13. COURSES OF STUDY AND SCHEME OF ASSESSMENT

M Sc SOFTWARE SYSTEMS

(2015 REGULATIONS)
(TOTAL CREDITS TO BE EARNED: 211*)

Course Code	Course Title	Hours/Week			Credits	Maximum marks			CAT
		Lecture	Tutorial	Practical		CA	FE	Total	
I SEMESTER									
15XW11	CALCULUS AND ITS APPLICATIONS	3	2	0	4	50	50	100	BS
15XW12	ENGLISH FOR PROFESSIONAL SKILLS	3	0	0	3	50	50	100	HS
15XW13	MATERIALS SCIENCE	4	0	0	4	50	50	100	BS
15XW14	ANALOG AND DIGITAL ELECTRONICS	4	0	0	4	50	50	100	BS
15XW15	C PROGRAMMING	3	0	0	3	50	50	100	PC
15XW16	ENGINEERING GRAPHICS AND GEOMETRIC MODELING	0	0	4	2	100	-	100	ES
15XW17	C PROGRAMMING LAB	0	0	4	2	100	-	100	PC
15XW18	MATERIAL SCIENCE AND DIGITAL ELECTRONICS LAB	0	0	4	2	100	-	100	BS
15XW29	PERSONALITY AND CHARACTER DEVELOPMENT	0	0	** Refer Sem 2 and footnote					MC
Total 31 hrs		**17**	**2**	**12**	**24**	**550**	**250**	**800**	
II SEMESTER									
15XW21	PROBABILITY AND STATISTICS	3	2	0	4	50	50	100	BS
15XW22	APPLIED LINEAR ALGEBRA	3	2	0	4	50	50	100	BS
15XW23	DATA STRUCTURES AND ALGORITHMS	3	0	0	3	50	50	100	PC
15XW24	OBJECT ORIENTED PROGRAMMING	3	0	0	3	50	50	100	PC
15XW25	COMPUTER ORGANIZATION	3	0	0	3	50	50	100	PC
15XW26	OBJECT COMPUTING LAB	0	0	4	2	100	-	100	PC
15XW27	DATA STRUCTURES LAB	0	0	4	2	100	-	100	PC
15XW28	WEB DESIGNING LAB	0	0	4	2	100	-	100	PC
15XW29	PERSONALITY AND CHARACTER DEVELOPMENT	0	0	** Grade - - -					MC
Total 31 hrs		**15**	**4**	**12**	**23**	**550**	**250**	**800**	

***** Indicated is the minimum number of credits to be earned by a student.
CA – Continuous Assessment; FE - Final Examination; CAT – Category; BS – Basic Sciences; HS – Humanities & Social Sciences; ES – Engineering Sciences; PC – Professional Core; PE – Professional Elective; OE – Open Elective; EEC – Employability Enhancement Course; MC – Mandatory Course.
** - Total 40 hrs in semesters I & II put together.
Grade: Completed / Not Completed.

M Sc SOFTWARE SYSTEMS **(2015 REGULATIONS)**

Course Code	Course Title	Hours/Week			Credits	Maximum marks			CAT
		Lecture	Tutorial	Practical		CA	FE	Total	
III SEMESTER									
15XW31	DISCRETE STRUCTURES	3	2	0	4	50	50	100	BS
15XW32	DATA BASE MANAGEMENT SYSTEM	3	0	0	3	50	50	100	PC
15XW33	TRANSFORM TECHNIQUES	3	2	0	4	50	50	100	BS
15XW34	ADVANCED DATA STRUCTURES	3	0	0	3	50	50	100	PC
15XW35	MICROPROCESSOR SYSTEMS AND PROGRAMMING	3	0	0	3	50	50	100	PC
15XW36	RDBMS LAB	0	0	4	2	100	-	100	PC
15XW37	ADVANCED DATA STRUCTURES LAB	0	0	4	2	100	-	100	PC
15XW38	ASSEMBLY LANGUAGE PROGRAMMING LAB	0	0	4	2	100	-	100	PC
Total 31 hrs		**15**	**4**	**12**	**23**	**550**	**250**	**800**	
IV SEMESTER									
15XW41	ACCOUNTING AND FINANCIAL MANAGEMENT	4	0	0	4	50	50	100	BS
15XW42	DATA COMMUNICATION NETWORKS	3	0	0	3	50	50	100	PC
15XW43	OPTIMIZATION TECHNIQUES	4	0	0	4	50	50	100	BS
15XW44	OPERATING SYSTEMS	3	2	0	4	50	50	100	PC
15XW45	SOFTWARE ENGINEERING TECHNIQUES	3	0	0	3	50	50	100	PC
15XW46	COMPUTER NETWORKS LAB	0	0	4	2	100	-	100	PC
15XW47	WINDOWS PROGRAMMING LAB	0	0	4	2	100	-	100	PC
15XW48	MATHEMATICAL COMPUTING LAB	0	0	4	2	100	-	100	BS
Total 31 hrs		**17**	**2**	**12**	**24**	**550**	**250**	**800**	

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M Sc SOFTWARE SYSTEMS **(2015 REGULATIONS)**

Course Code	Course Title	Hours/Week			Credits	Maximum marks			CAT
		Lecture	Tutorial	Practical		CA	FE	Total	
V SEMESTER									
15XW51	UNIX ARCHITECTURE AND PROGRAMMING	3	0	0	3	50	50	100	PC
15XW52	JAVA PROGRAMMING	3	0	0	3	50	50	100	PC
15XW53	TCP/IP NETWORKS AND APPLICATIONS	3	0	0	3	50	50	100	PC
15XW54	OBJECT ORIENTED ANALYSIS AND DESIGN	3	2	0	4	50	50	100	PC
15XW55	PROFESSIONAL ELECTIVE – I	3	2	0	4	50	50	100	PE
15XW56	JAVA PROGRAMMING LAB	0	0	4	2	100	-	100	PC
15XW57	TCP/IP APPLICATIONS LAB	0	0	4	2	100	-	100	PC
15XW58	UNIX SHELL AND SYSTEM PROGRAMMING LAB	0	0	4	2	100	-	100	PC
Total 31 hrs		**15**	**4**	**12**	**23**	**550**	**250**	**800**	
VI SEMESTER									
15XW61	PRINCIPLES OF COMPILER DESIGN	3	0	0	3	50	50	100	PC
15XW62	MACHINE LEARNING	3	0	0	3	50	50	100	PC
15XW63	SOFTWARE PATTERNS	3	2	0	4	50	50	100	PC
15XW64	SOFTWARE TESTING	3	2	0	4	50	50	100	PC
15XW65	OPEN ELECTIVE I	3	2	0	4	50	50	100	OE
15XW66	PRINCIPLES OF COMPILER DESIGN LAB	0	0	4	2	100	-	100	PC
15XW67	MACHINE LEARNING LAB	0	0	2	1	100	-	100	PC
15XW68	DISTRIBUTED ENTERPRISE COMPUTING LAB	0	0	4	2	100	-	100	PC
Total 31 hrs		**15**	**6**	**10**	**23**	**550**	**250**	**800**	
VII SEMESTER									
15XWP1	PROJECT WORK I	**0**	**0**	**-**	**12**	50	50	100	EEC

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Course Code	Course Title	Hours/Week			Credits	Maximum marks			CAT
		Lecture	Tutorial	Practical		CA	FE	Total	
VIII SEMESTER									
15XW81	DATA MINING	3	0	0	3	50	50	100	PC
15XW82	SOFT COMPUTING	3	0	0	3	50	50	100	PC
15XW83	SOFTWARE PROJECT MANAGEMENT	3	2	0	4	50	50	100	PC
15XW84	PROFESSIONAL ELECTIVE II	3	2	0	4	50	50	100	PE
15XW85	OPEN ELECTIVE II	3	2	0	4	50	50	100	OE
15XW86	DATA MINING LAB	0	0	4	2	100	-	100	PC
15XW87	SOFT COMPUTING LAB	0	0	4	2	100	-	100	EEC
15XW88	CASE STUDY LAB	0	0	4	2	100	-	100	PC
Total 33 hrs		**15**	**6**	**12**	**24**	**550**	**250**	**800**	
IX SEMESTER									
15XW91	PRINCIPLES OF MANAGEMENT AND BEHAVIOURAL SCIENCE	3	0	0	3	50	50	100	HS
15XW92	WEB SERVICES	3	0	0	3	50	50	100	PC
15XW93	INFORMATION RETRIEVAL	3	0	0	3	50	50	100	PC
15XW94	PROFESSIONAL ELECTIVE III	3	2	0	4	50	50	100	PE
15XW95	PROFESSIONAL ELECTIVE IV	3	2	0	4	50	50	100	PE
15XW96	INFORMATION RETRIEVAL LAB	0	0	4	2	100	-	100	PC
15XW97	WEB SERVICES LAB	0	0	4	2	100	-	100	PC
15XW98	OPEN SOURCE SOFTWARE LAB	0	0	4	2	100	-	100	PC
Total 31 hrs		**15**	**4**	**12**	**23**	**550**	**250**	**800**	
X SEMESTER									
15XWP2	PROJECT WORK II	**0**	**0**	-	**12**	50	50	100	EEC

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Course Code	Course Title	Hours/Week			Credits	Maximum marks			CAT
		Lecture	Tutorial	Practical		CA	FE	Total	
PROFESSIONAL ELECTIVE THEORY COURSES (Four to be opted)									
15XWA1	MODELLING AND SIMULATION	3	2	0	4	50	50	100	PE
15XWA2	ADVANCED DATABASE MANAGEMENT SYSTEMS	3	2	0	4	50	50	100	PE
15XWA3	SOFTWARE METRICS	3	2	0	4	50	50	100	PE
15XWA4	PARALLEL AND DISTRIBUTED COMPUTING	3	2	0	4	50	50	100	PE
15XWA5	DATA COMPRESSION	3	2	0	4	50	50	100	PE
15XWA6	COMPUTER GRAPHICS AND VISUALIZATION	3	2	0	4	50	50	100	PE
15XWA7	REAL TIME AND EMBEDDED SYSTEMS	3	2	0	4	50	50	100	PE
15XWA8	MOBILE COMPUTING	3	2	0	4	50	50	100	PE
15XWA9	SERVICE ORIENTED ARCHITECTURE	3	2	0	4	50	50	100	PE
15XWAA	PRINCIPLES OF PROGRAMMING LANGUAGES	3	2	0	4	50	50	100	PE
15XWAB	AGILE SOFTWARE DEVELOPMENT	3	2	0	4	50	50	100	PE
15XWAC	SYSTEM SECURITY	3	2	0	4	50	50	100	PE
15XWAD	PERVASIVE COMPUTING	3	2	0	4	50	50	100	PE
15XWAE	SEMANTIC WEB	3	2	0	4	50	50	100	PE
15XWAF	CLOUD COMPUTING	3	2	0	4	50	50	100	PE
15XWAG	HUMAN COMPUTER INTERACTION	3	2	0	4	50	50	100	PE
15XWAH	SOCIAL NETWORK ANALYSIS	3	2	0	4	50	50	100	PE
15XWAI	ADVANCED COMPUTER GRAPHICS	3	2	0	4	50	50	100	PE
15XWAJ	COMPUTER VISION AND IMAGE ANALYSIS	3	2	0	4	50	50	100	PE
15XWAK	BIG DATA ANALYTICS	3	2	0	4	50	50	100	PE

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Course Code	Course Title	Hours/Week			Credits	Maximum marks			CAT
		Lecture	Tutorial	Practical		CA	FE	Total	
OPEN ELECTIVE THEORY COURSES (Two to be opted)									
15XWO1	ENTREPRENEURSHIP	3	2	0	4	50	50	100	OE
15XWO2	COMPUTER FORENSICS	3	2	0	4	50	50	100	OE
15XWO3	WIRELESS NETWORKS	3	2	0	4	50	50	100	OE
15XWO4	RANDOMIZED ALGORITHMS	3	2	0	4	50	50	100	OE
15XWO5	DATA VISUALIZATION	3	2	0	4	50	50	100	OE
15XWO6	APPLIED GRAPH THEORY	3	2	0	4	50	50	100	OE
15XWO7	CRYPTOGRAPHY	3	2	0	4	50	50	100	OE

Labeling and Grouping of Courses

HUMANITIES AND SOCIAL SCIENCES (HS)				
S.No.	**Course Code**	**Course Title**	**L:T:P:C**	**Preferred Semester**
1	15XW12	ENGLISH FOR PROFESSIONAL SKILLS	3:0:0:3	I
2	15XW91	PRINCIPLES OF MANAGEMENT AND BEHAVIOURAL SCIENCE	3:0:0:3	IX

BASIC SCIENCES (BS)				
S.No.	**Course Code**	**Course Title**	**L:T:P:C**	**Preferred Semester**
1	15XW11	CALCULUS AND ITS APPLICATIONS	3:2:0:4	I
2	15XW13	MATERIAL SCIENCE	4:0:0:4	I
3	15XW14	ANALOG AND DIGITAL ELECTRONICS	4:0:0:4	I
4	15XW18	MATERIAL SCIENCE AND DIGITAL ELECTRONICS LAB	0:0:4:2	I
5	15XW21	PROBABILITY AND STATISTICS	3:2:0:4	II
6	15XW22	APPLIED LINEAR ALGEBRA	3:2:0:4	II
7	15XW31	DISCRETE STRUCTURES	3:2:0:4	III
8	15XW33	TRANSFORM TECHNIQUES	3:2:0:4	III
9	15XW41	ACCOUNTING AND FINANCIAL MANAGEMENT	4:0:0:4	IV
10	15XW43	OPTIMIZATION TECHNIQUES	4:0:0:4	IV
11	15XW48	MATHEMATICAL COMPUTING LAB	0:0:4:2	IV

ENGINEERING SCIENCES (ES)				
S.No.	**Course Code**	**Course Title**	**L:T:P:C**	**Preferred Semester**
1	15XW16	ENGINEERING GRAPHICS AND GEOMETRIC MODELING	0:0:4:2	I

PROFESSIONAL CORE (PC)				
S.No.	**Course Code**	**Course Title**	**L:T:P:C**	**Preferred Semester**
1	15XW15	C PROGRAMMING	3:0:0:3	I
2	15XW17	C PROGRAMMING LAB	0:0:4:2	I
3	15XW23	DATA STRUCTURES AND ALGORITHMS	3:0:0:3	II
4	15XW24	OBJECT ORIENTED PROGRAMMING	3:0:0:3	II
5	15XW25	COMPUTER ORGANIZATION	3:0:0:3	II
6	15XW26	OBJECT COMPUTING LAB	0:0:4:2	II
7	15XW27	DATA STRUCTURES LAB	0:0:4:2	II
8	15XW28	WEB DESIGNING LAB	0:0:4:2	II
9	15XW32	DATA BASE MANAGEMENT SYSTEM	3:0:0:3	III
10	15XW34	ADVANCED DATA STRUCTURES	3:0:0:3	III
11	15XW35	MICROPROCESSOR SYSTEMS AND PROGRAMMING	3:0:0:3	III
12	15XW36	RDBMS LAB	0:0:4:2	III
13	15XW37	ADVANCED DATA STRUCTURES LAB	0:0:4:2	III
14	15XW38	ASSEMBLY LANGUAGE PROGRAMMING LAB	0:0:4:2	III
15	15XW42	DATA COMMUNICATION NETWORKS	3:0:0:3	IV
16	15XW44	OPERATING SYSTEMS	3:2:0:4	IV
17	15XW45	SOFTWARE ENGINEERING TECHNIQUES	3:0:0:3	IV
18	15XW46	COMPUTER NETWORKS LAB	0:0:4:2	IV
19	15XW47	WINDOWS PROGRAMMING LAB	0:0:4:2	IV
20	15XW51	UNIX ARCHITECTURE AND PROGRAMMING	3:0:0:3	V
21	15XW52	JAVA PROGRAMMING	3:0:0:3	V
22	15XW53	TCP/IP NETWORKS AND APPLICATIONS	3:0:0:3	V
23	15XW54	OBJECT ORIENTED ANALYSIS AND DESIGN	3:2:0:4	V
24	15XW56	JAVA PROGRAMMING LAB	0:0:4:2	V
25	15XW57	TCP/IP APPLICATIONS LAB	0:0:4:2	V
26	15XW58	UNIX SHELL AND SYSTEM PROGRAMMING LAB	0:0:4:2	V
27	15XW61	PRINCIPLES OF COMPILER DESIGN	3:0:0:3	VI
28	15XW62	MACHINE LEARNING	3:0:0:3	VI
29	15XW63	SOFTWARE PATTERNS	3:2:0:4	VI
30	15XW64	SOFTWARE TESTING	3:2:0:4	VI
31	15XW66	PRINCIPLES OF COMPILER DESIGN LAB	0:0:4:2	VI
32	15XW67	MACHINE LEARNING LAB	0:0:2:1	VI
33	15XW68	DISTRIBUTED ENTERPRISE COMPUTING LAB	0:0:4:2	VI
34	15XW81	DATA MINING	3:0:0:3	VIII
35	15XW82	SOFT COMPUTING	3:0:0:3	VIII
36	15XW83	SOFTWARE PROJECT MANAGEMENT	3:0:0:3	VIII
37	15XW86	DATA MINING LAB	3:2:0:4	VIII
38	15XW87	SOFT COMPUTING LAB	0:0:4:2	VIII
39	15XW88	CASE STUDY LAB	0:0:4:2	VIII
40	15XW92	WEB SERVICES	3:0:0:3	IX
41	15XW93	INFORMATION RETRIEVAL	3:0:0:3	IX
42	15XW96	INFORMATION RETRIEVAL LAB	0:0:4:2	IX
43	15XW97	WEB SERVICES LAB	0:0:4:2	IX
44	15XW98	OPEN SOURCE SOFTWARE LAB	0:0:4:2	IX

PROFESSIONAL ELECTIVES (PE)				
S.No.	**Course Code**	**Course Title**	**L:T:P:C**	**Preferred Semester**
1	15XWA1	MODELLING AND SIMULATION	3:2:0:4	FROM V
2	15XWA2	ADVANCED DATABASE MANAGEMENT SYSTEMS	3:2:0:4	FROM V
3	15XWA3	SOFTWARE METRICS	3:2:0:4	FROM V
4	15XWA4	PARALLEL AND DISTRIBUTED COMPUTING	3:2:0:4	FROM V
5	15XWA5	DATA COMPRESSION	3:2:0:4	FROM V
6	15XWA6	COMPUTER GRAPHICS AND VISUALIZATION	3:2:0:4	FROM V
7	15XWA7	REAL TIME AND EMBEDDED SYSTEMS	3:2:0:4	FROM V
8	15XWA8	MOBILE COMPUTING	3:2:0:4	FROM V
9	15XWA9	SERVICE ORIENTED ARCHITECTURE	3:2:0:4	FROM V
10	15XWAA	PRINCIPLES OF PROGRAMMING LANGUAGES	3:2:0:4	FROM V
11	15XWAB	AGILE SOFTWARE DEVELOPMENT	3:2:0:4	FROM V
12	15XWAC	SECURITY IN COMPUTING	3:2:0:4	FROM V
13	15XWAD	PERVASIVE COMPUTING	3:2:0:4	FROM V
14	15XWAE	SEMANTIC WEB	3:2:0:4	FROM V
15	15XWAF	CLOUD COMPUTING	3:2:0:4	FROM VI
16	15XWAG	HUMAN COMPUTER INTERACTION	3:2:0:4	FROM VI
17	15XWAH	SOCIAL NETWORK ANALYSIS	3:2:0:4	FROM VI
18	15XWAI	ADVANCED COMPUTER GRAPHICS	3:2:0:4	FROM VI
19	15XWAJ	COMPUTER VISION AND IMAGE ANALYSIS	3:2:0:4	FROM VI
20	15XWAK	BIG DATA ANALYTICS	3:2:0:4	FROM VI

OPEN ELECTIVES (OE)				
S.No.	**Course Code**	**Course Title**	**L:T:P:C**	**Preferred Semester**
1	15XWO1	ENTREPRENEURSHIP	3:2:0:4	VIII
2	15XWO2	COMPUTER FORENSICS	3:2:0:4	FROM VI
3	15XWO3	WIRELESS NETWORKS	3:2:0:4	FROM VI
4	15XWO4	RANDOMIZED ALGORITHMS	3:2:0:4	VIII
5	15XWO5	DATA VISUALIZATION	3:2:0:4	FROM VI
6	15XWO6	APPLIED GRAPH THEORY	3:2:0:4	FROM VI
7	15XWO7	CRYPTOGRAPHY	3:2:0:4	VIII

EMPLOYABILITY ENHANCEMENT COURSES (EEC)				
S.No.	**Course Code**	**Course Title**	**L:T:P:C**	**Preferred Semester**
1	15XWP1	PROJECT WORK I	0:0:0:12	VII
2	15XW88	CASE STUDY LAB	0:0:4:2	VIII
3	15XWP2	PROJECT WORK II	0:0:0:12	X

SEMESTER 1

15XW11 CALCULUS AND ITS APPLICATIONS

3 2 0 4

BASIC CONCEPTS: Functions – Graphs, limit, continuity, jump discontinuity, piecewise continuity, periodic, differentiable, integrable, absolutely integrable functions. Fundamental theorem of calculus (statement only). Sequences – increasing, decreasing, bounded, function limit properties (No Proof). Series – convergence and divergence – alternating series test, absolute convergence – ratio test, power series. (7+5)

FOURIER SERIES : Periodic waveforms, even and odd functions, orthogonality relations, Fourier series - Dirchlet's conditions, statement of Fourier Theorem, Fourier Co-effecients – change of scale , Half range series, Parseval's theorem – average power of a signal, RMS value, applications – frequency response of a linear system. (8+5)

FUNCTIONS OF TWO VARIABLES: Introduction- partial derivative and its geometrical interpretation. Taylor series about a point - Maxima, minima - Constrained maxima and minima – Lagrange multiplier method. (7+5)

INTEGRAL CALCULUS: Evaluation of multiple integrals - Change the order of integration - Application of multiple integrals to find area and volume - Beta and Gamma Integrals - Evaluation of definite integrals in terms of Beta and Gamma functions. (8+5)

ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER: Modeling- Geometrical meaning- Exact differential equations, Integrating factors- linear differential equations, Bernouli equations - Applications to linear systems. (7+5)

LINEAR DIFFERENTIAL EQUATIONS OF SECOND AND HIGHER ORDER: Homogeneous linear equations of second order and higher order equations with constant coefficients. Euler-Cauchy equation, Non-homogeneous equations, Solution by variation of parameter - Applications to linear systems. (8+5)

Total L:45+T:30 = 75

TEXT BOOKS :

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley, 2014.
2. Maurice D. Weir, Joel Hass, Frank R. Giordano, "Thomas' Calculus", Pearson, 2013.

