ws.
- Write WSDL document to describe services.
- Publish web service in Jav-ws platform.
- Create Java Web Service Client with Java-ws.
- Create and send messages using SOAP Attachment API for Java (SAAJ).
- Accessing the message content and Adding elements to the message using SAAJ.

15MSSL06 - CLOUD COMPUTING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

15MSS33

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Demonstrate knowledge on creating, cloning, migrating virtual machines using VirtualBox, a virtualization tool*
- *For a given system configuration, can use EC2 to acquire instances*
- *Develop an application, launch it on Google App Engine, and access it with proper authentication mechanisms*
- *Construct a private cloud using the open source cloud technologies such as OpenStack/CloudStack/ OpenNebula for a given requirement*
- *For a given requirement, develop application using the simulation tool, CloudSim*

I. VIRTUALIZATION - VIRTUAL BOX

1. Create virtual machines of different configurations
2. Communication between host and virtual machine
3. Communication between virtual machine to virtual machine
4. Show the virtual machine migration from one node to the other.

II. PRIVATE CLOUD

Use Eucalyptus or OpenStack or CloudStack or equivalent to set up the cloud and demonstrate:

1. Find procedure to run the virtual machine of different configuration. Check how many virtual machines can be utilized at particular time.
2. Find procedure to attach virtual block to the virtual machine and check whether it holds the data even after the release of the virtual machine.
3. Install a C compiler in the virtual machine and execute a sample program.
4. Show the virtual machine migration from one node to the other.
5. Find procedure to install storage controller and interact with it.

III. PUBLIC CLOUD

1. Explore Amazon S3 and EC2
2. Create virtual machines in Amazon, run a sample java application on the EC2 instance
3. Communicate between two EC2 instances
4. Run an application in the GoogleAppEngine

IV. SIMULATION TOOL - CLOUDSIM

15MSSL07 - PARALLEL COMPUTING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

15MSS16

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Given a parallel algorithm, develop the system using MPI.*
- *Given a parallel code, analyze its performance, determine computational bottlenecks, and optimize the performance of the code.*
- *Given a parallel code, diagnose the errors and fix them*
- *Given a problem, implement an efficient and correct code to solve it, analyze its performance*
- *Given a network of stations, construct a cluster using Local Area Multicomputer*

Set Up : Building a cluster using Local Area Multicomputer (LAM)

PARALLEL APPLICATIONS EXPLOITING THE FOLLOWING FEATURES OF MPI NEED TO BE GIVEN

1. Inter-process communication in MPI
2. Communication between MPI Processes: Blocking Operation
3. MPI collective operations using synchronization, data movement, collective computation
4. Communication between MPI Processes: Non-Blocking Operation
5. Collective Communication in MPI: Broadcast and Reduce
6. Collective Communication in MPI: Scatter and Gather

15MSSL08 - IMAGE PROCESSING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Develop the basic Knowledge of any Image processing toolbox (Matlab/Scilab) available and perform different basic image operations.*
- *Perform various filtering operations in the image processing toolbox.*
- *Implement different types of edge detection technique on same image and measure the accuracy.*
- *Apply various image transforms and analyse the characteristics of the image.*
- *Apply image processing technique to solve real world problems*

LIST OF EXPERIMENTS

1. Display of Grayscale Images.
2. Histogram Equalization.
3. Filtering in frequency domain.
4. Display of color images.
5. Conversion between color spaces.
6. Non-linear Filtering.
7. Edge detection using Operators.
8. 2-D DFT and DCT.
9. DWT of images.
10. Segmentation using watershed transform.

15MSSL09 - REAL-TIME EMBEDDED SYSTEMS LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

15MSS16

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *To develop programs based on PIC Microcontroller arithmetical and logical instructions*
- *To develop embedded C programs for PIC Microcontroller ROM and RAM using MPLAB*
- *To construct ALP and c programs using PIC microcontroller timer, counter and serial port*
- *To write programs based on timer, external hardware and serial communication interrupts using MPLAB*
- *To write and develop programs for MUCOS RTOS system level, memory level and time delay functions*

CONCEPTS TO BE COVERED

The students must be trained for

1. Using the constructs of MPLAB
2. Writing programs using PIC microcontroller architecture.
3. Using the constructs of µCoS RTOS

15MSSL10 - BUSINESS INTELLIGENCE LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

15MSSE31, 15MSSL11

ASSESSMENT : LABORATORY

COURSE OUTCOME

- *Demonstrate generation of business reports and presentations using BI Tools for the given case studies.*
- *Evaluate data by extracting and Transforming using ETL tools for any given dataset.*
- *Effectively apply data mining techniques in variety of business applications to generate mining solutions.*
- *Design and implement practical business intelligence solution for real time projects.*
- *Outline the role of business analytics within an organization.*

TOPICS TO BE COVERED

1. Construct data warehouse/database and perform Extraction of data using queries, Loading data and apply Transformational techniques using ETL tools.
2. Generating reports using Business Intelligence tools.