REFERENCES :

1. James Stewart, "Essential Calculus", Thomson Brooks/Cole, 2011.
2. Michael D Greenberg, "Advanced Engineering Mathematics", Pearson Education, 2009.
3. Ray Wylie C and Louis C Barrett," Advanced Engineering Mathematics", McGraw Hill, 2013.
4. Riley K F and Hobson M P, "Essential Mathematical Methods for the Physical Sciences", Cambridge University Press, 2011.
5. Roland E Thomas and Albert J Rosa, "The Analysis and Design of Linear Circuits", John Wiley, 2011.
6. Thomas L Harman, James B Dabney and Norman J Richert, "Advanced Engineering Mathematics with Matlab", Thomson Brooks/Cole, 2000.

15XW12 ENGLISH FOR PROFESSIONAL SKILLS

3 0 0 3

READING COMPREHENSION: Developing Reading Skills like Skimming and Scanning for information, Critical Reading, Inferential, Cognition, and analytical Skills- appropriate reading texts to be used from general, scientific, and literary genres. (10)

PRINCIPLES OF CLEAR WRITING: The fundamental aspects of formal writing like objectivity, conciseness, clarity, simplicity, coherence, parallelism, unity, cohesion and accuracy to be focused Writing in different ways to create an emphasis – samples from news items, creative articles and reports to be used. (4)

TECHNICAL WRITING: Technical Style, Mechanics, Critical Evaluation of different types of technical texts and different genres of technical writing. – Format and different types of formal reports – Technical Papers. (4)

CORRESPONDENCE: Memos, Principles of Official, Social, and E-mail Correspondence to be focused. (4)

FOCUS ON SOFT SKILLS: Intra and Interpersonal Communication, Telephone Etiquette, Body language and Interview Techniques, Presentation Techniques – Group communication for effective team working. (5)

PRACTICALS: Listening exercises using Language Laboratory, Making short speeches, Group Discussions and Role-Plays. (18)

Total L:45

TEXT BOOKS:

1. Teaching Material prepared by the Faculty, Department of English, PSG College of Technology, Coimbatore.

REFERENCES:

1. Mark Ibboston, "Cambridge English for Engineering", Cambridge University Press, 2011.
2. William S Pfiffer and Kaye E Adkins, ,"Technical Communication Fundamentals", Prentice Hall, 2012.
3. Nitin Bhatnagar and Monisha Bhatnagar, "Communication English for Engineers and Professionals", Pearson, 2013.
4. Ashraf Rizvi M , " Effective Technical Communication", Tata McGraw Hill, 2012.
5. Herta A Murphy etal ,"Effectiive Business Communication", Tata McGraw Hill, 2012.

15XW13 MATERIALS SCIENCE

4 0 0 4

LASERS AND FIBER OPTICS: Principle of Laser: spontaneous and stimulated emission, types of laser: He-Ne, CO_2 and Nd:YAG laser. Applications: Laser diodes, holography, cutting, drilling, welding**.** Principle of Fiber optics. Modes of propagation. Classification based on materials, refractive index profile, modes. Splicing. Losses in optical fiber. Fiber optical communication system, Light sources and Detectors - Fiber optic sensors – temperature, displacement and strain. (12)

CONDUCTORS AND APPLICATIONS : Drude Lorentz theory of electrical conduction, Band theory of solids - Factors affecting resistivity of metals – temperature, alloying, magnetic field and strain - Applications of conductors – Strain gauge, conducting material, and resistance thermometer. (12)

SEMICONDUCTORS AND DEVICES: Elemental and compound semiconductors. Intrinsic and extrinsic semiconductors - Properties. Hall effect - Hall coefficient in extrinsic semiconductors, experimental determination of Hall coefficient. Application of Semiconductors –Solar Cells, LED and LCD. Introduction to semiconductor memory devices: Random Access Memory (RAM), Read only Memory (ROM), DRAM CCD. (12)

MAGNETIC MATERIALS AND MEMORY DEVICES: Origin of magnetism, Classification, Ferro magnetic materials – Properties. Domain theory of ferromagnetism.Hysteresis.Hard and soft magnetic materials. Ferrite – structure and properties. Applications – optical, magnetic and magneto optical memory devices. (12)

ADVANCED MATERIALS AND APPLICATIONS: Nano materials - Synthesis - PVD and ball milling techniques.properties, applications. Shape Memory alloys (SMA) – Characteristics, properties of NiTi alloy, application in MEMS. Superconductivity- types of superconductors - High Tc superconductors, Application of superconductors -SQUID, Levitation and cryotron. (12)

Total L:60

TEXTBOOKS :

1. William D Callister and David G. Rethwisch, "Fundamentals of Materials Science and Engineering: An Integrated Approach", John Wiley, 2011.
2. Rajendran and Marikani, "Materials Science", Tata McGraw Hill, 2006

REFERENCES:

1. Leonid V Azaroff and James J Brophy, "Electronic Processes in Materials", McGrawHill, 1991.
2. Raghavan V, "Materials Science and Engineering- A First Course", Prentice Hall, 2006.
3. Sze S M, "Semiconductor Devices: Physics and Technology", John Wiley, 2012.

15XW14 ANALOG AND DIGITAL ELECTRONICS

4 0 0 4

SEMICONDUCTOR DEVICES AND CIRCUITS: (Qualitative treatment only) Fundamental aspects of semiconductors - PN junction diode -Zener diode - Rectifiers - Zener voltage regulators - Filters - Bipolar Junction Transistors - Transistor Amplifiers - Field Effect Transistor. (7)

NUMBER SYSTEM AND CODES: Binary - Octal - Hexadecimal - BCD - excess three - Gray codes - Error correcting and detecting codes. (7)

DIGITAL CIRCUITS AND GATES: AND, OR, NOT, NAND and NOR gates - exclusive OR gates. Positive and negative logic systems - Digital integrated circuits-Characteristics -TTL and MOS logic circuits - Comparison. (6)

BOOLEAN ALGEBRA AND KARNAUGH MAPS: Boolean relations - Laws and theorems - Simplifications - Karnaugh maps and simplifications - Don't care conditions - NAND-NAND realizations. (7)

COMBINATIONAL LOGIC: Design and Implementation of Half and Full adders - Subtractors - Parallel adders - Carry look ahead addition - Encoders and decoders - Multiplexers and De-multiplexers. (8)

SEQUENTIAL LOGIC: R-S, J-K, D and T type Flip-Flops - Binary counters: Ripple and synchronous types - UP/DOWN counters - Decade counters - Shift registers - Ring counters. (7)

OPERATIONAL AMPLIFIERS: Definition of terms - Inverting and non-inverting amplifiers, inverting summing amplifier, integrators and differentiators. (9)

A/D AND D/A CONVERTORS: DACs: weighted and binary ladder types - ADCs: counter, dual slope, successive approximation types. (9)

Total L:60

TEXT BOOKS:

1. Donald P Leach, Albert Paul Malvino and Goutamsaha, "Digital Principles & Applications", Tata McGraw Hill, 2011.
2. Allen Mottershead, "Electronic devices and circuits – An Introduction", Prentice Hall, 2009.

REFERENCES:

1. Gothmann H, "Digital Electronics: An Introduction to Theory and Practice", Prentice Hall, 2001.
2. Paul Horowitz and Winfield Hill, "The Art of Electronics", Cambridge University Press, 2015.
3. Hamacher C V, Vranesic Z G and Zaky S G, "Computer Organization",McGraw Hill, 2011.

15XW15 C PROGRAMMING

3 0 0 3

PROBLEM SOLVING: Introduction to Problem Solving- Program development- Analyzing and Defining the Problem- Modular Design – Algorithm - Flow Chart - What is a programming language-Types of programming language- Program Development Environment. (3)

C LANGUAGE: Introduction to C Language - C character set - Identifiers and Keywords - Data Types - Constants - Variables - Arrays - Declarations - Expressions - Statements - Symbolic constants - Operators and Expressions - Library Functions - Data Input and Output Functions. (6)

CONTROL STATEMENTS: While Statement - Do While Statement – For Loop – Nested Loop - If Else - Switch - Break - Continue - Comma Operator – goto Statement. (4)

FUNCTIONS: Defining Function - Accessing a Function - Passing Arguments to Functions - Specifying Arguments Data Types - Function Prototypes - Storage Classes - Auto - Static - Extern and Register Variables. (6)

ARRAYS: Defining Array – Processing array - Passing array to a function - Multi dimensional array - Array and strings. (4)

POINTERS: Declarations - Pointers to a function - Pointers and one dimensional arrays - Operating a pointer - Pointer and multi-dimensional arrays - arrays of pointers - passing functions to other functions. (7)

STRUCTURES AND UNIONS: Definition of Structure and Union - Processing a structure – Bit field representations - Structures and pointers - Passing structure to functions - Self-referential structures – Nested structure. (6)

FILES: File Structure concepts introduction - Definitions, concept of record, file operations: Storing, creating, retrieving, updating Sequential, relative, indexed and random access mode, Files with binary mode(Low level), performance of Sequential Files – Operations on Files – Types of Files, Various input and output functions on Files., (5)

Enumerated Data Type – Typedef - Preprocessor Directives - Command Line Arguments. (4)

Total L:45

TEXT BOOKS :

1. Kernighan B W and Ritchie D M, "C Programming Language (ANSI C)", Prentice Hall, 2013.
2. Deitel H M and Deitel P J, "C How to Program**",** Prentice Hall, 2013.

REFERENCES :

1. Herbert Schildt, "C The Complete Reference", Tata McGraw Hill, 2010.
2. Gottfried Byron," Programming With C", Tata McGraw Hill, 2011.

15XW16 ENGINEERING GRAPHICS AND GEOMETRIC MODELLING

0 0 4 2

INTRODUCTION: BIS specifications - lines, lettering, and dimensioning. Projection –types.
FIRST ANGLE PROJECTION: Introduction- Projection of points, lines, planes, and solids –parallel, perpendicular and inclined to planes.
ISOMETRIC PROJECTION: Introduction- prismatic and cylindrical components.

INTERACTIVE GRAPHICS: Parametric modelling –1D, 2D and 3D geometry – transformations - display – points, lines using software.
CURVES: Types- parametric curves generation-displaying - evaluating points on curves.
SURFACES: Types- parametric surface generation-displaying - evaluating points on surfaces.
SOLIDS: Generation of part models using Computer Aided Geometric Modelling software.

TEXT BOOKS:

1. "A Primer on Engineering Drawing using Pro Engineer", Department of Production Engineering and CAD/CAM Centre, PSG College ofTechnology, Coimbatore, 2012.
2. Michael E. Mortensen, "Geometric Modeling (Digitized)", Industrial Press, 2011.

REFERENCES:

1. David F Rogers, Alan Adams J., "Mathematical Elements in Computer Graphics (Digitized)", McGraw Hill, 2007.
2. David Solomon, "Computer Graphics and Geometric Modeling", Springer, 2013.
3. Michael E Mortenson, "Geometric Modeling(Digitized)", Industrial Press, 2011.
4. MarttiMantyla,"An Introduction to Solid Modeling (Digitized)", Computer Science Press, 2007.

LAB :
Engineering Graphics using CAD

1. Introduction to CAD Software.
2. Exercise on first angle projection of
   a. Points b. Lines
3. Exercise on projection of
   a. Planes b. Solids
4. Exercise on conversion of isometric to orthographic projection.
5. Exercise on orthographic to isometric projection.
6. Exercise on Sectioning of regular solids.
7. Exercise on Perspective projection of simple solids.

Geometric Modeling using a graphical programming language

8. Modeling and displaying a point and line using orthographic projection and performing simple geometric transformation.
9. Modeling and displaying of parametrically represented analytical curves
   a. Circle b. Ellipse
10. Modeling and displaying of parametrically represented synthetic curves
    a. Bezier Curve b. B-spline
11. Modeling and displaying of parametrically represented NURBS curve.
12. Modeling and displaying of parametrically represented synthetic surface.
    a. Planar surfaceb. Ruled surface
13. Modeling and displaying of Bezier surface.
14. Modeling and displaying of B-Spline surface .

Total P:60

15XW17 C PROGRAMMING LAB

0 0 4 2

1. Simple programs to understand the concepts of data types.
2. Familiarizing conditional, control and repetition statements
3. Usage of single and double dimensional arrays including storage operation
4. Implementation of functions, recursive functions
5. Defining and handling structures, array of structures and union
6. Implementation of pointers, operation on pointers dynamic storage allocation
7. Creating and processing data files.

Total P:60

15XW18 MATERIAL SCIENCE AND DIGITAL ELECTRONICS LAB

0 0 4 2

MATERIAL SCIENCE LAB :

1. Resistivity of an Alloy – Carey Foster's Bridge
2. Band Gap of Thermistor – Post Office Box
3. Thermal Conductivity of Metallic Wire – Wiedmann Franz law
4. Temperature co-efficient of Resistance – Post Office Box
5. Efficiency of Solar Cell
6. Band Gap Determination – Reverse Saturation Current
7. Photodiode Characteristics

8. Determination of Wavelength of laser source using grating

DIGITAL ELECTRONICS LAB :

1. Study of basic logic gates and realisation of logic gates using universal gates.
2. Multiplexer and demultiplexer.
3. Half and full adder / subtractor.
4. Encoder and decoder.
5. Binary decade counter.
6. BCD to seven segment decoder.
7. Study of D/A converter.
8. Crystal Oscillator using logic gates

Total P:60

SEMESTER 2

15XW21 PROBABILITY AND STATISTICS

3 2 0 4

PROBABILITY : Introduction - Sample space and events - Axiomatic approach to probability – Basic theorems. Conditional Probability - Law of multiplication - Law of total probability and Bayes' Theorem - Independence. (7+4)

RANDOM VARIABLES: Discrete and continuous random variables - probability mass function and density function - distribution function - Expectation and variance. Discrete distributions: Binomial, Poisson and Geometric - Continuous distributions: Uniform, Normal, Exponential and Weibull - Joint probability distributions - marginal and conditional distributions - statistical independence - Conditional expectation. (12+8)

LIMIT THEOREMS: Moments and moment generating functions- Limit theorems: Markov and Chebyshev inequalities, Law of Large numbers, Central Limit Theorem. (6+4)

STATISTICAL INFERENCE: Sampling distribution - Estimation: Point estimation, interval estimation. Hypothesis Testing: General concepts - Errors in Hypothesis testing - One-and two-tailed tests - Tests concerning mean, proportion, and variance - Tests for Goodness of fit and independence of attributes. (11+7)

CORRELATION AND REGRESSION: introduction - Estimation using the regression line - Correlation analysis -Limitations, errors, and caveats of using regression and correlation analyses - Multiple regression and correlation analysis. (6+5)

ANALYSIS OF VARIANCE: Introduction to design of experiments, Analysis of variance - Completely Randomized Design and Randomized Block Design. (3+2)

Total L:45+T:30 =75

TEXT BOOKS :

1. SaeedGhahramani, "Fundamentals of Probability with Stochastic Processes", Pearson Education, 2014.
2. Richard A. Johnson, "Probability and Statistics for Engineers and Scientists", Prentice Hall, 2011.
3. Jay L Devore, "Probability and Statistics for Engineering and Sciences", Cengage Learning, 2015.

REFERENCES :

1. Sheldon M.Ross, "Introduction to Probability Models", Academic Press, 2014.
2. Trivedi K.S, "Probability and Statistics with Reliability, Queueing and Computer Science Applications", Prentice Hall, 2011.
3. Richard I. Levin. David S. Rubin, "Statistics for Management", Pearson Education, 2007.
4. Ronald E. Walpole, Raymond H. Meyers, Sharon L. Meyers, "Probability and Statistics for Engineers and Scientists", Pearson Education, 2012.

15XW22 APPLIED LINEAR ALGEBRA

3 2 0 4

LINEAR SYSTEMS: System of linear equations - Consistent and inconsistent systems - Geometric interpretation of linear system in 2 and 3 unknowns - Row reduction and Echelon forms – Vector equation – Matrix equation Ax=b - LU decomposition - Applications of linear systems. (6)

VECTOR SPACES: Euclidean n-space, General vector spaces, Subspaces, Linear independence, Basis and dimension, Row space, Column space. and Null space, Rank and nullity – Change of basis – Similarity - Isomorphism. (10)

LINEAR TRANSFORMATIONS: Introduction, Properties-Kernel and range, Linear Transformation from R^n to R^m, Matrices of linear transformations. (9)

INNER PRODUCT SPACES: Inner products, Length and Angle in inner product spaces - Orthonormal bases, Gram Schmidt process - Orthogonal matrices, QR decomposition - Best Approximation and Least-squares. (10)

EIGEN VALUES AND EIGEN VECTORS: Eigen values and Eigen vectors - Diagonalization, Symmetric Matrices, Orthogonal Diagonalization – Singular Value Decomposition – Eigen values and linear transformations - Discrete Dynamical systems. (10)

TEXT BOOKS :

1. Howard Anton and Chris Rorres, "Elementary Linear Algebra" John Wiley &Sons, 2011.
2. David C Lay, "Linear Algebra and its Applications ", Addison Wesley, 2011.

REFERENCES :

1. Gilbert Strang, "Linear Algebra and its Applications ", Cengage Learning, 2012.
2. Stephen Andrilliand David Hecker, "Elementary Linear Algebra", Academic Press, 2010
3. Otto Bretscher, "Linear Algebra with Applications", Prentice Hall, 2008.
4. Gareth Williams, "Linear Algebra with Applications", Narosa, 2008.

TUTORIAL PRACTICE :

1. Introduction to the software and its constructs
2. Solving system of Linear equations by direct methods and Iterative methods.
3. Finding the rank of the given matrix.
4. Finding if the given set of vectors is linear independent or dependent and finding the relationship between the vectors if the set is linearly dependent.
5. Finding images of Linear transformation from R^n to R^m
6. Finding the norm of the given vector and angle and distance between two vectors.
7. Constructing an orthonormal basis from the given basis using Gram -Schmidt Process
8. Finding Least-squares solution of a inconsistent system and fitting least-squares line and parabola
9. Finding Eigen values and Eigen vectors of the given matrix and diagonalize the given matrix if possible.
10. Finding Singular Value decomposition and LU- decomposition of mxn matrices
11. Finding Dominant Eigen value using Power method.

Total L: 45+T: 30=75

15XW23 DATA STRUCTURES AND ALGORITHMS

3 0 0 3

INTRODUCTION: Software Development process – Abstraction - Data structures - Abstract data Types - Primitive data structures - Analysis of algorithms - Best, worst and average case time complexities –notation (4)

ARRAYS: Operations - implementation of one, two, three and multi dimension arrays – Sparse and dense matrices –Applications; **STACKS:** primitive operations - sequential implementation - Applications: Subroutine handling - Recursion – Expression Processing,Parentheses matching. (8)

QUEUES: Primitive operations - sequential implementation - Priority Queues - Dequeues - Applications: Image component labeling; Machine shop simulation. (5)

LISTS: Primitive Operations - Singly linked lists, doubly linked lists, Circular lists, Multiply linked lists - Applications: Addition of Polynomials; Sparse Matrix representation and Operations. – Linked Stacks - Linked queues - Linked Priority queues - Dynamic Storage Management. (11)

TREES: Terminologies - implementation - **BINARY TREE:** Properties - sequential and linked representation - common binary tree operations - traversals - Expression trees - Infix, Postfix and Prefix expressions - Threaded trees - Tournament trees - Heaps, Max heap, Min heap - Applications: Huffman codes. (8)

HASH TABLE: Introduction Hash Function --Collision – successful and unsuccessful search. (3)

SORTING: Insertion Sort, Selection Sort, Sheel sort, Bubble Sort, Heap Sort, Radix Sort – Algorithms and their time complexity (6)

Total L: 45

TEXT BOOKS :

1. Aaron M Tanenbaum, Moshe J Augenstein and YedidyahLangsam, "Data structures using C and C++", Pearson Education, 2012.
2. SahniSartaj, "Data Structures, Algorithms and Applications in C++", Silicon Press, 2011.

REFERENCES :

1. Nell Dale, “C++ Plus Data Structures”, Jones & Bartlett Learning, 2011.
2. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, Pearson Education, 2014.
3. Robert L Kruse, Bruce P Leung and Clovin L Tondo, “Data Structures and Program Design in C”, Pearson Education, 2013.

15XW24 OBJECT ORIENTED PROGRAMMING

3 0 0 3

PRINCIPLES OF OBJECT ORIENTED PROGRAMMING: Software crisis Software Evolution - Procedure Oriented ProgrammingObject Oriented Programming Paradigm - Basic Concepts and Benefits of OOP - Object Oriented Programming Language - Application of OOP - Structure of C++ - Tokens, Expressions and Control Structures - Operators in C++ - Manipulators. (6)

FUNCTIONS IN C++: Function Prototyping - Call by Reference - Return by reference - Inline functions - Default, Const Arguments - Function - Overloading - Friend and Virtual Functions - Classes and Objects - Member functions - Nesting of Member functions - Private member functions - Memory allocation for Objects - Static data members - Static Member Functions - Arrays of Objects - Objects as Function Arguments - Friend Functions - Returning Objects - Const Member functions - Pointers to Members. (10)

CONSTRUCTORS: Parameterized Constructors - Multiple Constructors in a Class - Constructors with Default Arguments - Dynamic Initialization of Objects - Copy and Dynamic Constructors – Destructors overloading . (5)

OPERATOR OVERLOADING: Overloading Unary and Binary Operators - Overloading Binary Operators using Friend functions – Operator Type conversion (4)

INHERITANCE: Defining Derived Classes - Single Inheritance - Making a Private Member Inheritable - Multiple Inheritance - Hierarchical Inheritance - Hybrid Inheritance - Virtual Base Classes - Abstract Classes - Constructors in Derived Classes - Member Classes - Nesting of Classes – Composition – Aggregation (9)

POLYMORPHISM: Basics of polymorphism – Types of polymorphism - Compile and Run Time Polymorphism - Virtual function – Object Slicing – Virtual Destructor – Dynamic binding (4)

TEMPLATES & EXCEPTION HANDLING: Introduction to Templates, Generic Functions and Generic Classes – Exception Handling – Examples. (3)

STREAMS: String I/O -Character I/O - Object I/O - I/O with multiple Objects - File pointers - Disk I/O with member functions . (4)

Total L:45

TEXT BOOKS :

1. BjarneStroustrup, “The C++ Programming Language”, Pearson Education, 2014.
2. Stanley B Lippman, JoseeLajoie and Barbara E Moo, “The C++ Primer”, Pearson Education, 2013.

REFERENCES :

1. Harvey MDeitel,Paul J Deitel, “C++ How to Program”, Prentice Hall, 2014.
2. Herbert Schildt, “C++ - The Complete Reference", Tata McGraw Hill, 2012.

15XW25 COMPUTER ORGANIZATION

3 0 0 3

DATA AND INSTRUCTION FORMATS: Data types - fixed point and floating point number representation - representation of signed numbers - alphanumeric data representation. (4)

REGISTER TRANSFER AND MICRO OPERATIONS: Register transfer language - inter register transfer - arithmetic micro operations - logic micro operations - shift micro operations - control functions – Arithmetic Logic Shift Unit . (5)

ARITHMETIC AND LOGIC UNIT: Addition/subtraction, multiplication and division with signed numbers. (5)

BASIC COMPUTER ORGANIZATION AND DESIGN: Computer registers - Computer Instructions - Timing & Control - Instruction Cycle - hardwired and micro programmed control unit- Address Sequencing- Memory Reference Instructions - Input - Output and Interrupts - Design of Basic Computer. (8)

CENTRAL PROCESSING UNIT: Processor bus organization - stack organization - instruction formats - - addressing modes - data transfer and manipulation - RISC and CISC machine characteristics. (5)

MEMORY AND INPUT-OUTPUT UNITS: Memory hierarchy - main memory: RAM and ROM address spaces - associative memory - virtual memory - cache memory – address mapping. (7)

PERIPHERAL DEVICES: I/O interface - I/O bus versus memory mapped I/O - example of I/O interface – DMA - Input-Output processor. (6)

MULTIPROCESSOR SYSTEM ORGANIZATION: Characteristics of Multiprocessors - interconnection structures - cross bar switch, time-shared common bus, multiport memory. (5)

Total L: 45

TEXT BOOKS :

1. Morris Mano, “Computer Systems Architecture", Pearson Education, 2008.
2. Hamacher V C, Vranesic Z G and Zaky S G, "Computer Organization (Digitized)", McGraw Hill,2012.

REFERENCES :

1. Rao P V S, "Perspectives in Computer Architecture", Prentice Hall,2007.
2. John P Hayes, “Computer Architecture and Organization (Digitized)”, WCB/McGrawHill, 2007.

15XW26 OBJECT COMPUTING LAB

0 0 4 2

1. Implementation of arithmetic operations using array of objects and dynamic data members.
2. Creation of a class having read-only member function and processing the objects of that class.
3. Creation of a class which keeps track of the member of its instances. Usage of static data member, constructor and destructor to maintain updated information about active objects.
4. Illustration of a data structure using dynamic objects.
5. Usage of static member to count the number of instances of a class.
6. Illustration for the need of default arguments.
7. Usage of a function to perform the same operation on more than one data type.
8. Creation of a class with generic data member.
9. Overloading the operators to do arithmetic operations on objects.
10. Acquisition of the features of an existing class and creation of a new class with added features in it.
11. Implementation of run time polymorphism.
12. Overloading stream operators and creation of user manipulators.
13. Implementation of derived class which has direct access to both its own members and the public members of the base class.
14. Implementation of Streams to store and maintain Library system, with the features of Book Issue and Book Return.

Total P: 60

15XW27 DATA STRUCTURES LAB

0 0 4 2

1. Sparse & dense Matrix operations using arrays.
2. Stacks using array representation.
3. Conversion of infix expression to postfix expression and evaluation.
4. Queues using array representation.
5. Linked Lists: Singly linked, Doubly linked and Circular lists and applications.
6. Linked Stacks and Queues.
7. Conversion and Manipulation of Expressions.
8. Binary trees and Threaded trees (with graphical representation).
9. Multi-precision Arithmetic Operations.
10. Implementation and analysis of Hash Table with collision handling.
11. Sorting Algorithms: Insertion sort, Selection sort and Heap sort.

Total P: 60

15XW28 WEB DESIGNING LAB

0 0 4 2

INTRODUCTION: WWW – presentation / business logic layer-Browser architecture – HTTP architecture, Methods.

HTML: Basic Structure – HTML tags – Tables – Forms – Links – Frames – DOM – Styling Tags.

CSS: Introduction – Types (Where to place CSS) – Rules – Selectors – Styling Fonts – Layouts – Positioning.

JavaScript: Scripting Languages – Syntax – Variables – Data Types – Operators – Expressions – Conditional Statements – Loops – Arrays – Functions – Event Handling – Enhancing HTML Documents with JavaScript.

PHP: Evaluation of PHP – Basic Syntax – Variables – Constants – Data Types – Operator – Expression – Form Processing – Looping – Functions – Arrays – Strings – PHP Global Array - Sessions – Cookies.

WEB PUBLISHING / HOSTING: Host Registration – Domain Registering – Server FTP Upload.

TEXT BOOKS:

1. Elizabeth Castro and Bruce Hyslop, “Visual Quickstart Guide: HTML5 and CSS3“, Peachpit Press, 2013.
2. David Flanagan, ”JavaScript: The Definitive Guide, O'Reilly Media, 2011.

REFERENCES:

1. RasmusLerdorf, Kevin Tatroe, ”Programming PHP”, OReily, 2013.

1. Create a simple website using html.
2. Create a website using CSS and JavaScript.
3. Create a simple php page to get the name of the user.
4. Create a form and receive the data using php.
5. Create and upload a website to the web using FTP.

Total P: 60

SEMESTER 3

15XW31 DISCRETE STRUCTURES

3 2 0 4

LOGIC AND PROOF: Logic - Propositional Equivalences - Normal forms –Predicates and Quantifiers – Nested Quantifiers – Methods of Proof - Mathematical reasoning**:** Proof strategy – Mathematical Induction – Program correctness. (10+7)

RELATIONS AND FUNCTIONS: Relations and their properties – Representing relations – Closures of relations – Partial orderings. Functions-Definitions – Composition of functions – Inverse functions – Binary and n-ary operations – Characteristic functions – Hashing function. (6+4)

COUNTING: Permutation and Combination – Generalized Permutation and Combination – Generating Permutation and Combination - Advanced counting techniques - Recurrence relation, Solving recurrence relations using characteristic roots. (7+5)

FORMAL LANGUAGES: Four classes of grammars (Phrase Structure, Context sensitive, Context Free, Regular) - Context free languages: generation trees - ambiguity. (3+2)

FINITE AUTOMATA: Finite State Automata (DFA) - Non-deterministic Finite State Automata (NDFA) - Conversion of NDFA to DFA - Equivalence of regular grammar and finite automata. (6+4)

PUSH DOWN AUTOMATA: Acceptance by final state and empty store, Equivalence of acceptance by final state and empty store, Equivalence of PDA's and CFL's. (7+5)

TURING MACHINES: Construction of simple Turing Machines - Universal Turing Machines - Halting problem. (6+3)

Total L: 45+T: 30=75

TEXT BOOKS:

1. Kenneth H Rosen, “Discrete Mathematics and its Applications”, Tata McGraw Hill, 2011.
2. John C Martin, "Introduction to Languages and the Theory of Computation", Tata McGraw Hill, 2014.

REFERENCES:

1. Tremblay J P and Manohar R, “Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill, 2011.
2. John E Hopcroft, Rajeev Motwani and Jeffrey DUllman, "Introduction to Automata Theory, Languages and Computation", Pearson Education, 2014.
3. Mishra K L P, Chandrasekaran N,”Theory of Computer Science: Automata Languages and Computation”, Prentice Hall, 2014.

15XW32 DATABASE MANAGEMENT SYSTEM

3 0 0 3

BASIC CONCEPTS: Introduction to databases – Conventional file processing – Purpose of database system – Characteristics of database approach – Advantages of using DBMS – Database concept and architecture – Data Abstraction – Data Models – Instances and Schema – Data Independence – Schema Architecture – Components of a DBMS. (7)

DATA MODELING: Introduction – Data associations – Entities, attributes, relationships – Type role and structural constraints – Weak and Strong entity types – Design of Entity Relationship data models (ERD) – Generalization – Aggregation – Conversion of ERD into tables – Applications – Introduction to Network data model and Hierarchical data model. (7)

FILE ORGANIZATION: Storage device characteristics – Constituents of a file – Operations on file – Serial files – Sequential files – Index sequential files – Direct files – Primary and Secondary Key Retrieval – Types of indexes - Indexing using Tree Structures. (6)

RELATIONAL MODEL: Introduction to Relational Data Model – Basic concepts – Enforcing Data Integrity constraints – Relational Algebra Operations – Extended Relational Algebra Operations (3)

RELATIONAL DATABASE MANIPULATION: Introduction to Structured Query Language (SQL) – SQL Commands for defining Database, Constructing database, Manipulations on database – Basic data retrieval operations – Advanced Queries in SQL – Functions in SQL – Aggregation – Categorization – Updates in SQL – Views in SQL –— PL/SQL Basics – Procedures – Functions – Triggers. (9)

DATA BASE DESIGN THEORY: Data base design process – Relational Database Design – Relation Schema – Anomalies in a database – Functional dependencies – Axioms – Normal forms based on primary keys – Second Normal form, Third Normal form, Boyce – Codd Normal form – Examples – Multi-valued dependencies – Fourth Normal form – Reduction of an E-R schema to Tables – Practical database design tuning. (6)

TRANSACTION PROCESSING AND CONCURRENCY CONTROL: Transactions, Locking techniques, Concurrent access, Deadlock handling (3)

DATABASE SECURITY, INTEGRITY CONTROL: Security and Integrity threats – Defense mechanisms – Discretionary Access Control and Mandatory Access Control. (4)

Total L:45

TEXT BOOKS:

1. Silberschatz A., Korth H and Sudarshan S., “Database System Concepts”, Tata McGraw Hill, 2011.
2. Elmasri R and Navathe S.B, “Fundamentals of Database Systems”, Pearson Education, 2015.

REFERENCES:

1. Date C J,Kannan A, Swamynathan S, “An Introduction to Database Systems”, Pearson Education, 2009.
2. Raghu Ramakrishnan and Johannes Gehrke, “Database Management System (Digitized)”, Tata McGraw Hill, 2010.
3. Graeme C Simsion, “Data Modeling Essentials”, Dreamtech, 2006.

15XW33 TRANSFORM TECHNIQUES

3 2 0 4

TRANSFORM METHODS: Basic waveforms and their properties, Operational calculus, concept of transformation, integral transforms, kernel of a transform, examples of transforms, linearity property. (2+1)

LAPLACE TRANSFORM: Definition – Transforms of standard functions – Transform of unit step function – Dirac -Delta function- Transforms of derivatives and integrals – Transforms of Periodic functions – Inverse Laplace transform – Convolution theorem – Solving ordinary linear differential equations with constant coefficient by Laplace transform technique. Transfer functions, applications to linear systems. (12+7)

FOURIER TRANSFORM: Fourier integrals – Fourier transform – Infinite Fourier sine and Cosine transform – Transforms of standard functions – properties, Convolution theorem (Concept &Statement) – relation with Laplace transform. (8+6)

DISCRETE FOURIER TRANSFORM: Discrete convolution – Periodic sequence and circular convolution –Decimation- in-time and decimation-in-frequency algorithms – Computation of inverse DFT. (7+5)

WAVELET TRANSFORM: Continuous wavelet transform, admissibility condition, Haar-wavelet, Mexican-hat-wavelet, Morlet-wavelet. Convolution. Inverse transform. Comparison with Fourier transform. Application – detection of signal changes. Case studies – analysis of sensor signals, analysis and classification of audio signals. (8+6)

DISCRETE WAVELET TRANSFORM: Discretization, Orthonormal wavelets, Haar-wavelet, Shannon-wavelet, Daubechies-wavelet. Comparison with Fourier series. Case studies – Energy compaction and compression for 1-d and 2-d signals. (8+5)

Total L:45+T:30=75

TEXT BOOKS:
1. Anthony Croft, Robert Davison, Martin Hargreaves, "Engineering Mathematics - A Foundation for Electronic, Electrical, Communications & Systems Engineers", Pearson Education, 2013.
2. Hans-Georg Stark, Wavelets and Signal Processing, Springer, 2009.

REFERENCES:
1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley, 2013.
2. Lokenath Debnath and Dambaru Bhatta, Integral Transforms and Their Applications, Chapman & Hall/CRC, 2010.
3. Michael D. Greenberg, "Advanced Engineering Mathematics", Pearson Education, 2013.
4. Thomas L. Harman, James Dabney and Norman Richert, "Advanced Engineering Mathematics with MATLAB", Thomson Brooks/Cole, 2000.

15XW34 ADVANCED DATA STRUCTURES

3 0 0 3

INTRODUCTION: Algorithm – analysis of algorithms – best case and worst case complexities, analysis of some algorithms using simple data structures, Amortized time complexity. (4)

BINARY SEARCH TREES: Searching – Insertion and deletion of elements – Analysis. (2)

AVL TREES: Definition – Height – searching – insertion and deletion of elements, AVL rotations – Analysis. (3)

SPLAY TREES: Definition, splay steps, searching, insertion and deletion, Amortized analysis. (2)

MULTIWAY SEARCH TREES: Indexed Sequential Access – m-way search trees – B-Tree – searching, insertion and deletion - B+ trees - Tries. (4)

GRAPHS: Definition – representations (Adjacency matrix, packed adjacency list and linked adjacency list) – network representation – Graph search methods (Breadth first and depth first traversals). (4)

DIVIDE AND CONQUER: Method – examples – Merge sort, Quick sort, Binary Search. (5)

GREEDY METHOD: Optimization problems – method – examples – Minimum cost spanning tree (Kruskal's and prim's algorithms), Topological sorting, optimal storage on tapes. (4)

DYNAMIC PROGRAMMING: Method – examples – All pairs shortest path problem – Traveling salesman problem. (4)

BACK TRACKING: Method – Examples – Eight queen's problem, Hamiltonian Cycles. (4)

BRANCH & BOUND: Method – Examples – 0/1 Knapsack, Traveling Salesman problem. (4)

NP-HARD, NP-COMPLETE CLASSES: Basic concepts – Non deterministic algorithms – satisfiability problem – NP-hard and NP-complete Problems – Cooks theorem (informal proof). (5)

Total L:45

TEXT BOOKS:
1. Thomas HCormen, Charles E Leiserson and Ronald LRivest, "Introduction to Algorithms", Prentice Hall, 2009.
2. Alfred VAho, John EHopcraft,Jeffrey D Ullman,"Data structures and Algorithms", Pearson Education, 2009.

REFERENCES:
1. SahniSartaj, "Data Structures, Algorithms and Application in C++", Silicon Press, 2011.
2. Ellis Horowitz and SahniSartaj, Dinesh Mehta, "Fundamental of Computer Algorithms", Galgotia,2006.

3. Robert L Kruse, Clovis L Tondo, Bruce P Leung,ShashiMogalla, “Data Structures and Program design in C”, Pearson Education, 2013.
4. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Pearson Education, 2013.

15XW35 MICROPROCESSOR SYSTEMS AND PROGRAMMING

3 0 0 3

INTRODUCTION TO MICROPROCESSORS: Evolution of Microprocessors - Microprocessor based systems - Advantages and limitations. (5)

INTEL 8086/88 PROCESSOR: Block diagram of 8086 - Addressing modes – Instruction format - Instructions - assembler directives – Construction of Machine code. (6)

ASSEMBLY LANGUAGE PROGRAMMING: Programs for multi precision addition, subtraction-block moves-array processing-string processing-procedures and macros. (5)

INTERRUPT SYSTEMS: Advantages and disadvantages of interrupts - Interrupt systems of 80x86 processors – Programmable Interrupt Controller. (4)

ADVANCED MICROPROCESSORS: Comparison of 286,386 processors with 8086-memory paging mechanisms-features of 486 and Pentium processors. (4)

PROTECTED MODE PROGRAMMING: Protected mode - descriptor tables-operation-programming. (5)

PENTIUM PROCESSOR: Special Pentium Registers – Super scalar Architecture – Pipelining – Branch Prediction. (5)

MEMORY DESIGN: Design of Memory sections for 8086 and 8088 Microprocessors. (5)

BASIC I/O INTERFACE: I/O port address decoding-useful I/O hardware - I/O devices - Programming Peripheral Interface – Direct Memory Access. (6)

Total L:45

TEXT BOOKS:

1. Barry B Brey, "The Intel Microprocessors - 8086/88, and 80186, 80286, 80386, and 80486", Prentice Hall, 2009.
2. Douglus V Hall, "Microprocessors and Interfacing", Tata McGraw Hill, 2010.

REFERENCES:

1. James L Antonakos, “The Intel microprocessor family: hardware and software principles and application”, Thomson Delmar, 2006.
2. Walter A. Triebel,Avtar Sing, “8088 and 8086 Microprocessors Programming”, Pearson Education, 2008.
3. Walter A Triebel, Kenneth J Ayala, “The 8088 and 8086 Microprocessors Programming, Interfacing, Software, Hardware and Applications”, Pearson Education, 2007.
4. Sivarama P. Dandamudi, Introduction to Assembly Language Programming: For Pentium and RISC Processors Springer, 2005

15XW36 RDBMS LAB

0 0 4 2

SQL

1. Working with DDL and DML commands of SQL for creation and manipulation of single, multiple tables.
2. Working with Triggers and stored procedures.
3. Developing a Package using a database.