15MSSL11 - DATA MINING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

15MSS44

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Employ data cleaning techniques for normalization and standardization of given dataset.*
- *Determine the mining solutions using data mining techniques in real time problems.*
- *Calculate Information Gain measure to select the test attribute in the decision tree.*
- *Find the outliers using various Outlier Detection methods in a given dataset.*
- *Evaluate the accuracy of measures for text retrieval and classification of Web documents.*

PROBLEMS

1. Perform data cleaning techniques for a given data test.
2. Perform Data Normalization using min-max, z-score and normalization by decimal scaling methods.
3. Extract Frequent Item Sets using candidate generation and without using candidate generation.
4. Calculate Information Gain measure to select the test attribute in the decision tree.
5. Perform Decision Tree Induction for a given training data.
6. Develop a model to apply Linear Regression for prediction.
7. Implementing clustering techniques (k-means, k-medoids)
8. Find the outliers using various Outlier Detection method.
9. Evaluation of measures for text retrieval.
10. Classification of Web documents.

Tool : RapidMiner / Wega

15MSSL12 - BIG DATA ANALYTICS LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Operate the tools in hadoop echo system for data analytics reports in real time applications.*
- *Use the R tool for solving big data analytic problems that help to manage good decision making.*
- *Experiment the analytical techniques on variety of Big data application scenarios.*
- *Generate dynamic solutions for data analytics problems using map reduce framework*
- *Set up hadoop clusters and write complex map reduce programs for parallel processing of big data.*

PROBLEMS

€ Using R for implementing the data mining algorithms and techniques.

€ Using R for analyzing the data in various business domains

€ Solving problems in Data Analysis using Hadoop echo system and MapReduce framework

Coimbatore Institute of Technology, COIMBATORE-14

CGC-CLAP CELL OF CIT

Course on AI for Assistive Technology

Duration : 5 Saturdays from 13.08.2022

Report

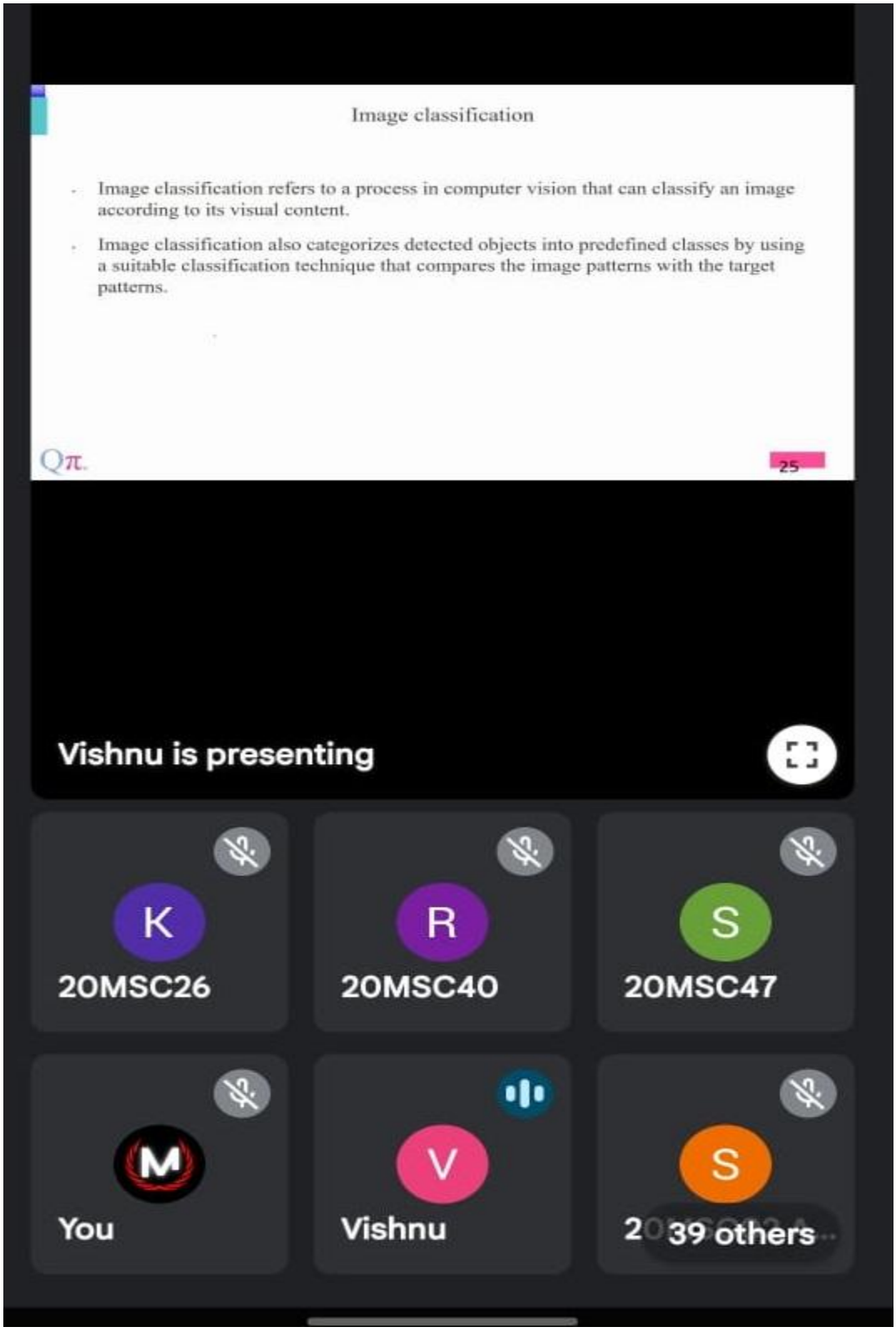
PRE-REQUISITE WEBINAR- DEEP LEARNING COURSE