Note: Problem Sheets will be provided.

TotalP:60

15XW37 ADVANCED DATA STRUCTURES LAB

0 0 4 2

Implementation of the following problems:

1. Binary search Trees and its operations with graphical display.
2. Demonstration of AVL Rotations.
3. B Trees.
4. An appropriate illustration using graphs and graph traversals.
5. Divide and Conquer versions of Merge sort, Quick sort and binary search.
6. Greedy method implementation of Topological sort, Minimum cost spanning tree.
7. Dynamic Programming implementation of Traveling Salesperson problem.

8. Eight queen's problem backtracking.
9. Knapsack using LC branch and bound.

Total P:60

15XW38 ASSEMBLY LANGUAGE PROGRAMMING LAB

0 0 4 2

1. Study of Assembler (Turbo) and Assembler Directives.
2. Study of INT 21H functions for input and output.
3. Multi-precision addition and subtraction.
4. Packing and unpacking of BCD digits.
5. Conversion of BCD numbers into ASCII characters and vice versa.
6. Delay loop implementation.
7. Arrangement of numbers in ascending and descending order.
8. Checking whether a given character string is a PALINDROME.
9. Usage of MACROS - Examples.
10. BCD to Binary conversion and vice versa.
11. To check whether a given string is a substring of another.
12. Implementation of LEFT(), RIGHT(), SUBSTR() functions.
13. To display the contents of the given memory locations.
14. Encryption and decryption of a message.
15. To find the Minimum and the Maximum number of a given array.

Total P:60

SEMESTER 4

15XW41 ACCOUNTING AND FINANCIAL MANAGEMENT

4 0 0 4

COST ACCOUNTING: Cost classification - significance of overhead Cost - Preparation of Cost sheet - Concept of cost volume profit analysis - Concept of variance - Principles of Job Costing, batch costing and Process costing - Operating Costing - Modern techniques/concepts of Cost Control/ Cost Management. (14)

FINANCIAL ACCOUNTING: Double Entry Book keeping concepts - Journalisation of Business Transactions - Subsidiary Books - Preparation of Profit and Loss Account and Balance sheet from Trial balance - Simple problems - Methods of depreciation. (16)

FINANCIAL RATIO ANALYSIS: Uses and Nature - preparation of Liquidity Ratios - coverage Ratios and profitability Ratios from profit & Loss Account and Balance sheet - common size Income statement and common size Balance sheet. (11)

GOALS AND FUNCTIONS OF FINANCIAL MANAGEMENT: Finance function - Importance of Corporation finance - objectives of Financial Management - organization of the finance function - concept of time value of money. (6)

PRINCIPLES OF CAPTIAL BUDGETING: Kinds of capital Budgeting Decisions - Evaluation of proposals from the given cash inflows - Net present value versus Internal rate of return method problems. (6)

WORKING CAPITAL MANAGEMENT: Definition and importance of working capital - factors affecting working capital - Inventory management - simple problems - Receivables Management - cash Budget Preparation - Estimate of overall working capital requirements - Various sources of financing . (7)

Total L:60

TEXT BOOKS:

1. Khan M Y, Jain P K, "Cost Accounting and Financial Management", Tata McGraw Hill, 2008.
2. Gupta R L, RadhaswamyM, "Advanced Accountancy", Sultan Chand & Sons, 2009.

REFERENCES:

1. Sharma R K and Shashi K Gupta, "Management Accounting - Principles and Practice", Kalyani Publishers, 2011.
2. KuchalS C, "Financial Management",Chaitanya Publishing House,2006.

15XW42 DATA COMMUNICATION NETWORKS

3 0 0 3

BASIC CONCEPTS: Introduction to Network Applications – Categories of Networks – Layered Architecture - The OSI Model – Functions of the Layers. (5)

DATA TRANSMISSION: Types of Network - Network Topologies- Analog and Digital data transmission- Data encoding- Bandwidth and data rate-. Bit Rate, Baud Rate.- Sampling Rate. (6)

CONNECTING DEVICES: Cabling**-**Auto crossover detection**-**Repeaters, Hubs, Bridges, Switches, Routers, Backbone networks (5)

SWITCHING: Circuit Switching - Space Division Switches – Time Division Switches - Space and Time Division Switch Combinations – Packet switching – Datagram Approach – Virtual Circuit Approach – Connection oriented Vs Connectionless Services. (5)

ERROR DETECTION AND CORRECTION : Transmission Impairments - Types of Errors – Single bit – Multiple bit – Burst Error – Detection – Vertical redundancy Check – Longitudinal Redundancy Check – Cyclic redundancy Check – Error Correction – Single bit Error Correction – Hamming Code. (5)

DATA LINK CONTROL AND PROTOCOLS: Line Discipline – Flow Control – Error control - Stop and Wait - Sliding Window – Synchronous Protocols – High Level Data Link Control, PPP. (5)

MULTIPLE ACCESS: Random access – Controlled access – Channelization – Local Area networks – Traditional Ethernet – Fast Ethernet, Gigabit Ethernet- Ethernet over optical links-SONET-SDH (8)

ADVANCED NETWORK ARCHITECTURES: Introduction to ATM –– MPLS: Fundamentals of labels – Label stack – VC merging – Label distribution protocol – Explicit routing for traffic engineering. (6)

Total L:45

TEXT BOOKS :

1. Behrouz A Forouzan, "Data Communication and Networking", Tata McGraw Hill, 2013.
2. William Stallings, “Data and Computer Communication”, Pearson Education, 2013.

REFERENCES :

1. Andrew S Tanenbaum, “Computer Networks”, Pearson Education, 2014.
2. Keshav S, “An Engineering Approach to Computer Networking”, Pearson Education, 2008.
3. Fred Halsall and Lingana Gouda Kulkarni, "Computer Networking and the Internet", PearsonEducation,2009.
4. Michael Duck and Richard Read, "Data Communications and Computer Networks: For Computer Scientists and Engineers", Pearson Education, 2011.

15XW43 OPERATIONS RESEARCH

4 0 0 4

INTRODUCTION : Statement of optimization problems – classification of optimization problems – classical optimization techniques - Single variable optimization - Multi variable optimization with equality constraints – solution by the method of Lagrange multipliers – Multivariable optimization with inequality constraints – Kuhn –Tucker conditions. (7)

LINEAR PROGRAMMING: Graphical method for two dimensional problems – central problems of Linear Programming – Definitions – Simplex – Algorithm – Phase I and Phase II of Simplex Method – Revised Simplex Method. (9)

Simplex Multipliers – Dual and Primal – Dual Simplex Method – Sensitivity Analysis – Transportation problem and its solution – Assignment problem and its solution by Hungarian method – Karmakar’s method – statement, Conversion of the Linear Programming problem into the required form, Algorithm. (9)

DECISION THEORY: Decision processes –Naïve decision criteria - Decision trees – Utility – Von Neumann Utilities (8)

NON LINEAR PROGRAMMING(UNCONSTRAINED OPTIMIZATION): Introduction – Random search method – Univariate method – Pattern search methods – Hooke and Jeeves method, Powell’s method- Simplex method – Gradient of a function – steepest descent method – Conjugate gradient method. (10)

DYNAMIC PROGRAMMING: Introduction – multistage decision processes – Principles of optimality – Computation procedures. (9)

SIMULATION: Introduction to Simulation – Simulation study – Types of Simulation – Limitations of Simulation – Areas of Simulation – Simulation of Queues, Networks and Inventory models. (8)

Total L:60

TEXT BOOKS:

1. Hamdy A Taha, “Operations Research – An introduction”, Prentice Hall, 2011.
2. Singiresu S Rao, “Engineering Optimization Theory and Practice”, John Wiley, 2014.

REFERENCES:

1. Kambo N S, “Mathematical Programming Techniques”, Affiliated East – West Publishing, 2012.
2. Hillier and Lieberman, “Introduction to Operations Research”, Tata McGraw Hill, 2010.
3. Jerry Banks, Barry L Nelson, ”Discrete Event System Simulation”, Prentice Hall, 2010.

15XW44 OPERATING SYSTEMS

3 2 0 4

INTRODUCTION: Abstract view of an operating system - Operating Systems Objectives and Functions – Evolution of Operating Systems - Dual-mode operation - Protecting I/O, memory, CPU, Kernels and micro-kernels – system calls- Structure of Operating System – Components of Computers – various components of operating systems. (5)

PROCESS DESCRIPTION AND CONTROL: Job/process concepts - Process Creation – Process Termination - Process states – Process Description – Process Control. (5)

PROCESS AND THREADS: Relationship between process and threads – Thread State – Thread Synchronization – Types of Thread – Multithreading model (3)

PROCESS SCHEDULING: Scheduling basics - CPU-I/O interleaving - (non-)preemption - context switching - Types of Scheduling – Scheduling Criteria – Scheduling Algorithms. (4)

PROCESS SYNCHRONIZATION AND DEADLOCK: Concurrent Process – Principles of Concurrency – Race Condition - Mutual Exclusion – Critical section problems – Software support – Hardware Support – Operating System Support – Deadlock: Deadlock Prevention, Avoidance and Detection and recovery. (4)

MEMORY MANAGEMENT: Memory hierarchy – Linking and Loading the process – Memory Management requirement - Fixed partitioning - Dynamic partitioning – Buddy Systems – Simple paging – Multilevel paging – Inverted paging – Simple Segmentation – segmentation and paging. (8)

VIRTUAL MEMORY MANAGEMENT: Need for Virtual Memory management – Demand Paging – Copy on write - Page Fault handling – Demand Segmentation – Combined demand segmentation and paging - Thrashing- working set model. (4)

FILE SYSTEM MANAGEMENT: Files – Access methods - File System Architecture – Functions of File Management –Directory and disk structure – file sharing – File system implementation – directory implementation - File Allocation – free space management. (5)

I/O MANAGEMENT AND DISK SCHEDULING: Organization of I/O function – Evolution of I/O function – Types of I/O devices – Logical Structure of I/O functions – I/O Buffering – Disk I/O – Disk Scheduling algorithms – Disk Cache. (5)

CASE STUDIES: UNIX, Linux, Windows NT. (2)

TEXT BOOKS:

1. Silberschatz A, Galvin PB and Gagne G, “Operating System Concepts Essentials”,John Wiley, 2014.
2. William Stallings, “Operating Systems”, Pearson Education, 2014.
3. Andrew S Tanenbaum, "Modern Operating System", Pearson Education, 2015.

REFERENCES:

1. Elmasri E, Carrick AG and Levine D, “Operating Systems: A Spiral Approach”, Tata McGraw Hill, 2012.
2. McHoes A M and Flynn I M, “Understanding Operating Systems”, Cengage Learning, 2013.
3. Dhamdhere D M, “Operating Systems: A Concept-based Approach”, Tata McGraw-Hill, 2012.
4. UreshVahalia,“Unix Internals”, Pearson Education, 2010.
5. DiazC, “Introduction to Unix/Linux”, Thomson Brooks/Cole, 2007.

TUTORIAL PRACTICE:

1. Practicing UNIX Commands
2. Writing SHELL Scripts
3. Writing programs using UNIX System Calls
4. Process Creation and Execution
5. Thread Creation and Execution
6. Process / Thread Synchronization using semaphore
7. Developing Application using Inter Process communication (using sharedmemory, pipes or message queues)
8. Implementation of Memory Management Schemes
9. Implementation of file allocation technique (Linked, Indexed, Contiguous)

Total L: 45+T: 30=75

15XW45 SOFTWARE ENGINEERING TECHNIQUES

3 0 0 3

INTRODUCTION: System - System Development - types of systems – people involved in the systems development – need for software Engineering - objectives & benefits of Software Engineering - Factors that influence Quality & Productivity – Quality attributes of a software product. (3)

THE SOFTWARE PROCESS: A generic view of process - Process Framework – Process Patterns – Process Assessment – Process Technology – Product & Process. Process Models - The Waterfall Model – Incremental Process Model – Evolutionary Process model – Specialized Process Models &The Unified Process**.** (3)

SOFTWARE PLANNING: Software Project Estimation - different techniques of project cost estimation Decomposition technique - COCOMO & PUTNAM models. (3)

REQUIREMENTS ENGINEERING: Requirements Engineering tasks – Initiating Requirements Engineering Process – Eliciting Requirements – Negotiating Requirements – Validating Requirements. Methods - Semantic Data models- Object oriented approaches - View point oriented Requirements Methods - Structured Analysis and Design Technique (SADT), CORE, VOSE, VORD. (6)

BUILDING THE ANALYSIS MODEL: Requirements Analysis – Analysis Modeling approaches – Data Modeling concepts: Data Dictionary – ERD, Flow Oriented Modeling: Data Flow Diagram – Creating a Behavioral Model – State Transition Diagram. (6)

DESIGN ENGINEERING: Design Process & Design Quality – Design Concepts – The Design Model: Data Design Elements – Architectural Design Elements – Interface Design Elements – Component level Design Elements – Deployment level Design Elements. Design Tools: HIPO diagram - Structure Chart - Decision Tree - Decision Table - Structured Flowchart - Structured English – Pseudo code – Nassi-Shneiderman Diagram. (10)

SOFTWARE TESTING & DEBUGGING: Testing Strategies – Testing Tactics – Testing Methodologies and Debugging Methods – study of automated Testing tools. (7)

SOFTWARE IMPLEMENTATION: System Documentation Manuals - Document review - Software Training - Post Implementation Review - Maintenance issues. (3)

CASE STUDIES (4)

Total L: 45

TEXT BOOKS:

1. Pressman R S, “Software Engineering - A Practitioner’s Approach”, Tata McGraw Hill, 2015.
2. PankajJalote, “Integrated Approach to Software Engineering”, Springer, 2014.

REFERENCES:

1. Shari Lawrence Pfleeger and Joanne M Atlee, “Software Engineering Theory and Practice”, Pearson Education, 2014.
2. Ian Sommerville, “Software Engineering”, Pearson Education, 2014.

15XW46 COMPUTER NETWORKS LAB

0 0 4 2

1. Study of different types of Network cables and Practically implement the cross-wired cable and straight through cable using clamping tool.
2. Parallel Communication using 8 bit parallel cable
3. Serial communication using RS 232C
4. Network Protocol Analysis
5. Operating Systems and LAN Implementation
6. Study of basic network command and Network configuration commands.
7. Configure a Network topology using packet tracer software.
8. Familiarizing with various tools like Ethernet analyser, traffic generation (XIA)
9. PPP client server connection
10. Configure a Network using Distance Vector Routing protocol
11. Spanning tree protocol.

Total P:60

15XW47 WINDOWS PROGRAMMING LAB

0 0 4 2

MICROSOFT FOUNDATION CLASS FRAMEWORK: Windows Architecture - Event driven programming – Message handling - Resources - Icons - Menus - Cursors – Toolbars – Dialog Boxes - Property Sheets, Wizards – Graphical Device Interface - GDI Objects – Text functions- Fundamentals of DirectX - Direct2D, Direct 3D Bitmaps - Document/view architecture –Document Classes - View Classes - Multiple Views.

.NET PROGRAMMING USING C#: Introduction to NET - C# Language Features - OOP with C# - Types and members - Inheritance and Interfaces – Delegates - Events - Lambda Expressions – Generics - NET Framework APIs - File Handling and

Serialization - LINQ to Objects - ADO.NET Entity Framework - Memory Management APIs - Threading -Thread pool- Signaling events- Synchronization.

WINDOWS PRESENTATION FOUNDATION: WPF concepts and features - Creating a simple WPF application - Event Handling - Creating a User Interface - Managing Windows - Resources, Styles, and Triggers - Control Templates - Data Binding in WPF - Binding to LINQ and XML - Multithreading with WPF.

TEXT BOOKS:

1. Jeff Prosise, "Programming Windows with MFC", Microsoft Press, 2003.
2. Herbert Schildt, "MFC Programming from the Ground up", Tata McGraw Hill, 2008.
3. Chris Anderson, "Essential Windows Presentation Foundation (WPF)", Addison-Wesley Professional, 2009.

REFERENCES:

1. Jeffrey Ritcher, "CLR via C#", Microsoft Press, 2010.
2. Anthony Northrup, "MCAD/MCSD Self-Paced Training Kit: Developing Web Applications with Microsoft Visual Basic .NET and Microsoft Visual C# .NET", Microsoft Press, 2004.
3. Charles Petzold, "Programming Microsoft Windows with C#" ,Microsoft Press, 2001.
4. Mark Russinovich , David A. Solomon , Alex Lonescu , "Windows Internals Part1", Microsoft Press, 2012.

EXERCISES:

1. Applications using MFC.
2. Windows forms applications using .NET
3. Building custom controls using .NET framework
4. Windows applications using Data binding
5. Standalone and Web Applications using WPF

Total P:60

15XW48 MATHEMATICAL COMPUTING LAB

0 0 4 2

TRANSFORM TECHNIQUES:

1. Construct basic waveforms and interpret their properties.
2. Solve Differentiation, integration and differential equations.
3. Evaluate Laplace transform and its inverse.
4. Solve initial value problems using Laplace transform techniques.
5. Evaluate Harmonics of Fourier series and its expression.
6. Find Infinite Fourier transform and inverse.
7. Find Infinite Fourier sine and cosine transform.
8. Sampling of Continuous function.
9. Find Convolution of Discrete Fourier transform.
10. Fast Fourier transform – Decimation- in-time and decimation-in-frequency algorithms and inverse.
11. Construct planes, lines, skew lines, circle and sphere in 3D geometry.

OPTIMIZATION TECHNIQUES:

1. Solving L.P.P using Simplex, Two phase Dual Simplex and Revised Simplex methods.
2. Finding initial basic feasible solution by North-West corner rule, Matrix minimum method and Vogel's approximation method and also perform optimality test by Modi method.
3. Solving Nonlinear programming problems.
4. Solving Dynamic programming problems.
5. Solving Simulation problems.

Total P:60

SEMESTER 5

15XW51 UNIX ARCHITECTURE AND PROGRAMMING

3 0 0 3

INTRODUCTION TO UNIX : File System – Essential Commands - General Purpose Utilities - Bourne Shell – SimpleFilters - Advanced filters – sed, awk- Process - Communication and Scheduling - Programming with Shell – File System Architecture. (14)

FILE SYSTEM STRUCTURE: Kernel architecture - Kernel data structure - Buffer Cache - Structure of Buffer pool - Scenarios for buffer retrieval - Reading and Writing disk blocks - Advantages and Disadvantages of buffer cache - Inode - Structure of regular file - Conversion of a pathname to an inode - Inode assignment to a new file - allocation of disk blocks. (15)

PROCESS SYSTEM : Process states and transitions - Context of a process - Saving the context of a process - Manipulating Process address space - Process creation and termination – Signals – Awaiting Process Termination - System Boot and INIT process - Process Scheduling – Functions of a Clock Interrupt Handler. (10)

MEMORY MANAGEMENT: Swapping - allocation of swap space – Swapping Processes Out – Swapping Processes in - Demand Paging - Data structures of demand paging - Page stealer Process - Page faults. (6)

Total L:45

TEXT BOOKS:

1. Sumithabha Das, "Unix System V.4 - Concepts and Applications", Tata McGraw Hill, 2008.
2. Maurice J Bach, "Design of the UNIX Operating System", Prentice Hall, 2007.

REFERENCES:

1. Sumitabha Das, “Your Unix the Ultimate Guide “, Tata McGraw Hill, 2012.
2. Richard F Gilberg, Behrouz A Forouzan,”Unix and Shell Programming - A Text Book (Digitized)”, ThomsonBrooks/Cole, 2009.
3. UreshVahalia, "UNIX Internals: The New Frontiers", Pearson Education, 2010.
4. Keith Haviland, Dina Gray, “Unix System Programming (Digitized)”, AddisonWesley, 2007.

15XW52 JAVA PROGRAMMING

3 0 0 3

JAVA PROGRAMMING: Introduction - Data Types - Operators - Declarations - Control Structures - Arrays and Strings - Input/Ouput.-Java Classes - Fundamentals - Methods - Constructors - Scope rules - this keyword - object based vs oriented programming.- -Inheritance-Reusability - Composing class - Method overloading - Abstract classes - Virtual Functions. (8)

PACKAGES AND INTERFACES: Packages - Access protection - Importing packages - Interface - Defining and Implementing Interface - Applying Interface - Variables in Interfaces. (6)

EXCEPTION HANDLING: Fundamentals - Exception types - Uncaught Exception - Using Try and Catch - Multiple catch clauses - Nested Try statements - Throw - Throws - Java Built-in Exception - Creating your own subclasses. (6)

MULTI THREADED PROGRAMMING: Java thread model - Priorities - Synchronization - Messaging - Thread class and runnable Interface - Main thread - Creating the Thread - Synchronization - Interthread Communication – Deadlock. (10)

I/O, APPLETS: I/O basics - Stream - Stream Classes - Predefined stream - Reading/Writing console input - Applet fundamentals - Native methods.- GUI Components - Applets - Java Scripts – Swing. (7)

NEW FEATURES IN J2SE V5.0: Generics – Enhanced for Loop – Autobox – Auto unboxing – Enums – Varargs – Static import – Annotations – Collections Frameworks – List – Vector – Set – Array - Maps . (8)

Total L:45

TEXT BOOKS:

1. Herbert Schildt, "JAVA - The Complete Reference", Tata McGraw Hill, 2014.
2. Horstmann, Cornell, “Core Java”, Prentice Hall, 2012.

REFERENCES:

1. Harvey M Deitel,Paul J Deitel, "JAVA: How to Program", Prentice Hall, 2013.
2. William Stanek, Peter Norton, "Peter Norton's Guide to Java Programming",Tech Media, 2008.
3. Paul Deitel, Harvey Deitel, "Java for Programmers", Pearson Education, 2012.
4. Ivor Horton, “Beginning Java 2 JDK 5 Edition”, Wiley Dreamtech, 2007.
5. Herbert Schildt ,“Java 2 V.5.O (Tiger) New Features”, Tata McGraw Hill, 2004.

15XW53 TCP/IP NETWORKS AND APPLICATIONS

3 0 0 3

REVIEW OF NETWORK ARCHITECTURE: Introduction – Internetworking concepts – TCP/IP Reference Model – Comparison with OSI reference model. (3)

INTERNET ADDRESSES: Classes of IP Address – Special Addresses – Concept of Subnetting and Supernetting. Classless addressing – IPV6. (6)

INTERNET PROTOCOL (IP): Introduction – Purpose – IP format – Address Resolution – ARP –DHCP – ICMP (7)

ROUTING : IP forwarding – Core Routers – Peer backbones – AS – Vector Distance Routing – Linkstate Routing – Path Vector Routing – RIP, OSPF (6)

TCP&UDP: Ports, UDP header, TCP header, connections, ACK, sliding windows, options, connection states. : Analysing packets – performance measurements- Congestion control – Quality of Service- Integrated Services (8)

APPLICATION LAYER: DNS – TELNET – FTP – SMTP - SNMP - HTTP. (8)

SECURITY- Firewalls and Internet Access – Packet Level Filters – Firewall Architecture- DMZ, proxy servers, IDS-VPN- Need for VPN-Addressing and Routing – Application Gateway – Network Address Translation (NAT) – Multi Address NAT – Port Mapped NAT (7)

Total L:45

TEXT BOOKS:

1. Behrouz A Forouzan, "TCP/ IP Protocol Suite", McGraw Hill, 2010.

REFERENCES:

1. Kevin R Fall, Richard Stevens W**, "**TCP/IP Illustrated, Volume 1: The Protocols", Pearson Education, 2012.
2. James F. Kurose, Keith Ross**, "**Computer Networking: A Top-Down Approach" , Addison Wesley, 2012.
3. Douglas Comer, "Internetworking with TCP/IP", Prentice Hall, 2013.
4. William Stallings, "Data and Computer Communications", Pearson Education, 2009.

15XW54 OBJECT ORIENTED ANALYSIS AND DESIGN

3 2 0 4

SOFTWARE DEVELOPMENT BEST PRACTICES: The Rational Unified Process – Static Structure Process description – Dynamic Structure – Iterative Development – An Architecture centric process, a use-case driven process – Process workflows. (12)

UNIFIED PROCESS: Phases – Inception, Elaboration, Construction, Transition. (10)

UML: The importance of modeling - Basic structural modeling – Advanced Structural modeling – Basic behavioral modeling – Advanced behavioral modeling – Architectural modeling. (10)

UML DIAGRAMS: Class Diagrams, Sequence Diagrams, Class Diagram Advanced concepts, Object Diagrams, Package Diagrams, Deployment Diagrams, Use cases, State Machine Diagrams, Activity Diagrams, Communication Diagrams, Composite Structures, Component Diagrams, Collaborations, Interaction overview Diagrams, Timing Diagrams. (13)

TEXT BOOKS:

1. Philippe Krucheten,"The Rational Unified Process – An Introduction ", Pearson Education, 2004.
2. Grady Booch, James Rumbaugh and Ivar Jacobson, "The Unified Modelling Language User Guide", Pearson Education, 2009.
3. Craig Larman, "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development", Prentice Hall Professional, 2005.

REFERENCES:

1. Martin Fowler, "UML Distilled ", Pearson Education, 2009.
2. John Hunt, "The Unified Process for Practitioners: Object-oriented Design, the UML and Java", Springer Science and Business Media, 2013.

TUTORIAL PRACTICE:

UML Modeling for Case Studies:

1. Use case diagram for credit card processing
2. Sequence diagram and Collaboration diagram for database connectivity
3. Interaction diagram for grocery shopping
4. Activity diagram for order processing
5. State diagram for CPU execution
6. Class diagram for electronic shopping cart
7. Package diagram for web server connection
8. Deployment diagram for TCP/IP layout

Total L: 45+T: 30=75

15XW56 JAVA PROGRAMMING LAB

0 0 4 2

1. To create runtime polymorphism using abstract class, interface
2. To create callback feature using interface.
3. To create a program for interface inheritance
4. To implement a user defined package
5. To implement a user defined checked exception and unchecked exception
6. To create threads, thread groups
7. To create inter-thread communication using shared memory, piper stream.
8. To implement socket connections (UDP, TCP).

Total P:60

15XW57 TCP/IP APPLICATIONS LAB

0 0 4 2

1. Introduction to a network simulator like NS-2.
2. Using a simulator configure a router.
3. Static and default routing.
4. Configure and test RIP and OSPF.
5. Create a TCP socket between a server and a client and authenticate the user.
6. Implement a Package using the concepts of socket programming.

Total P:60

15XW58 UNIX SHELL AND SYSTEM PROGRAMMING LAB

0 0 4 2

1. Simple Bash shell Programs with basic Unix Commands – Essential Commands, General Purpose Utilities, Filters, Process and Communication.
2. Bash Shell Programs using advanced programming concepts like getopts.
3. Low level File, Process and IPC System Calls using C.
4. Implement a package using Shell Programming / System Calls

Note: Separate Problem Sheets will be provided for Shell and System Calls.

TotalP:60

SEMESTER 6

15XW61 PRINCIPLES OF COMPILER DESIGN

3 0 0 3

ASSEMBLERS: General Design procedures – Design of an Assembler – data structures – format of databases – algorithm – flow chart – PASS structures – modular functions. (6)

MACRO LANGUAGE AND MACRO PROCESSORS: Macro instructions, features of a macro facility – implementation. (6)

LOADERS: Loader schemes – compile and go loaders, general load scheme – absolute loaders – direct linking loaders and their design. Other loading schemes: linking loaders, overlays, dynamic binders. (6)

COMPILERS: Introduction – Structure of a compiler – phases of a compiler - compiler writing tools - Bootstrapping. (2)

LEXICAL ANALYSIS: Role of a lexical analyzer – finite automata –regular expressions to finite automata – minimizing the number of states of a deterministic finite automata – implementation of a lexical analyzer. (6)

PARSING TECHNIQUES: Context free grammars – derivations and parse trees – ambiguity – capabilities of context free grammars. Top down and bottom up parsing – handles – shift reduce parsing – operator precedence parsing – recursive descent parsing – predictive parsing. (8)

Automatic Parsing Techniques – LR parsers – canonical collection of LR (0) items – construction of SLR parsing tables. (3)

INTERMEDIATE CODE GENERATION: Postfix notation, Quadruples, triples, indirect triples, Translation of Expressions - control flow – Representing information in a symbol table – introduction to code optimization – basic blocks – DAG representation – error detection and recovery - code generation. (8)

Total L:45

TEXT BOOKS:

1. John J Donovan, “Systems Programming”, Tata McGrawHill, 2012.

2. Dhamdhere D M, “Systems Programming”, Tata McGrawHill, 2012.

REFERENCES:

1. Alfred V Aho, Monica S Lam, Ravi Sethi, Jeffrey D Ullman, “Compilers: Principles, Techniques and Tools”, Pearson,2013.
2. Dhamdhere D M, “Compiler Construction Principles and Practice”, Macmillan,2008.
3. Allen I Holub “Compiler Design in C (Digitized)”, Prentice Hall, 2015.
4. Leland L. Beck, “System Software: An Introduction to Systems Programming”, Pearson India, 2002.

15XW62 MACHINE LEARNING

3 0 0 3

INTRODUCTION: Machine learning - supervised and unsupervised learning – Classification – Regression – Generative models – Discriminative models - Model selection and generalization. (7)

INSTANCE BASED LEARNING : k-Nearest neighbor – Classification and regression using k.NN (2)

PROBABILISTIC LEARNING : Bayesian decision theory- Classification- losses and risks – Discriminant functions – Logistic regression (7)

PARAMETRIC METHODS: Maximum likelihood estimation - Evaluating an estimator – Bayes estimator- Multivariate methods – Estimation of missing values - Multivariate classification and regression. (6)

DIMENSIONALITY REDUCTION: Subset selection - Principal component analysis - Factor analysis - Linear discriminant analysis (5)

CLUSTERING: Expectation maximization - K means clustering - Hierarchical clustering – Choosing the number of clusters. (6)

DECISION TREES: Univariate trees – Rule extraction from trees – Pruning trees - Multivariate trees. (5)

SUPPORT VECTOR MACHINES:Linearly separable data, overlapping classes, non-linearly separable, regression (4)

GRAPHICAL MODELS: Bayesian Networks, Hidden Markov Models (3)

Total L:45

TEXT BOOKS:

1. Christopher M Bishop, “Pattern Recognition and Machine Learning”, Springer, 2013.
2. Richard O Duda, Peter E Hart and David G Stork, “Pattern Classification (Digitized)”, John Wiley, 2012.

REFERENCES:

1. David Barber, “Machine Learning: A Probabilistic Approach”, http://www.idiap.ch/~barber, 2006.
2. AlpaydinEthem, “Introduction to Machine Learning”, Massachusetts Institute of Technology Press, 2009.
3. Trevor Hastie, Robert Tibshirani and Jerome Friedman, “The Elements of Statistical Learning”, Springer, 2013.

15XW63 SOFTWARE PATTERNS

3 2 0 4

INTRODUCTION TO PATTERNS: Reusable object oriented software, Motivation, Best design practices of object oriented software, Coupling and Cohesion, Types of Cohesion and Coupling, Benefits of patterns, Definition of a Pattern, Types, Pattern description, Pattern Language, IDIOMS, Framework, Architecture. (6)

DESIGN PATTERNS: Creational patterns – Abstract factory, Builder, Factory method, Prototype, Singleton, Structural patterns – Adapter, Bridge, Composite, Decorator, Façade, Flyweight, Proxy, Behavioral patterns – Command, Interpreter, Iterator, Mediator, Memento, Observer, State, Strategy, Template method, Visitor, Chain of Responsibility, Case Studies. (15)

ARCHITECTURAL PATTERNS: From Mud to Structure – Layers, Pipes and Filters, Blackboard, Distributed systems – Broker, Interactive Systems – Model View Controller (MVC), Presentation Abstraction Control, Adaptable Systems – Reflection, Microkernel. Anti-Patterns. (3)

REFACTORING: What is refactoring, Principles in refactoring, Bad smells in code, Refactoring Techniques - Composing methods, Moving features between objects, Organizing data, Simplifying conditional expressions, Making method calls simpler, Dealing with generalization. Design Refactoring – Technical Debt, Design Smells, Abstraction Smells, Encapsulation Smells, Modularization Smells, Hierarchy Smells, Architectural Refactoring. Refactoring Tools. (9)

TEXT BOOKS:

1. Erich Gamma, Richard Helm, Ralph Johnsons and John Vlissides, “Design Patterns: Elements of Reusable Object-Oriented Software”, Pearson Education, 2004.

2. Frank Buschman, Regine Meunier, Hans Rohnert, Peter Sommerlad and Michael Stal, “Pattern-Oriented Software Architecture: A System of Patterns”, John Wiley, 2011.
3. Martin Fowler, Kent Beck, William Opdyke, Don Roberts, “Refactoring: Improving the Design of Existing Code”, Addison-Wesley Longman, 2012.

REFERENCES:

1. Sherif Yacoub, Hany Ammar, “Pattern-Oriented Analysis and Design: Composing Patterns to Design Software Systems”, Pearson Addison-Wesley, 2003.
2. Girish Suryanarayana, Ganesh Samarthyam, Tushar Sharma, “Refactoring for Software Design Smells: Managing Technical Debt”, Morgan Kaufmann Publishers, Elsevier Inc., 2014.

TUTORIAL PRACTICE:

1. Developing object oriented systems using Design Patterns.
2. Designing and giving architectural solutions to real time systems using Architectural Patterns.
3. Refactoring open source projects using Refactoring tools.
4. Develop simple refactoring tools.
5. Adopt new refactoring techniques to make the implementation more reusable.

Total L: 45+T:30=75

15XW64 SOFTWARE TESTING

3 2 0 4

INTRODUCTION: Need for testing – Psychology of testing – Testing economies – Types of testing – SDLC and testing – Verification and Validation. (6)

DEVELOPING A TEST APPROACH: Defining a software system testing strategy - Developing software system testing tactics - Testing tools – Test Plan and Test Cases. (4)

TESTING A SOFTWARE USING A LIFE CYCLE METHODOLOGY: Requirements phase testing - Design phase testing - Program phase testing - Desk debugging and program peer view test tools - Evaluating test results - Installation phase testing - Acceptance testing. (10)

TESTING METHODOLOGY FOR SOFTWARE MAINTENANCE: Testing the correctness of the installing a software change - Testing the validity of a software cost estimate - Testing the progress of the software system - Inspecting test plan and test cases - Software Inspection - Costs and Benefits - Overview - The Inspection Process. (8)

TESTING OBJECT ORIENTED SOFTWARE: Challenges – Differences from testing non-OO software – Class testing strategies – class modality – State based testing. (3)

TESTING METHODLOGIES : Testing Rapid Application Development– Testing Adequacy of System Documentation – Testing Web based systems-Testing off the shelf Software – Testing in Multi-platform environment – Testing Security – Testing Data warehouse – Testing Metrics – Evaluating test effectiveness (10)

TECHNIQUES FOR AUTOMATING TEST EXECUTION: Testing and test automation – Tool support for lifecycle Testing - Common problems of test automation – limitations of automating software testing. (4)

TEXT BOOKS:

1. William Perry, "Effective Methods for Software Testing", John Wiley, 2009.

REFERENCES:

1. John Watkins, “Testing IT: An off the shelf Software Testing Process”, Cambridge Press, 2010.
2. John Watkins, “Agile Testing: How to succeed in an extreme Testing environment”, Cambridge Press, 2009.
3. Boris Beizer, “Software Testing Techniques”, Dream Tech Press, 2003.

TUTORIAL PRACTICE :

1. Preparation and Review of SRS and Design documentation for developed package.
2. Exercise for code review process.
3. Prepare test plan for developed package.
4. Prepare test cases for Unit Testing
5. Prepare test cases for System and Integration Testing
6. Prepare test cases for Acceptance (End to end scenario) and Regression testing.
7. Execute Test cases for each scenario and document the outcome (Bugs raised, status, verification etc)
8. Log Bugs in Bug Management Tool.
9. Update the different versions of the code onto a Version Control System.
10. Test the package for load, performance and other non-functional requirements using open source tools.

Total L: 45+T: 30=75

15XW66 PRINCIPLES OF COMPILER DESIGN LAB

0 0 4 2

1. Study of Programming Systems Assembler, Macro Processor, Editor, Debugger.
2. Study of basic features of DOS and UNIX internals.
3. Design and Implementation of a Text Editor.
4. Design and Implementation of a simple Assembler.
5. Design and Implementation of a Macro Processor.
6. Implementation of Transition diagram to strip off comment statements from a given source file.
7. Development of a Lexical Analyzer.
8. Design and Implementation of a Symbol Table Manager.
9. Implementation of the following Parsing algorithms.
   a. Recursive descent Parser b. Shift reduce Parser.
10. Implementation of a Syntax Directed Translation Engine to
    a. Simulate a Desk Calculatorb. Generation of Postfix code.

Total P:60

15XW67 MACHINE LEARNING LAB

0 0 2 1

Download the datasets from UCI machine learning repository / www.kaggle.com for classification and clustering

1. Implement the following Classification algorithms for the above datasets
   a. Naïve Bayes Algorithm
   b. Decision tree
   c. SVM
   d. K nearest neighbor
2. Do tenfold cross validation experiments and statistical validation using t-test and ANOVA
3. Implement different clustering techniques

Total P:30

15XW68 DISTRIBUTED ENTERPRISE COMPUTING LAB

0 0 4 2

DISTRIBUTED MULTI-TIER COMPUTING: Introduction – Basis of distributed computing - Centralized vs Distributed systems – Distributed operation system – Single System image – transparencies– decomposition approaches – layers and tiers.
CLIENT/SERVER COMPUTING : Approaches to client server computing –enterprise architectural overview - component based software development for enterprise – java enterprise system - operating system services for client – server types – server side scripting – operating system services for server – client and server software requirements
MIDDLEWARE: Architecture – classification of middleware – database middleware – drivers, connection, statements - communication middleware – transaction middleware – isolation – interfacing.
Enterprise Web Communication – Java servlets – HTTP Servlet, generic servlets, Java server pages – elements of JSP – JSTL.
MULTI-TIER ENTERPRISE COMPUTING: Middleware services **–** development and deployment **-** Enterprise Java Beans – types – lifecycle – entities – POJO – POJI – Java persistent query language - accessing ejbs using JSP – XML processing APIs
DISTRIBUTED ENTERPRISE COMMUNICATION: RMI – CORBA – DCOM – Java Messaging Service – Message oriented middleware services – publish/subscribe messaging – AJAX – JSON
JAVA WEB SERVICES: Web service standards – Describing and publishing – JAX-WS – SOAP
DISTRIBUTED ENTERPRISE SYSTEMS: Services using EJB: Naming Services, Directory and Trading services, Activation Services, Transaction Services, Security Services
FRAMEWORKS: Struts - Java Server Faces – Spring – Hibernate – Ruby on Rails

TEXT BOOKS:

1. Robert Orfali, Dan Harkey and Jeri Edwards, “Client / Server survival Guide”, Wiley, 2011.
2. Rima Patel Sriganesh, Gerald Brose and Micah Silverman, Mastering Enterprise JavaBeans 3.0”, Wiley, 2006.
3. Rod Johnson, JuergenHoeller, AlefArendsen, Thomas Risberg and Colin Sampaleanu, “Professional Java Development with the Spring Framework”, Wiley, 2008.

REFERENCES:

1. George Reese, “Database programming, with JDBC and Java", O’Reilly, 2013.
2. Dustin R. Callaway - "Inside Servlets " Pearson Education, 2009.
3. Sam Ruby, Dave Thomas, David Heinemeier Hansson, “Agile Web Development with Rails (Pragmatic Programmers)”, Pragmatic Bookshelf, 2011.

4. Dave Minter and Jeff Linwood, ""Beginning Hibernate: From Novice to Professional", Apress, 2010.
5. Ted Husted, Cedric Dumoulin, George Franciscus, David Winterfeldt, and Craig R McClanahan, "Struts in Action: Building Web Applications with the Leading Java Framework", Manning Publications, 2006.
6. Craig Walls and Ryan Breidenbach, "Spring in Action", Dreamteach, 2008.
7. Mike Keith and Merrick Schincariol, "Pro EJB 3: Java Persistence API (Experts Voice in Java)", APress, 2006.

Programs to demonstrate:

1. Develop a host application and install it in another system.
2. Convert the developed application to two, three and multi-tiered application using the latest front and back end technologies.
3. Migrate the application to distributed environment.
4. Demonstrate the communication between the tiers using interfaces.
5. Session beans.
6. Entity and Message Driven Beans.
7. RMI communication between two applications.
8. Web Service with its client.
9. Conversion of entity bean to web service.
10. Java Transaction API.
11. Application using any one of the frameworks.