A webinar on **"Deep Learning"** was held on 13.08.2022 between 11.30 AM to 02.00 PM through the Google Meet Platform**.** To deliver the valuable content on Deep Learning, we had **Mr.Vishnu Karthiklu, ML Lead, QPiCloud, Bangalore as Resource Person**. The speaker started the session by providing insight on the basics of Machine Learning and its types like Regression, Classification etc. He also explained how the Residual Gradient Descent optimization algorithm is used to train machine learning models. The key topics discussed by him were Deep Learning, Convolutional Neural Networks and its layers. Furthermore, the students learned about various architectures of CNN like AlexNet, GoogleNet, VGGNet etc. The webinar had 57 registrations and 45 participants from various departments of the college.

Google Meet Link: https://meet.google.com/bxd-xekk-hsz?pli=1

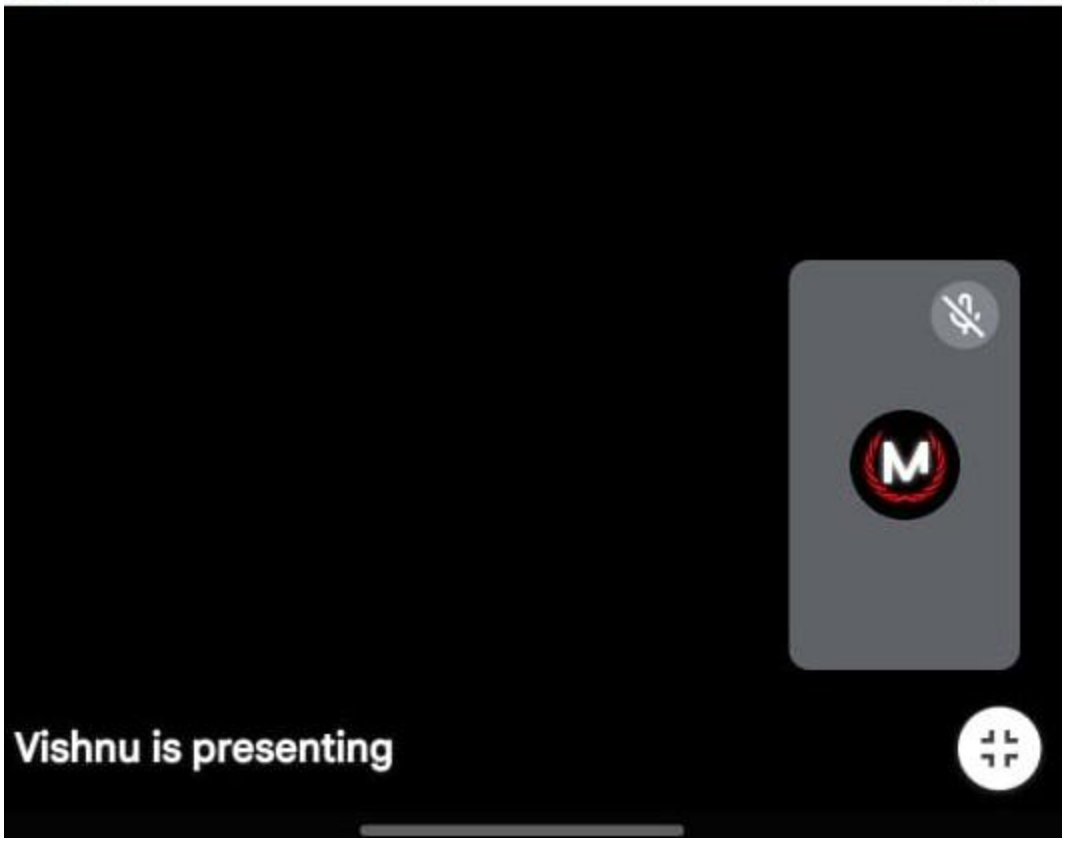
Feedback Form Link:
https://docs.google.com/forms/d/1sUTdivAcATFCCSAU4n2Np0xweUXudUYu1h7nfcBTq48/edit?ts=630308e2