Total P:60

SEMESTER 7

15XWP1 PROJECT WORK I

0 0 0 12

SEMESTER 8

15XW81 DATA MINING

3 0 0 3

INTRODUCTION: Motivation for Data Mining – Importance – Definition – Kinds of data for Data Mining – Data Mining functionalities – Patterns – Classification of Data Mining Systems – Major issues in Data Mining. (3)

DATA PREPROCESSING: Types of data, Data cleaning, Aggregation, Sampling – Data Reduction – Feature subset selection - x^2 and Information Gain. (5)

DATA WAREHOUSE and OLAP TECHNOLOGY: Overview- Need for Data Warehouse- multidimensional data model-Data Warehouse architecture -Data warehousing Schemas - Data Warehousing to Data mining (5)

MINING FREQUENT PATTERNS, ASSOCIATIONS AND CORRELATIONS: Basic concepts – Efficient and Scalable Frequent Itemset Mining methods – Apriori, FP Tree . (5)

ENSEMBLE OF CLASSIFIERS: Classification –Evaluating the accuracy of a classifier- Ensemble Learning–Bagging, Boosting, Cascading – Ensemble pruning. (5)

CLUSTERING: Categorization of major clustering methods – density based methods –DBSCAN, OPTICS, DENCLUE- Outlier analysis. (3)

MINING DATA STREAMS: Challenges-Mining time- Series databases and sequence data –Stationary data stream learning-Hoeffding trees- Evolving data stream mining. (5)

MINING MASSIVE DATA SETS- Challenges- Distributed file system – Introduction to Map Reduce- Mining high dimensional association rules-CARPENTER- classifying high-dimensional data- PLANET- clustering high-dimensional Data-BIRCH-Distributed Data Mining (8)

APPLICATIONS AND TRENDS IN DATA MINING: Spatial Data Mining –Graph Mining- Web Mining –Text Mining. (6)

Total L:45

TEXT BOOKS:

1. Jiwei Han, MichelineKamber , " Data Mining – Concepts and Techniques", Morgan Kaufmann, 2011.
2. Tan, Steinbach, Kumar, "Introduction to Data Mining", Pearson Education, 2014.

REFERENCES:

1. AnandRajaraman, and Jeffrey Ullman, “Mining Massive Data sets”, Cambridge University Press, 2014.
2. Trevor Hastie, Robert Tibshirani, Jerome Freidman,” The Elements of Statistical Learning: Data Mining, Inference, and Prediction”, Springer, 2011.
3. Ian Witten, Frank Eibe, Mark A Hall and Geffery Holmes, "Data Mining: Practical Machine Learning Tools”, Elsevier, 2011.

15XW82 SOFT COMPUTING

3 0 0 3

ARTIFICIAL INTELLIGENCE AND SOFT COMPUTING: Subject of AI – Problem solving by intelligent search – Breadth First Search, Depth First Search, Iterative Deepening, Hill Climbing, Iterative Deepening, A*, Best First Search. (7)

GENETIC ALGORITHM: Basic Concepts – Encoding – Binary, Permutation, Tree, Value – Fitness Function – Reproduction – Roulette Wheel, Boltzmann, Tournament, Rank, Elitism – Operators - Crossover – Single point, Two point, Multi point, Uniform, Matrix, Partially Matched, Order and Cycle – Mutation – Flip, Swap, Inverse – Application. (8)

FUZZY SET THEORY: Basic Definitions and Terminologies – Set theory operations – Membership function formulation and parameterization – Fuzzy rules and reasoning – Extension principle and fuzzy relations, Fuzzy if then rules, Fuzzy reasoning – Fuzzy Inference Systems – Mamdani fuzzy model, Sugeno Fuzzy models, Tsukamoto fuzzy models. (13)

NEURAL NETWORKS– Fundamentals – Neural Network Architecture – Learning methods - Simple neural nets – McCulloch Pitts – Linear separability – Hebb Net – Perceptron – Standard Back Propagation Network – Radial Basis Function Network - Pattern Association – Hebb rule – Hetero associative memory – Auto associative memory – Iterative Associative net – Discrete Hopfield Net – Bidirectional Associative Memory – Competitive net – Kohonen Self Organizing Map – Adaptive Resonance Theory. (17)

Total L:45

TEXT BOOKS:

1. AmitKonar, “Artificial Intelligence and Soft Computing”, CRC Press, 2008.
2. Stuart Russell, Peter Norvig, “Artificial Intelligence: A modern Approach”, Pearson Education, 2014.

REFERENCES:

1. Rajasekaran S,VijayalaskhmiPai G A, “Neural Networks, Fuzzy Logic and Genetic Algorithms”, Prentice Hall, 2006.
2. David E Goldberg, “Genetic Algorithms in search, optimization and machine learning”, Pearson Education, 2007.
3. JangJSR, SunCT and Mizutani E, “Neuro-fuzzy and Soft Computing”, Pearson Education, 2004.
4. LaureneFausett,“Fundamentals of Neural Networks”, Pearson Education, 2011.

15XW83 SOFTWARE PROJECT MANAGEMENT

3 0 0 3

INTRODUCTION: Software Projects various other types of projects - Problems with software projects - an overview of project planning - Project evaluation - Project Analysis and technical planning - Project estimates - Preparation of Estimates - COCOMO model - Function Point Analysis - Putnam Model - Non-development overheads. (10)

ACTIVITY PLANNING: Project schedules - Sequencing and scheduling projects - Network planning models - Shortening project duration - Identifying critical activities. (9)

RISK MANAGEMENT: Resource allocation - Monitoring and Control - Managing people and organizing teams - Planning for small projects - Handling large projects - Divide and Conquer - Software Project survival. (9)

SOFTWARE CONFIGURATION MANAGEMENT: Basic functions, responsibilities, standards, configuration Management, Prototyping - Models of prototyping. (9)

Case study using Project management tools. (8)

Total L: 45

TEXT BOOKS:

1. Mike Cotterell and Bob Hughes, "Software Project Management - Inclination", Tata McGraw Hill, 2014.
2. Robert K Wysocki, Robert Beck Jr and David B Crane, "Effective Project Management", John Wiley, 2012.

REFERENCES:

1. Steve McConnell, "Software Project Survival Guide", Microsoft Press, 2011.
2. Gerald M Weinberg,"Quality Software Management:Systems Thinking“, Dorset House, 2014.
3. Gerald M. Weinberg," Quality Software Management:First Order Measurement”, Dorset House, 2009.
4. Pressman R S, "Software Engineering - A Practitioner's Approach",Tata McGraw Hill,2015.
5. Darrel Ince,"An Introduction to S/W Quality Assurance and its Implementation", Tata McGraw Hill, 2009.

15XW86 DATA MINING LAB

0 0 4 2

1. Implementation of data mining techniques using WEKA.
2. Implementation of Association rule mining using Apriori algorithm and FP Growth algorithm
3. Classification rules using Decision Tree classifier, Ensemble of Classifiers.
4. Implementation of clustering algorithms
5. Case studies using R programming
6. A Package using data mining techniques based on research papers.

Total P: 60

15XW87 SOFT COMPUTING LAB

0 0 4 2

Develop the following packages:

1. Define an application and implement using Fuzzy Logic.
2. Define an application and implement using Genetic Algorithm.
3. Define an application and implement using any type of Neural Network.
4. On any one of the application, suggest an improvement using any other technique.

Note: The applications should be based on Research Publications.

Total P: 60

15XW88CASE STUDY LAB

0 0 4 2

Assigned based on the area of interest of the student.

Total P: 60

SEMESTER 9

15XW91 PRINCIPLES OF MANAGEMENT AND BEHAVIOURAL SCIENCES

3 0 0 3

PRINCIPLES OF MANAGEMENT: Meaning, Definition and Significance of Management, Basic Functions of Management – Planning, Organizing, Staffing, Directing and Controlling. Organizational Environment – Social, Economic, Technological and Political. Corporate Social Responsibility - Case discussion (8)

INDUSTRIAL AND BUSINESS ORGANIZATION: Growth of Industries (Small Scale, Medium Scale and Large Scale Industries). Forms of Business Organizations.Resource Management – Internal and External Sources. (7)

ORGANIZATIONAL BEHAVIOUR: Significance of OB, Impact of culture on organization. Role of leadership and leadership styles.Personality and Motivational Theories. Attitudes, Values and Perceptions at work - Case discussion (7)

GROUP BEHAVIOUR: Group dynamics, Group formation and development, group structure and group cohesiveness. Informal organization – Sociometry – Interaction analysis - Exercises (8)

GLOBALISATION: Issues for global competitiveness, proactive and reactive forces of globalization. Cross cultural management – Management of work force diversity. (5)

HUMAN RESOURCE MANAGEMENT: Objectives and Functions, Selection and Placement, Training and Development – Conflict management – Stress management - Human resource management in global environment - Human resource information system(HRIS) - Case discussion. (10)

Total L: 45

TEXT BOOKS:

1. Harold Koontz, Heinz Weihrich and RamachandraAryasri, “Principles of Management”, Tata McGraw Hill, 2014.
2. Mamoria CB, “Personnel Management”, Sultan Chand & Sons, 2005.

REFERENCES:

1. John W Newstromand Keith Davis, “Organizational Behavior”, Tata McGraw Hill, 2010.
2. Stephen P Robbins, ”Organisational behavior”, Prentice Hall, 2010.
3. Khanna O P, “Industrial Engineering & Management”, DhanpatRai Publications, 2010.

15XW92 WEB SERVICES

3 0 0 3

INTRODUCTION: Review of Distributed Computing - COM & RPC Models - Web Services Vs RPC - Strengths and Weakness - Evolution of Web Services – Architecture – Service Oriented Architecture. (5)

XML: Introduction to XML - Comparison with HTML - XML documents - Well-formed XML document - Markup and character data - Prolog and XML declaration - Processing Instructions - XML elements - Types of elements - CDATA sections - XML Namespace. (3)

VALID XML DOCUMENT: Document Type Declarations and Document Type Definitions (DTDs) - Internal and External DTDs - Validating XML documents using DTD - Entities and Attributes - General and Parameter Entities. (3)

XML SCHEMAS: Validating XML documents using XML Schema - Comparison with DTD - Creation of Simple Types - Specifying attribute constraints and defaults - Creation of Complex type - Specifying different types of content using Complex type - Specifying data types and restrictions in Schema. (3)

JSON: Introduction to JSON - JSON Data Structure - JSON Object, Text - Comparison with XML - Validating JSON using JSON Schema - JSON Lint - Creating / Parsing JSON Messages with JavaScript. (4)

SOAP: SOAP Message Exchange Model - Relation to XML - SOAP Envelope - Header - Body - Fault - SOAP Encoding - Using SOAP in HTTP - Using SOAP for RPC - Security considerations. (6)

WSDL & UDDI: WSDL Document structure - Types , Messages , Port Types , Bindings , Ports , Services - SOAP Binding - HTTP GET and POST Binding. (6)

UDDI: Introduction - UDDI Data structure - Business Entity - Business Service - Binding Template - tModel - Technical Overview - UDDI API - Inquiry API , Publication API - Security. (5)

RESTful Services: Introduction - Resource Oriented Architecture - Resources - URIs - Statelessness - Representations - Queries - Web Linking. (5)

Designing Read-only Services - Designing Read-Write Services - Resource Oriented Services vs SOAP based Services. (5)

Total L: 45

TEXT BOOKS:

1. Ron Schmelzer, “XML and Web Services Unleashed”, Pearson Education, 2011.
2. Martin Kalin, “Java Web Services: Up and Running”, O’ Reilly, 2013.

REFERENCES:

1. Leonard Richardson and Sam Ruby, “RESTful Web Services”, O'Reilly, 2007.
2. William RStanek, “XML Pocket Consultant” ,Microsoft Press, 2011.
3. Eric Newcomer and Greg Lomow, “Understanding SOA with web services”, Pearson Education, 2009.

15XW93 INFORMATION RETRIEVAL

3 0 0 3

INTRODUCTION: Overview of IR Systems - Historical Perspectives - Goals of IR - The impact of the web on IR - The role of artificial intelligence (AI) in IR. (3)

TEXT REPRESENTATION: Statistical Characteristics of Text: Zipf's law; Porter stemmer; morphology; index term selection; using thesauri.**Basic Tokenizing, Indexing:** Simple tokenizing, stop-word removal, and stemming; inverted indices; Data Structure and File Organization for IR - efficient processing with sparse vectors. (6)

RETRIEVAL MODELS: Similarity Measures and Ranking - Boolean Matching – Extended Boolean models - Ranked retrieval - Vector Space Models -, text-similarity metrics - TF-IDF (term frequency/inverse document frequency) weighting - cosine similarity, Probabilistic Models, Evaluations on benchmark text collections. (8)

QUERY PROCESSING: **Query Operations and Languages**- Query expansion; Experimental Evaluation of IR: Performance metrics: recall, precision, and F-measure. (5)

TEXT CATEGORIZATION AND CLUSTERING: Categorization :Rocchio; Naive Bayes, kNN; Clustering: Agglomerative clustering; k-means; Expectation Maximization (EM); Dimension Reduction: LSI, PCA. (6)

INFORMATION FILTERING TECHNIQUES: introduction to Information Filtering, Relevance Feedback - Applications of Information Filtering: **RECOMMENDER SYSTEMS**: Collaborative filtering and Content-Based recommendation of documents and products. (6)

WEB SEARCH: IR Systems and the WWW - Search Engines: Spidering, Meta Crawlers; Link analysis: Hubs and Authorities, Google PageRank , Duplicate Detection (5)

INFORMATION EXTRACTION AND INTEGRATION: Extracting data from text; Basic Techniques: NE Recognition, Co-reference Resolution, Relation Extraction, Event Extraction; Extracting and Integrating specialized information on the web, Web Mining and Its Applications. (6)

Total L: 45

TEXT BOOKS:

1. Christopher D. Manning, PrabhakarRaghavan and HinrichSchütze, "Introduction to Information Retrieval", Cambridge University Press, 2012.
2. Ricardo Baeza-Yates and Berthier Ribeiro-Neto, "Modern Information Retrieval", Pearson Education, 2010.
3. B. Croft, D.Metzler, T.Strohman, "Information Retrieval in Practice", Pearson Education, 2010. (Digitized)

REFERENCES:

1. Stephan Buttcher, Charles L.A. Clarke, Gordon V. Gormack, "Information Retrieval Implementing and Evaluating Search Engines", MIT Press, 2010.
2. Francesco Ricci, LiorRokach, BrachaShapira, Paul B. Kantor, Recommender Systems – Handbook, 2011.
3. AnandRajaraman and Jeffrey Ullman, "Mining Massive Data sets", Cambridge University Press, 2014.

15XW96 INFORMATION RETRIEVAL LAB

0 0 4 2

EXERCISES

1. Building a web crawler
2. HITS/PageRank for ranking of Web Pages
3. Spam detection personal mails in R
4. Build a simple recommender system
5. Designing a personalized Search Engine
6. Identifying near duplicates in web pages
7. Extracting information from web pages
8. Designing a Desktop search engine

Total P: 60

15XW97 WEB SERVICES LAB

0 0 2 1

1. Validation of XML document using DTD and Schema.
2. Simple case studies to understand JSON
3. Developing a case-study to test web services technology.
4. Developing and deploying web services using .NET, J2EE.
5. Simple exercise to create RESTful services.

Total P: 30

15XW98 OPEN SOURCE SOFTWARE LAB

0 0 4 2

INTRODUCTION: Proprietary Software, Free Software, Open Software, Licenses, Version Control, Explore GitHub – GitHub Workflows, Git Basics, Git Branching, Git on the Server, Distributed Git, GitHub, Git Tools, Customizing Git.

PYTHON PROGRAMMING LANGUAGE: Basic Syntax, Functions, Conditionals and Recursion, Iteration, Strings, Lists, Dictionaries, Tuples, Files, Classes and Objects, Inheritance, CGI, Multithreading, Networking, Python GUI - Tkinter, Distributing Python Modules, Python Standard Library, Django Framework.

RUBY PROGRAMMING LANGUAGE: Foundations and Scaffolding – Ruby Building Blocks, Ruby Ecosystem, The Core of Ruby - Classes, Objects, and Modules, Projects and Libraries, Error Handling, Files and Databases, Files and Databases, Deploying Ruby

Applications, Ruby Online – Web Applications Framework, Sinatra, Ramaze, Networking, Sockets, Daemons, Ruby Libraries and Gems.

RUBY ON RAILS: Scaling Rails, rails server, Deploying – Heroku Setup, User Resource, Microposts Resource, Static and Slightly Dynamic Pages, Rails Flavoured Ruby, Filling in the Layout, Modeling Users, Sign Up, Sign In, Sign Out, Updating, Showing, Deleting Users, User Microposts, Following Users.

TEXT BOOKS:

1. Karl Fogel, "Producing Open Source Software: How to Run a Successful Free Software Project", O'Reilly, 2005.
2. Scott Chacon, "ProGit", Apress, 2009.
3. Allen B Downey, "Think Python", O'Reilly, 2012.
4. Peter Cooper, "Beginning Ruby-From Novice to Professional", Apress, 2009.
5. Michael Hartl, "Ruby on Rails Tutorial", Addison Wesley, 2012.

REFERENCES:

1. Paul Berry, "Head First Python", O'Reilly, 2010.
2. David Flanagan, Yukihiro Matsumoto, "The Ruby Programming Language", O'Reilly, 2008.
3. Barry Burd, "Ruby on Rails for Dummies", Wiley Publishers, 2007.

EXERCISES:

1. Discovering the GitHUb collaboration platform.
2. Lab assignments using NumPy/SciPy, SQLAlchemy, PyTables, PyQt, TreeDict, Sage.
3. Lab exercises in Ruby.
4. Application Development and Deployment using Rails Framework.

Total P: 60

SEMESTER 10

15XWP2 PROJECT WORK II

0 0 0 12

PROFESSIONAL ELECTIVES

15XWA1 MODELLING AND SIMULATION

3 2 0 4

PRINCIPLE OF COMPUTER MODELLING AND SIMULATION: Monte Carlo simulation. Nature of computer modeling and simulation.Limitations of simulation, areas of application. (3)

SYSTEM AND ENVIRONMENT:Components of a system - discrete and continuous systems. Models of a system - A variety of modelling approaches. (4)

DATA-DRIVEN MODELS: Empirical Models-Introduction - Linear Empirical Model- Predictions-Linear Regression - Nonlinear One-Term Model - Multiterm Models - Advanced Fitting with Computational Tools (4)

RANDOM NUMBER GENERATION: Techniques for generating random numbers - Midsquare method - The midproduct method - Constant multiplier technique - Additive congruential method - Linear congruential method - Tauswarthe method - Tests for random numbers - The Kolmogorov_Smirnov test - The Chi-square test. (5)

RANDOM VARIABLE GENERATION: Inverse transform technique - Exponential distribution - Uniform distribution - Weibull distribution. Empirical continuous distribution - generating approximate normal variates - Erlang distribution. Empirical Discrete distribution - Discrete Uniform distribution - Poisson distribution - Geometric distribution - Acceptance - Rejection technique for Poisson distribution - Gamma distribution. (7)

DESIGN AND EVALUATION OF SIMULATION EXPERIMENTS: Input - Output analysis - variance reduction techniques - Antithetic variables - verification and validation of simulation models. (5)

DISCRETE EVENT SIMULATION: Concepts in discrete-event simulation, manual simulation using event scheduling, single channel queue, two server queue, simulation of inventory problem. (7)

SIMULATION LANGUAGES - GPSS - SIMSCRIPT - SIMULA - SIMPLE_1, Programming for Discrete event systems in GPSS, SIMPLE_1 and C. (5)

CASE STUDIES: Simulation of LAN - Manufacturing system - Hospital system. (5)

TEXT BOOKS:

1. Jerry Banks and John S. Carson, "Discrete Event System Simulation", Prentice Hall, 2013.
2. AngelaB.Shiflet andGeorge W. Shiflet, " Introduction to Computational Science: Modeling and Simulation for theSciences", Princeton University Press, 2014

REFERENCES:

1. Mohsen Guizani, Ammar Rayes, Bilal Khan, Ala Al-Fugaha, "Network Modelling and Simulation A Practical Perspective", John Wiley, 2010.
2. Averil M Law , "Simulation Modelling and Analysis", Tata McGraw Hill,2014.

TUTORIAL PRACTICE:

1. Implement variance reduction.
2. Implement event scheduling.
3. Simulate inventory problem.
4. Simulate a manufacturing system.