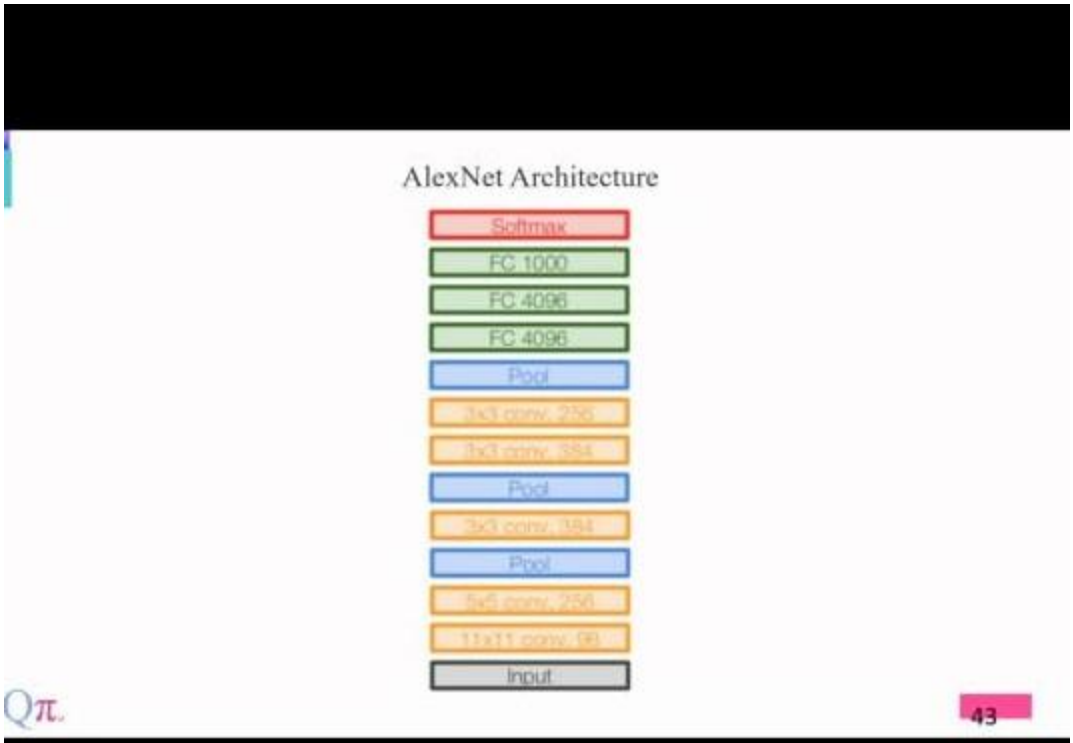
Screenshots of the Session:

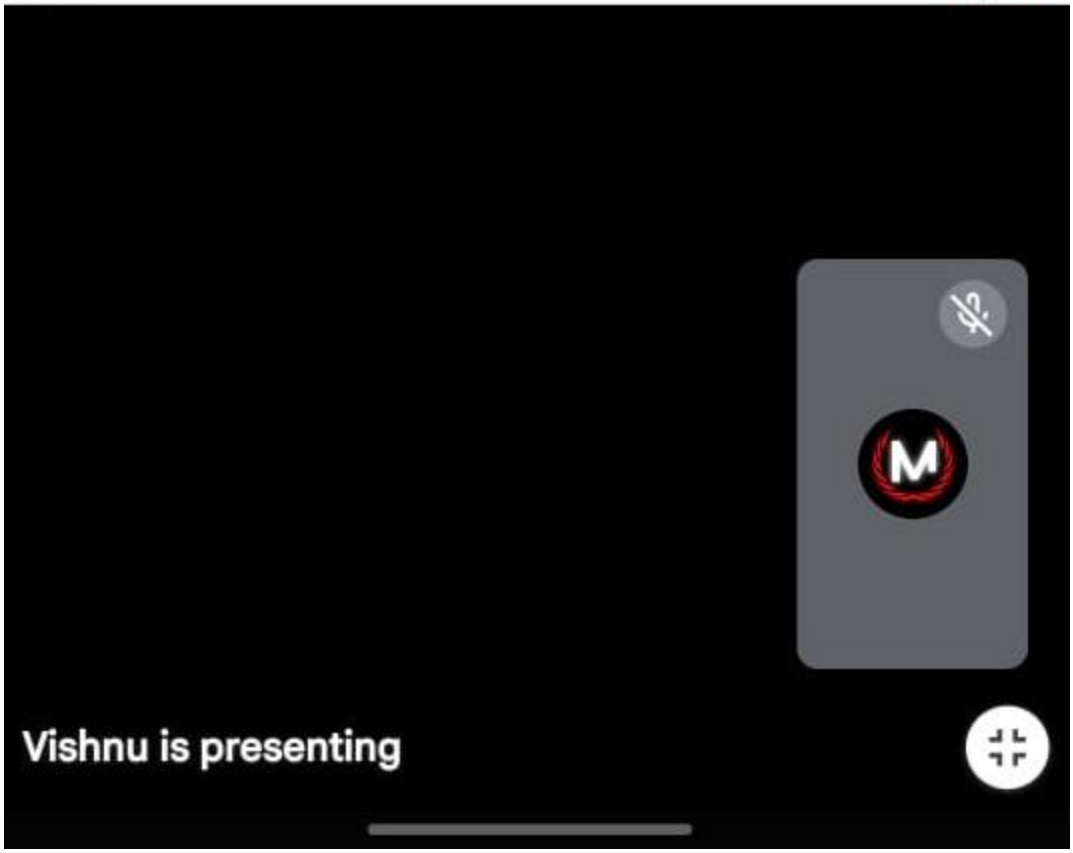


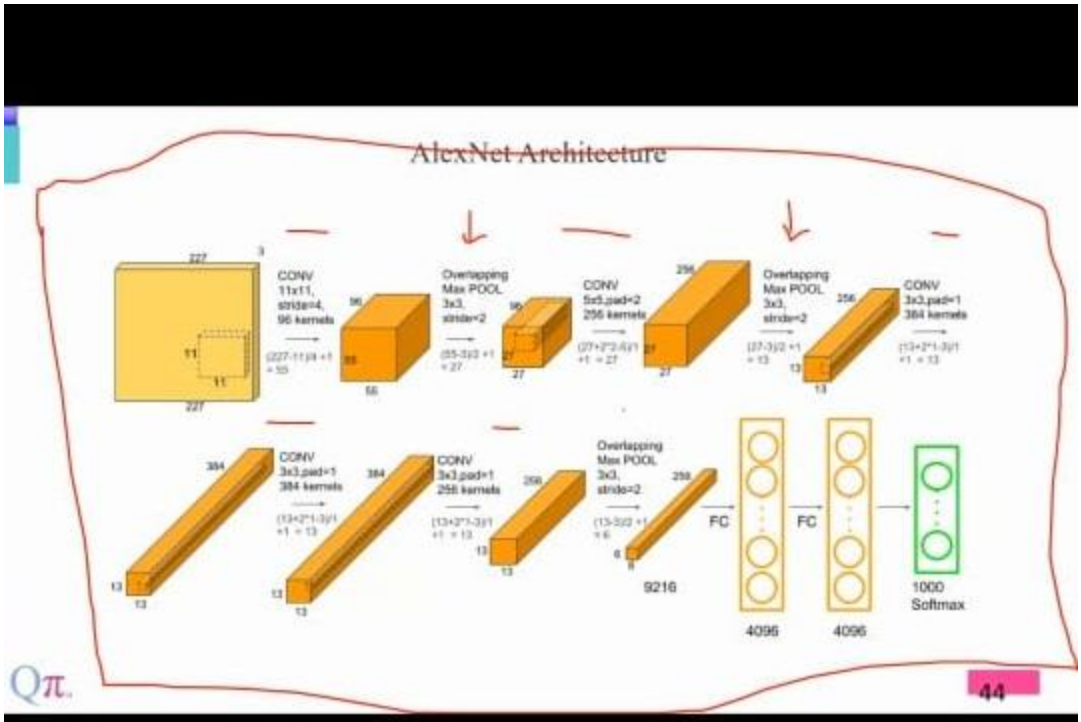
ResNet

- Residual Network (ResNet) is a Convolutional Neural Network (CNN) architecture which was designed to enable hundreds of convolutional layers.
- While previous CNN architectures had a drop off in the effectiveness of additional layers, ResNet can add a large number of layers with strong performance.




AlexNet Architecture
Softmax
FC 1000
FC 4096
FC 4096
Pool
3x3 conv, 256
3x3 conv, 384
Pool
3x3 conv, 384
Pool
5x5 conv, 256
11x11 conv, 96
Input
43


Vishnu is presenting



Vishnu is presenting

GoogLeNet Architecture

Qπ.

48

Vishnu is presenting

Comparison between models

- In every VGG architecture, all filters are of size 3*3 which is fixed.
- The idea here is that, two 3*3 filters almost cover the are of what a 5*5 filter would cover and also two 3*3 filters are cheaper than one 5*5
- Since there is very less number of calculations, VGGnet Outperforms other Complex CNN architecture computationally.

AI for Assistive Technology

The course on **"AI for Assistive Technology"** was designed by DeepVisionTech.AI Pvt Ltd. Bangalore and handled by the founder Mr. Jayasudan M and co-founder Mr. Arul Praveen. The course was held for five Saturdays on 20.08.2022, 27/8/2022, 3/9/2022, 10/9/2022 and 24/9/2022 in Room No. 103, Computing block at CIT campus**.** The detailed day wise report is as follows.

DAY 1: 20/8/2022

The course was inaugurated in the presence of Mr. Jayasudan M, Mr. Arul Praveen and Dr.Valliappan Raman, H.o.D, B.Tech. AI & DS. Introduction about AI and the need for AI in assistive technology was given by Mr.Jayasudan M. He gave a brief explanation on the project "Model to identify whether a person is signing or not", dataset creation and pre-processing. It was followed by Mr. Arul Praveen's session on dataset creation, augmentation and pre-processing using OpenCV.


10 23

DAY 2: 27/8/2022