Total L: 45+T: 30=75

15XWA2 ADVANCED DATABASE MANAGEMENT SYSTEMS

3 2 0 4

QUERY PROCESSING: Database Catalog - Query Processing Methodology - Query Interpretation - Equivalence of Expressions – Selection, Projection and Natural Join Operations - Estimation of Query Processing Cost - Estimation of access costs using Indices - Query Optimization – Heuristic Query optimization – Cost based query optimization (8)

OBJECT AND SPATIAL DATABASES: Object Model Vs Relational model - Object Oriented Databases - Introduction to ORDBMS - Complex data types - Structured types and Inheritance-Nesting and un-nesting of Relations – Query Processing in ORDBMS – Spatial Databases : Fundamentals of GIS - Spatial Data Types- Spatial relations – Spatial Queries -Spatial indexing techniques - R-trees, KD trees- Quad trees - Applications of spatial databases (9)

PARALLEL AND DISTRIBUTED DATA BASES: Architecture of parallel databases – Parallel query evaluation, Paralyzing individual operations, Parallel query optimization - Homogeneous and Heterogeneous databases - Architecture of distributed data bases - Storing data in distributed data bases - Distributed query processing -Distributed Transactions. (10)

DATABASE INTEGRATION: Data integration: schema directed data integration - Data exchange: Schema mapping *and* information preservation-Information Preserving XML Schema Embedding. (8)

NoSQL DATABASES: Big Data and Challenges, NoSQL data models – Key value pair - DynamoDB, Column store - BigTableHbase, Document oriented store- MongoDB –Graph data bases – Neo4g – Apache Hadoop (10)

TEXT BOOKS:

1. Abraham Silberschatz, Henry F.Korth and S.Sudarshan, "Database System Concepts", Tata McGraw Hill, 2010.
2. Tamer O Zsu M and Patrick Valduriez, "Principles of Distributed Database Systems", Pearson Education, 2011.
3. RamezElmasri and ShamkranNavathe, "Fundamentals of Database Systems", Addison Wesley, 2013.

REFERENCES:

1. Thomas Connolly and Carolyn Begg, "Database Systems", Pearsons Education, 2010.
2. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", Tata McGraw Hill, 2014
3. J.C. Corbett, "Spanner: Google's Globally-Distributed Database", OSDI, 2012
4. M. Stonebraker, "SQL Databases v. NoSQL Databases", Communications of the ACM, 2010.
5. www. Hbase.apache.org
6. www.MongoDB.org.

TUTORIAL PRACTICE:

Programming exercises are given in the following topics:

1. Query optimization
2. Object relational databases
3. Parallel/Distributed databases
4. Spatial databases

5. MongoDB,, AmazonDB
6. BigTable, Hbase
7. Hadoop

Total L: 45+T: 30=75

15XWA3 SOFTWARE METRICS

3 2 0 4

FUNDAMENTALS OF MEASUREMENT: Measurement in Software Engineering-Scope of Software Metrics - Measurement and Models-Measurement scales and scale types-Classifying software measures - Software Measurement validation - Software Metrics Data collection - Analyzing software measurement data. (10)

MEASURING INTERNAL PRODUCT ATTRIBUTES: Size and Structure - Measuring external product attributes. (5)

SOFTWARE RELIABILITY: Measurement and prediction - Parametric Reliability Growth models - The recalibration of software reliability growth predictions. (10)

RESOURCE MEASUREMENT: Productivity, teams and tools- Making process predictions - Good estimates - Models of effort and cost - Dealing with Problems of current estimation methods. (10)

MEASUREMENT AND MANAGEMENT: Planning - Measurement program - Measurement tools-Measurers - analysts - audience - Measurement in practice. (10)

TEXT BOOKS:

1. NormanE Fenton and Shari Lawrence Pfleeger, "Software Metrics", Thomson Brooks/Cole, 2013.

REFERENCES:

1. Stephen H Khan, "Metrics and Models in Software Quality Engineering", Pearson Education, 2012.
2. Dick B Simmons and Newton C Ellis, "Software Measurement", Prentice Hall, 2012.

TUTORIAL PRACTICE:

1. Complete the time recording log and Defect Recording log.
2. PSP Programming assignment.
3. Assess the Quality of the Student's PSP Data and record your observations in the specified format.
4. Estimate the size of the program using PSP Techniques and record it in the specified format.
5. Design Review Exercise.
6. Code Review exercise.
7. Exercise for measuring process and product quality.
8. Development of Project Plan.
9. Measurement of the quality of Team's process and Product.

Total L: 45+T: 30=75

15XWA4 PARALLEL AND DISTRIBUTED COMPUTING

3 2 0 4

INTRODUCTION : Forms of Computing – Monolithic – Distributed – Parallel-Cooperative - Computational demands of parallel processing, Flynn's classification – Terminology. (5)

PARALLEL COMPUTER ARCHITECTURES: Classification – Inter connection networks – Vector computers – Shared memory parallel computers – Cache coherence – Distributed shared memory parallel computers – Message passing parallel computers – Cluster of workstations. (5)

PARALLEL PROGRAMMING MODELS: Shared memory model, Message passing model - Synchronous and Asynchronous message passing models, Leader-Election algorithm, Breadth-First Search. Shortest Paths, Broadcast and Converge cast, Data Parallel model. (7)

PARALLEL ALGORITHMS : Models of parallel computation including PRAM - CRCW, CREW, ERCW, EREW models, Design and analysis of Parallel algorithms: : Automatic vs. Manual Parallelization – Understand the Problem and the Program – Partitioning – Communications – Synchronization – Data Dependencies – Load Balancing – Granularity – I/O – Limits and Costs of Parallel Programming – Performance Analysis and Tuning – Parallel Examples – Array Processing Matrix multiplication, Sorting, Searching, Merging, Minimum spanning tree, Prime numbers. (10)

DISTRIBUTED COMPUTING: Introduction to Distributed Programming - System *Models*- Architectural models - Client-server model, Peer-to-peer model- Variations of the above models -Distributed computing paradigms – *Inter process communication* -The API for the Internet protocols - External data representation and marshalling - Group communication - Case study: inter process communication in UNIX - Distributed file systems. (8)

DISTRIBUTED PROGRAMMING ALGORITHMS: Fundamental issues and concepts - Synchronization, Mutual Exclusion, Termination Detection, Clocks, Event ordering, Locking - Distributed Computing Tools & Technologies (CORBA, JavaRMI, Web Services). (5)

EMERGING AREAS OF PARALLEL AND DISTRIBUTED SYSTEMS: Grid computing, Peer-to-peer systems, Overlay networks, Edge computing and Ad-hoc networks. (5)

TEXT BOOKS:

1. Quinn Michael J, "Designing Efficient Algorithms for Parallel Computers", Tata McGraw Hill, 2004.
2. Wilkinson B and Allen M, "Parallel Programming: Techniques and Applications Using Networked Workstations and Parallel Computers", Prentice Hall, 2005.

REFERENCES:

1. Hariri and Parashar, "Tools and Environments for Parallel and Distributed Computing", John Wiley, 2004.
2. Jean Dollimore,Tim Kindberg and George Coulouris, "Distributed Systems: Concepts and Design", Addison Wesley, 2011.
3. Michael J Quinn, "Parallel Computing: Theory and Practice", Tata McGraw-Hill, 2004.
4. Joel M.Crichlow, "Distributed And Parallel Computing" , Prentice Hall Of India, 2004.
5. Andrew S Tannenbaum and Maarten Van Steen,"Distributed Systems, Principles and Paradigm" Prentice Hall, 2013.
6. Vijay K Garg,"Elements of Distributed Computing", John Wiley, 2014.

TUTORIAL PRACTICE:

1. Analyze Parallel algorithms to predict performance.
2. Implement Dekker's algorithm.
3. Implement Dinning philosopher algorithm.
4. Implement Array processing.
5. Implement Matrix Computation, Searching and Sorting algorithms using parallel processing.
6. Implement parallel algorithms using MPI.
7. Analyze the implementation of the above algorithms in a distributed environment.

Total L: 45+T: 30=75

15XWA5 DATA COMPRESSION

3 2 0 4

DATA COMPRESSION LEXICON: Introduction To Data Compression - Dawn Age - Coding - Modeling - Ziv And Lampel- Lossy Compression. (4)

MINIMUM REDUNDANCY CODING (THE DAWN AGE): The Shannon - Fano Algorithm, The Huffman Algorithm - Into The Huffmancode: Counting the Symbols, Building the Tree - Compression Code. (4)

ADAPTIVE HUFFMAN CODING: Adaptive coding - Updating the Huffman tree - the code. (4)

ARITHMETIC HUFFMAN CODING: Arithmetic coding - The code. (6)

STATISTICAL MODELING: higher-order modeling - finite context modeling - adaptive modeling – highest- order modeling. (4)

SLIDING WINDOW COMPRESSION: lz77 algorithm - lzss compression - Compression code. (5)

DICTIONARY-BASED COMPRESSION: lz78 compression and decompression algorithms – lzw compression and decompression algorithms – lzmw compression and decompression – lzap compression and decompression. (8)

SPEECH COMPRESSION: digital audio concepts - lossless compression of sound. (5)

VIDEO COMPRESSION: jpeg compression – discrete cosine transforms – coefficient quantization. (5)

TEXT BOOKS:

1. Mark Nelson, Jean Loup Gailly "The Data Compression Book", M&T Books, 2008.

REFERENCES:

1. Yun Q Shi, Huifang Sun, "Image and Video Compression for Multimedia Engineering", CRC Press, 2008.
2. Khalid Sayood, "Introduction to Data Compression", Morgan Kaufmann, 2006.

TUTORIAL PRACTICE:

1. Implement Shannon Fano algorithm and Huffman algorithm.
2. Design compression and decompression program using adaptive Huffman coding.
3. Implement arithmetic coding algorithm.
4. Design compression program using statistical modeling upto 3 order.

5. Design compression and decompression program using L277 algorithm.

Total L: 45+T: 30=75

15XWA6 COMPUTER GRAPHICS AND VISUALIZATION

3 2 0 4

GRAPHICS INPUT - OUTPUT DEVICES: Raster scan Displays - Random scan displays - Direct view storage tubes - Flat panel displays - Mouse - Track Ball - Joy Stick - Digitizers - Touch panels - LCD. GRAPHICAL USER INTERFACE AND INTERACTIVE INPUT METHODS: The user dialog - Input of graphical data - Input function - Interactive picture construction techniques - Virtual reality environments. (3)

OPENGL: Architecture, The OpenGL API, Primitives and Attributes, Color, Viewing, Control Functions, Programming Event-Driven Input, Transformations, *OpenGL Extensions.* (3)

TWO DIMENSIONAL GRAPHICS: Basic transformations - Matrix representation and homogeneous coordinates - Composite transformations - Line drawing algorithms: DDA and Bresenham's algorithms - Circle generation algorithms: Mid point circle algorithm - Point clipping - Line clipping: Cohen Sutherland algorithm - Polygon clipping: Sutherland Hodgeman algorithm - Line covering. (7)

RASTER GRAPHICS: Fundamentals: generating a raster image, representing a raster image, scan converting a line drawing, displaying characters, speed of scan conversion, natural images - Solid area scan conversion: Scan conversion of polygons, Y-X algorithm, properties of scan conversion algorithms - Interactive raster graphics: painting model, moving parts of an image, feed back images. (7)

CURVES AND SURFACES: Parametric representation of curves - Bezier curves – B-Spline curves - Parametric representation of surfaces - Bezier surfaces - Curved surfaces - Ruled surfaces - Quadric surfaces – Concatenation of two curve segments – Order of Continuity. (7)

IMAGE PROCESSING FUNDAMENTALS: Sampling and Quantization, Image Enhancement - Histogram Processing, Filtering, (8)

THREE DIMENSIONAL GRAPHICS: 3D transformations - Viewing 3D graphical data - Orthographic, oblique, perspective projections - Hidden lines and hidden surface removal. (6)

FRACTAL-GEOMETRY METHODS: Tiling the plane - Recursively defined curves - Koch curves - C curves - Dragons - Space filling curves - Fractals - Grammar based models - Graftals - Turtle graphics - Ray tracing. (4)

Note: Algorithms in have to be implemented by using C++/ OpenGL.

TEXT BOOKS:

1. Donald Hearn and Pauline Baker M, “Computer Graphics with OpenGL", Pearson Education, 2014.
2. William M. Newmann, Robert F Sproull, “Principles of Interactive Computer Graphics”, Tata McGraw Hill, 2011.

REFERENCES:

1. Foley James D, Vandam Andries and Hughes John F, "Computer Graphics: Principles and Practice", Addison Wesley, 2013.
2. Rafael C Gonzalez., and Richard Eugene Woods, “Digital Image Processing”, Prentice Hall, 2009.
3. Anil K Jain, “Fundamentals of Digital Image Processing”, Prentice Hall, 2010.
4. Angel, “Interactive Computer Graphics- A top down approach with OpenGL”, Addison Wesley, 2011.
5. Francis S. Hill, Stephen M. Kelley , “Computer Graphics”, Prentice Hall, 2007.

TUTORIAL PRACTICE:

1. Implementation of Simple transformations.
2. Implementation of Line drawing algorithms.
3. Windowing and Line Clipping.
4. Polygon clipping.
5. Implementation of an Analog Clock.
6. Polygon filling algorithms.
7. Merging of a circle and square.
8. Fractal drawing.
9. Image Processing Functions In Matlab

Total L: 45+T: 30=75

15XWA7 REAL TIME AND EMBEDDED SYSTEMS

3 2 0 4

INTRODUCTION TO EMBEDDED SYSTEMS: Definition – Examples of Applications – Important characteristics of these applications – real-time system and definitions – real –time system – Common misconceptions – Overview of science of real-time systems and examples of research problems. (3)

HARDWARE FUNDAMENTALS: Microprocessors – Microcontroller - Direct Memory Access – Universal Asynchronous Receiver / Transmiter (UART) – Programmable. Array Logic (PAL) – Application Specific Integrated Circuit (ASIC) – Watch dog Timer. (4)

INTERRUPTS: Interrupt Basics – Saving and Restoring the content - Disabling Interrupts – The Shared–data Problem – Shared–Data bug – Solving Atomic and Critical sections – Interrupt Latency. (3)

EMBEDDED SOFTWARE ARCHITECTURE: Round - Robin-Round – Robin with interrupts, Example – characteristics – Function-Queue- Scheduling Architecture – Real Time Operating System Architecture. (4)

REAL TIME OPERATING SYSTEMS: Task state, Scheduler Task and Data – Reentrancy, Rules – Semaphores and Shared-data–RTOS Semaphores – Initializing semaphores - Reentrancy and Semaphores – Multiple semaphores - Semaphore problems – variants. (4)

REAL TIME OPERATING SYSTEM SERVICES: Message Queues, Mailboxes and Pipes – Time functions – Events – Memory management – Interrupt Routine in RTOS Environment. (3)

DESIGN USING RTOS: Design Principles – Short Interrupt Routines – RTOS Tasks – Tasks for Priority – Tasks for Encapsulation – Creating and Destroying tasks – Avoidance. (7)

SCHEDULING : Execution sequences – Preemption – Fixed versus Dynamic Priority, Priority Inversion – Scope of scheduler – Earliest deadline first – Periodic scheduling – Aperiodic servers – Handling overload – Inversion Handling – Fixed Priority. (5)

MEMORY MANAGEMENT: Example of Scoped Memory Usage – Estimating the size of scoped memory – Assignment rules – Nested Memory areas and Single Parent rule – Sharing Memory areas and Schedulable Objects – Temporary Memory – Code Patterns for Temporary Memory – Real Time Threads in Temporary Memory. (5)

TESTING EMBEDDED SYSTEMS: Design for Testability - Built-In-Self-Test (BIST) for Embedded Systems - Boundary Scan Methods and Standards - On-line Testing of Embedded Systems (7)

TEXT BOOKS:

1. David E Simon, “An Embedded Software Primer “, Pearson Education, 2002.
2. Peter C Dibble, “Real –Time Java Platform Programming”, BooksSurge, 2008.

REFERENCES:

1. Jane W S Liu, “Real - time Systems”, Pearson Education, 2009.
2. Andrew Wellings, “Concurrent and Real Time Programming in Java”, John Wiley, 2004.
3. Gregory Bollella, Benjamin Brosgol, James Gosling, and Peter Dibble, “The Real Time Specification for Java”, Addison Wesley, 2000.
4. Albert M K Cheng, “Real-Time Systems Scheduling, Analysis and Verification”, John Wiley, 2003.
5. M. L. Bushnell and V. D Agarwal, “Essentials of Electronic Testing”, Kluwer academic Publishers, 2000.

TUTORIAL PRACTICE:

1. Design RTS program using Round Robin method.
2. Design RTS program with two threads which create deadlock.
3. Design RTS program using semaphore.
4. Design RTS program which uses message queue, mail box, pipe.
5. Design RTS program to create priority Inversion.

Total L: 45+T: 30=75

15XWA8 MOBILE COMPUTING

3 2 0 4

INTRODUCTION: Introduction to wireless networking, Advantages and disadvantages of wireless networking, Evolution of mobile communication generations- CDMA, FDMA, TDMA. Challenges in mobile computing – Vertical and horizontal applications of Wireless Networking–Wireless LAN and Wireless WAN. (6)

CELLULAR CONCEPT: Wireless transmission - Frequencies for radio transmission - Regulations - Signals , Antennas , Signal propagation ,Path loss of radio signals , Additional signal propagation effects - Multi-path propagation - Multiplexing - Space division multiplexing - Frequency division multiplexing -Time division multiplexing - Code division multiplexing - Spread spectrum - Direct sequence spread spectrum - Frequency hopping spread spectrum. (10)

GSM: Mobile services - System architecture -- Handover – GPRS – Mobile services – System Architecture – Location Management (8)

MOBILE DEVICES: Overview of mobile devices – input mechanism – Device classification – 3 G devices – 3 G Applications. (3)

MOBILE APPLICATIONS ARCHITECTURE: Wireless Internet – Wireless Internet Architecture – Smart Client – Smart Client Architecture – Messaging Architecture – Sample Applications. (6)

Building smart client applications – Mobile Operating systems – Client development process – Design, Development, implementation, testing and deployment phase. Thin client development process – design, development, implementation, testing and deployment phase. (8)

MOBILE INFORMATION MANAGEMENT: PIM architecture – Standardization – SyncML – vCalendar/iCalendar – vCard – Mobile device Management Software – Features. (4)

TEXT BOOKS:
1. Jochen Schiller, "Mobile Communications", Pearson Education, 2009.
2. Andreas F. Molisch, "Wireless Communications", Wiley, 2010.

REFERENCES:
1. David Taniar, "Mobile Computing Concepts, Methodologies, Tools and Applications", IGI Global, 2009.
2. Wen-Chen Hu, "Internet enabled handheld devices, Computing and Programming:Mobile Commerce and Personal data applications", IGI Global, 2008.

TUTORIAL PRACTICE:
Developing Mobile based applications using J2ME, Windows CE, Symbian OS, and Android OS.
Suggested Applications:
1. Online Shopping Cart
2. Airline Reservation System
3. WAP Portal Site
4. M-Commerce applications
5. Location based Services
6. Mobile games

Total L: 45+T: 30=75

15XWA9 SERVICE ORIENTED ARCHITECTURE

3 2 0 4

INTRODUCTION TO SERVICE ORIENTED ARCHITECTURE: Service Oriented Architectures – Business value of SOA - Characteristics of SOA - SOA Architecture – Service based collaboration through Federation – Component Definition - Component Granularity – Component Based Software Engineering – Enterprise Service bus – SOA Enterprise Service Model. (8)

QUALITY OF SERVICE: Web services orchestration – Workflow and Business Process Management – Business Process Execution Language – ACID Transactions - Web services Transactions – SOA Management – Systems Management – Alerting – Provisioning – Leasing – Lifecycle management – Management Architecture. (10)

FUNDAMENTAL PIECES OF SOFTWARE ORIENTED ARCHITECTURE: Universal Description Discovery and Integration – Programming UDDI – UDDI Data Model – UDDI SOAP APIs – Inquiry APIs – Publisher APIs – Web Service Definition Language – Defining Message data types – Defining Operations on Messages – Importing WSDL documents – Extensions for binding to SOAP – Simple Object Access Protocol – SOAP Specification – SOAP Message processing – SOAP use of Namespaces – SOAP Multipart MIMI attachments. (15)

WEB SERVICES STANDARDS: Web Services Security – WS Trust – WS Privacy – WS SecureConversation – WS Federation - Web Services Coordination – Web Services Policy – Web Services Reliable Messaging – Web Services Attachments. (12)

TEXT BOOKS:
1. Thomas Erl, "Service Oriented Architecture (SOA): Concepts, Technology and Design", Prentice Hall, 2008.
2. James McGovern, Oliver Sims, Ashish Jain and Mark Little, "Enterprise Service Oriented Architectures: Concepts, Challenges Recommendations". Springer,2006.