In this session, Mr. Arul Praveen explained about Deep Learning model training with hyper parameter tuning, performance metrics (accuracy, precision), evaluation (overfitting, underfitting) and validation (tensor board tool for validation), transfer learning with pretrained models and acknowledged with various resources for widening our knowledge in this domain. In the afternoon session, students worked on a model with benchmark datasets provided by the trainer.

DAY 3: 3/9/2022

During this session, students did their model training and evaluation separately and recorded its accuracy and improvised it. An introduction on streamlit was also given. Students were assigned tasks based on detection using absdiff images (no DL model involved) and detection using MediaPipe Pose model in OpenCV.

DAY 4: 10/9/2022

In this session, the trainer gave an introduction to Heroku, and students started the deployment with Streamlit. At the end of this session students created a webpage to detect whether a person is login or sign out from a live stream and its deployment on Heroku.

DAY 5: 24/9/2022

During this session, some of the students took seminars about their model's architecture, then followed by the explanation about Containerization (docker) and its deployment on Cloud.

To conclude, the training was really educational and beneficial to the students community. They had a lot of hands-on practice sessions, which really helped them to grasp the concepts easily.

Valedictory Function

The course concluded with the certificate awarding ceremony on 10.10.2022 at 3 pm in the Seminar hall, IT block. 32 students who registered and attended the classes were given the certificates in the valedictory function. Dr. Valliappan Raman preceded the ceremony by giving the welcome speech. It was followed by special address by Mr. Arul Praveen who enlightened the students with motivational information. He announced three intern awardees who were selected from the group of participants.


AI for Assistive Technology
Certificate Awarding Ceremony


AI for Assistive Technology
Certificate Awarding Ceremony