REFERENCES:
1. Eric New Comer,"Understanding Web Services: XML, WSDL, SOAP and UDDI", Pearson Education, 2002.
2. Thomas Erl, "Service Oriented Architecture: A Field Guide to Integrating XML and Web Services", Prentice Hall, 2004.
3. Eric Newcomer and Greg Lomow, "Understanding SOA with Web Services", Pearson Education, 2009.
4. Sandy Carter, "The New Language of Business: SOA and Web 2.0", Pearson Education, 2007.
5. SanjivaWeerawarana, Francisco Curbera, Frank Leymann, Tony Storey and Donald, "Web Services Platform Architecture: SOAP, WSDL, WS.Policy, WS-Addressing, WS-BPEL", Prentice Hall, 2005.

TUTORIAL PRACTICE:

1. Implement a XML Web Service by using Microsoft Visual Studio .Net
2. Implementation of webservice using Java APIs
3. Create a content syndication using RSS
4. Web service design / Coding projects

Total L: 45+T: 30=75

15XWAA PRINCIPLES OF PROGRAMMING LANGUAGES

3 2 0 4

INTRODUCTION: The Role of Programming Languages: Toward Higher-level Languages, Problems of Scale, Programming Paradigms, Language Implementation Bridging the Gap - Language Description:- Syntactic Structure: Expression Notations, Abstract Syntax Trees, Lexical Syntax, Context -Free Grammars, Grammars for Expressions, Variants of Grammars. (9)

IMPERATIVE PROGRAMMING: Statements: Structured Programming:- The Need for Structured Programming, Syntax-Directed Control Flow, Design Considerations: Syntax, Handling Special Cases in Loops, Programming with invariants, Proof Rules for Partial Correctness, Control flow in C - Types: Data Representation:- The Role of Types, Basic Types, Arrays Sequences of Elements, Records: Named Fields, Unions and variant Records, Sets, Pointers: Efficiency and Dynamic Allocation, Two String Tables, Types and Error Checking - Procedure Activations:- Introduction to Procedures, Parameter-passing Methods, Scope Rules for Names, Nested Scopes in the Source Text, Activation Records, Lexical Scope: Procedures as in C, Lexical Scope: Nested Procedures and Pascal. (12)

OBJECT ORIENTED PROGRAMMING: Groupings of Data and Operations:- Constructs fro Program Structuring, Information Hiding, Program Design with Modules, Modules and Defined Types, Class Declarations in C++, Dynamic Allocation I C++, Templates: Parameterized Types, Implementation of Objects in C++. - Object-Oriented Programming:- What is an Object?, Object-Oriented Thinking - Objects in Smalltalk. (6)

FUNCTIONAL PROGRAMMING: Elements of Functional Programming:- A little Language of expressions, Types : Values and Operations, Function declarations, Approaches to Expression Evaluation, Lexical Scope, Type Checking - Functional Programming in a Typed Languages:- Exploring a List, Function Declaration by Cases, Functions as First-Class Values, ML: Implicit Types, Data Types, Exception Handling in M, Little quit in Standard ML - Functional Programming with Lists:- Scheme, a Dialect of Lisp, The Structure of Lists, List Manipulation, A Motivating Example: Differentiation, Simplification of Expressions, Storage Allocation for Lists. (10)

OTHER PARADIGMS: Logic Programming:- Computing with Relations, Introduction to Prolog, Data Structures in Prolog, Programming techniques, Control in Prolog, Cuts - An Introduction to Concurrent Programming:- Parallelism in Hardware, Streams: Implicit Synchronization, Concurrency as interleaving, Liveness Properties, Safe Access to Shared Data, Concurrency in Ada, Synchronized Access to Shared variables. (8)

TEXT BOOKS:

1. Terrence W Pratt, Marvin V Selkowitz and TV Gopal, “Programming Languages Design and Implementation”, Pearson Education, 2006.
2. Robert Harber, “Programming in standard ML”, Carnegie Mellon University, 2005.

REFERENCES:

1. Ravi Sethi, “Programming Languages Concepts and Constructs “, Pearson Education, 2009.
2. Robert W Sebesta, “Concepts of Programming Languages”, Pearson Education, 2009.
3. Al Kelley and Ira Pohl, “A Book on C “, Pearson Education, 2009.

TUTORIAL PRACTICE:

1. Language tools like LEX, YACC.
2. Inter – Intra sequence control mechanism.
3. Parameter passing mechanism in C, C++.
4. Comparing Object oriented concepts in C++, Java.
5. List Operations in Prolog.
6. Fact finding & Theorem proving in Prolog.
7. Recursive functions in Functional programming language.
8. Expression evaluation in functional programming language.

Total L: 45+T: 30=75

15XWAB AGILE SOFTWARE DEVELOPMENT

3 2 0 4

AGILE COMPUTING - An Introduction– The Problem with parsing experience-Three levels of listening Cooperative game of Invention and Communication-Individuals-Overcoming Failure modes-Working Better in some ways than others - Drawing on Success modes (9)

AGILE PROCESS MODELS – Extreme programming, ASD, DSDM, Scrum, Crystal, FDD, Agile Modeling (9)

TEAM COMMUNICATION -Communicating and Cooperating teams – Convection currents of information-Jumping communication gaps-Teams as communities-Teams as Ecosystems (10)

AGILE METHODOLOGIES -Agile and self-adapting-The crystal methodologies-Crystal orange web-The agile software development manifesto-The agile alliance-Peter Naur, Programming as TheoryBuilding. (12)

Case Studies (5)

TEXT BOOKS:

1. Alistair Cockburn, "Agile Software Development", Pearson Education, 2014.

REFERENCES:

1. Craig Larman, "Agile and Iterative Development", Pearson Education, 2012.
2. Mike Cohn, "Agile Estimating and Planning", Pearson Education,2012.

TUTORIAL PRACTICE :

1. Exercise for modular development.
2. Exercise for Incremental delivery approach.
3. Development of Metaphor.
4. Exercise for proving the productivity using pair programming approach.
5. Exercise for understanding the concept of "Simple Design".
6. Exercise to understand "Test first " technique.
7. Writing user stories.
8. Creation of vision card.
9. Writing acceptance tests.
10. Exercise for refactoring the code.

Total L: 45+T: 30=75

15XWAC SYSTEM SECURITY

3 2 0 4

INTRODUCTION: Security Problems in computing – security goals –attacks – Services and mechanisms. (4)

USER AUTHENTICATION AND ACCESS CONTROL: Means of authentication - password-based authentication- token-based authentication - biometric authentication - remote user authentication - security issues for user authentication - Access Control Principles . DAC-MAC- Example: UNIX File Access Control -. Role-Based Access Control -. Case Study: RBAC System for a Bank –ABAC (8)

SOFTWARE SECURITY:Software Security Issues -Handling Program Input -Writing Safe Program Code -Interacting with the Operating System and Other Programs -Handling Program Output -Malicious Software -Malware taxonomy – defense mechanisms of Malicious Software-.Stack Overflows -Defending Against Buffer Overflows -Other Forms of Overflow Attacks. (12)

OPERATING SYSTEM SECURITY: Introduction to Operating System Security - System Security Planning - Operating Systems Hardening - Application Security -Security models Trusted Systems -Security Maintenance - Linux/Unix Security - Windows Security - Virtualization Security. (12)

DATABASE SECURITY: The Need for Database Security - Database Access Control- Inference- Statistical Databases - Database Encryption- Multilevel databases Security (4)

SECURITY AUDITING: Security Auditing Architecture -The Security Audit Trail -Implementing the Logging Function -Audit Trail Analysis -Example: An Integrated Approach. (5)

TEXT BOOKS:

1. M. Stamp, "Information Security: Principles and Practice," Wiley, 2011.

2. M. E. Whitman and H. J. Mattord, “Principles of Information Security”, Course Technology, 2011.
3. Charles P Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", Pearson Education,2009.

REFERENCES:

1. Richard E Smith, "Internet Cryptography", Pearson Education, 2008.

TUTORIAL PRACTICE:

1. Implementation of authentication
2. Access control policy implementation
3. Practice on buffer overflow attack
4. SQL injection attack
5. Cross site scripting
6. DOS attacks

Total L: 45+T: 30=75

15XWAD PERVASIVE COMPUTING

3 2 0 4

INTRODUCTION: Past, present, future; the pervasive computing market, m-Business, challenges and future of pervasive computing -modeling key for pervasive computing - pervasive system environment interaction - architectural design for pervasive system, application examples of pervasive computing: Healthcare, Tracking, emergency information systems, home networkingappliances and entertainment. (5)

DEVICE TECHNOLOGY FOR PERVASIVE COMPUTING: Hardware,computing devices and their characteristics - pervasive information access devices-smart identification, smart card, labels, tokens - embedded controls, smart sensors, actuators -Human-machine interfaces, Biometrics - Various operating systems for pervasive devices. (4)

COMMUNICATION TECHNOLOGIES FOR PERVASIVE COMPUTING: Connecting the world – WWAN, SRWC, DECT, Bluetooth, IrDA – mobile internet – internet protocols. Audio networks, data networks - wireless data networks - pervasive networks - service oriented networks - network design issues - Managing smart devices in virtual environments, human user-centered and physical environments - pervasive computing issues and outlook. (7)

APPROACHES FOR DEVELOPING PERVASIVE APPLICATIONS: Categorization - smart services for pervasive application development - developing mobile applications – presentation transcoding – device independent view component – heterogeneity of device platforms - Context Awareness and Mobility to build pervasive applications. (8)

CONTEXT AWARE SYSTEMS: Modelling - mobility awareness - spatial awareness - temporal awareness - ICT system awareness - Intelligent Systems - basic concepts- autonomous systems - reflective and self-aware systems - self management and autonomic computing - complex systems. (8)

LOCATION AWARE SYSTEMS: Basic concepts - location modelling - Introduction to location management – DNS Server, server process, client process – location update – location inquiry-location management cost – network topology – mobility pattern, memory less movement model, Markovian Model, Shortest distance model, Gauss-Markov model, Activity Based Model, Mobility Trace, Fluid-flow Model, Gravity Model. (7)

Location dependent information system- location dependent data – location aware queries – location dependent queries – moving object database queries - query transition steps in LDQ processing. (6)

TEXT BOOKS:

1. Stefan Poslad, “Ubiquitous Computing - Smart Devices, Environment and Interactions”, John Wiley, 2011.
2. Adelstein F and Gupta S K S, “Fundamentals of Mobile and Pervasive Computing”, Tata McGraw Hill, 2008.

REFERENCES:

1. GuruduthBanavar, Norman Cohen, Chandra Narayanaswami, “Pervasive Computing: An Application-Based Approach”, Wiley Interscience, 2012.
2. Mohammed Ilyas and ImadMahgoub, “Mobile Computing Handbook”, Auerbach Publications, 2005.
3. Burkhardt, Henn, Hepper, and Rintdorff, Schaeck. “Pervasive Computing”, Pearson Education, 2009.
4. AshokeTalukdar and RoopaYavagal, “Mobile Computing”, Tata McGraw Hill, 2010.

TUTORIAL PRACTICE:

1. Create Application with onClick, onKeyDown, onFocusChanged Event Handlers
2. Create Application with Toast Notifications
3. Create Application with Android's Advanced User Interface Functions

4. Create Android Audio/Video Application
5. Create Application to Create, Modify and Query an SQLite Database
6. Create Application that Works with an Android Content Provider
7. Create application that performs Data Storage and Retrieval from Android External Storage
8. Create Location-Aware application that uses Proximity Alerts and Google Maps API
9. Implementation of small packages to demonstrate all APIs.

Note: All implementations using android.

Total L: 45+T: 30=75

15XWAE SEMANTIC WEB

3 2 0 4

INTRODUCTION TO SEMANTIC WEB: Today's Web - From Today's Web to the Semantic Web - Examples - Semantic Web Technologies - A Layered Approach. (4)

DESCRIBING STRUCTURED WEB DOCUMENTS USING XML: Introduction to Markup languages - The XML Language - Structuring - Namespaces - Addressing and Querying XML Documents - Processing. (8)

DESCRIBING WEB RESOURCES IN RDF: Introduction to RDF - Basic Ideas - RDF: XML-Based Syntax - RDF Schema: Basic Ideas - RDF Schema - An Axiomatic Semantics for RDF and RDF Schema - A Direct Inference System for RDF and RDFS - Querying in RQL. (9)

WEB ONTOLOGY LANGUAGE: OWL Introduction - The OWL Language - Examples - OWL in OWL - Future Extensions. (8)

LOGIC AND INFERENCE: Introduction - Example of Monotonic Rules: Family Relationships - Monotonic Rules: Syntax - Monotonic Rules: Semantics - Nonmonotonic Rules: Motivation and Syntax - Example of Nonmonotonic Rules - Rule Markup in XML for Monotonic Rules - Rule Markup in XML for Nonmonotonic Rules. (8)

APPLICATIONS: Horizontal Information Products - Data Integration - e-Learning - Web Services - Other Scenarios. (4)

ONTOLOGY ENGINEERING: Constructing Ontologies Manually - Reusing Existing Ontologies - Using Semiautomatic Methods - On-To-Knowledge Semantic Web Architecture. (4)

TEXT BOOKS:

1. Grigoris Antoniou and Frank van Harmelen, "A Semantic Web Primer", The Massachusetts Institute of Technology Press, Cambridge, 2012.

REFERENCES:

1. Dean Allemans, James Handler, "Semantic web for the working ontologist: Effective modeling in RDFS and OWL", Elsevier, 2011.
2. Pascal Hitzler, Markus Krotzsch, Sebastian Rudolph, "Foundations of Semantic Web Technologies", CRC Press, 2009.

TUTORIAL PRACTICE:

1. Generate of well formed XML document.
2. Creating XML DTD and XSD for the given XML document.
3. Design a XSLT to display the XML document (given as input) based on the constraints given.
4. Generate an RDF graph.
5. Create an RDFS ontology (in triple or graph notation).
6. Write an RDF/XML encoding for the given situation.
7. Generation of OWL document.
8. A Package to implement the techniques.

Total L: 45+T: 30=75

15XWAF CLOUD COMPUTING

3 2 0 4

INTRODUCTION TO PARALLEL AND DISTRIBUTED COMPUTING: Introduction, Architecture and Distributed computing models and technologies SOA, Web Services (5)

GRID, CLUSTER AND UTILITY COMPUTING: Introduction, Architecture, Pros & Cons, Real time applications. (4)

INTRODUCTION TO CLOUD COMPUTING: Definition, History, Comparison of Cloud Computing with Grid, Cluster and Utility Computing, Deployment models – Private, Public, Hybrid and Community - Pros and Cons of Cloud Computing. SaaS, PaaS, IaaS etc. (8)

VIRUTUALIZATION: Types of Virtualization, Tools for Virtualization, Architecture of VMM, Virtualization for Cloud. (4)

ADVANCED WEB TECHNOLOGIES: AJAX and Mashup – Programing examples using applications. (4)

MAP REDUCE PARADIGMS: Introduction, GFS Architecture, HDFS Architecture, Hbase, Google big Table, Amazon's (key value) pair storage and Microsoft's Azure infrastructure, Map reduce programming examples. (6)

CLOUD COMPUTING FRAMEWORK: Amazon EC3, S3 storage revises, Aneka frame work, IBM blue Cloud. (7)

APPLICATIONS: Distributed search engine and distributed data mining in the cloud. (7)

TEXT BOOKS:

1. Anthony TVelte, Toby JVelte and Robert Elsenpeter, "Cloud Computing : A Practical Approach", Tata McGraw Hill, 2010

REFERENCES:

1. Liu M L, "Distributed Computing Principles and Applications", Pearson Education, 2009
2. Ron Schmelzer, "XML and Web Services Unleashed", Pearson Education, 2008.
3. Dean J and Ghemawat S, " MapReduce: Simplified Data Processing on Large Clusters" OSDI, 2004.
4. DeCandia, Deniz Hastorun, Madan Jampani, Gunavardhan Kakulapati, Avinash Lakshman, Alex Pilchin, Swaminathan Sivasubramanian, Peter Vosshall and Werner Vogels, " Dynamo Amazon's Highly Available Key-Value Store", SOSP, 2007.
5. Ghemawat S, Gobioff H and Leung S T, "The Google File System", SOSP, 2003.

TUTORIAL PRACTICE:

1. Parallel programming using pvm on Linux platform
2. Develop web services using Eclipse or similar tools
3. Virtualization (VM Ware, VCloud, Hyper V)
4. Develop a Mashup website based on 2 or more existing websites
5. Build Private cloud compatible with AWS API using Eucalyptus
6. Build Cloud platform using Openstack
7. Package development using tools supported by cloud providers as a free service

Total L: 45+T: 30=75

15XWAG HUMAN COMPUTER INTERACTION

3 2 0 4

INTRODUCTION: Design, Models, Evaluation. Need to understand people, computers and methods. Motivation. Contexts for HCI. (4)

FOUNDATION OF HCI - HUMAN ABILITIES &COMPUTERS:Human abilities - Vision. Hearing. Touch. Memory. Computers - Speed. Interfaces. Widgets. Effects on interaction. (6)

INTERACTION: Understanding the psychology towards Compters. Egonomics. Need finding. Understanding user's needs and expectations. Interaction styles - Command language. Form filling. Menu selection. Direct manipulation. (6)

DESIGN GUIDELINES &EVALUATION: Heuristics as guidelines - Simple and natural dialogue, Speak the user's language, Be consistent, Provide shortcuts. Using heuristics to explain usability problems. Style guides. Evaluation of users interfaces: Heurisitc evaluation, measuring API usability. (8)

USER-CENTERED DESIGN: Introduction to User-centered design and prototyping. Methods - Verbal techniques, Paper prototyping, Mock interfaces, Tutorials and manuals. Collaboration with users. (9)

CASE STUDIES:

Web design: Build a web application to demonstrate various techniques. Focus on user interaction, design and ease of use.

Mobile app design: Build a mobile application to demonstrate the following: Issues with interactions in mobile. Limitations of building apps in the small screens of mobile device; Designing the app for better usability.

Game development: Build a game to understand the challenges in building a rich as well as an easy to use interface. (12)

TEXT BOOKS:

1. Alan Dix, Janet Finlay, Gregory Abowdand Russell Beale,"Human-Computer Interaction", Prentice Hall, 2009.
2. Yvonne Rogers, Heken Sharp and Jenny Preece, "Interaction Design: Beyond Human-Computer Interaction", John Wiley, 2011.

REFERENCE :

1. William Buxton, “Performance by design: The role of design in software product development”, Proceedings of the Second International Conference on Usage-Centered Design, 2003.

TUTORIAL PRACTICE :

1. Web design: Build a web application with preference to user interaction, design and ease of use.
2. Mobile app design: Build a mobile application to demonstrate Issues with interactions in mobile; using small screens of mobile device with better usability.
3. Game development: Build a game to understand the challenges in building a rich as well as an easy to use interface.

Total L: 45+T: 30=75

15XWAH SOCIAL NETWORK ANALYSIS

3 2 0 4

INTRODUCTION: Motivation - different sources of network data - types of networks - tools for visualizing network data - review of graph theory basics. (9)

GRAPH THEORETIC PROPERTIES OF SOCIAL NETWORKS: Notions of centrality - Strong and weak ties – Homophily - Structural Balance. (5)

DYNAMIC PROPERTIES OF NETWORKS: Information diffusion - networks effects on information diffusion - maximizing influence spread - power law and heavy tail - preferential attachment models - small world phenomenon - cascading behavior on networks - Epidemics. (11)

BEHAVIORAL PROPERTIES ON NETWORKS: Network economics - Bargaining and power in networks - Sponsored search markets. (10)

MINING GRAPHS: Community and cluster detection: random walks - spectral methods - link analysis for web mining. (10)

TEXTBOOKS:

1. David Easley and Jon Kleinberg, “Networks, Crowds, and Markets: Reasoning About a Highly Connected World”, Cambridge University Press, Cambridge, 2010.

REFERENCES:

1. Stanley Wasserman, Katherine Faust, “Social network analysis: methods and applications”, Cambridge University Press, Cambridge,1998.
2. Peter R. Monge, Noshir S. Contractor, “Theories of communication networks”, Oxford University Press, 2003.
3. Duncan J Watts. “Six degrees: the science of a connected age”, Norton, 2004.
4. Narahari, Y., Garg, D., Ramasuri, N., and Prakash, H, “Game Theoretic Problems in Network Economics and Mechanism Design Solutions”, Springer-Verlag, 2008.

TUTORIAL PRACTICE:

1. Getting acquainted with UCINET and Netdraw.
2. Implementing graph-theoretic/social network metrics using UCINET.
3. Working with Visualization, Ego networks, Centrality, Community Detection etc.

Total L: 45+T: 30=75

15XWAI ADVANCED COMPUTER GRAPHICS

3 2 0 4

GEOMETRICAL TRANSFORMATIONS: 2D Transformations- Homogeneous Coordination and metric representation – Composition of 2D transformations – Window to view port transport, Efficiency- Matrix representation of 3D transformations – Composition of 3D transformation – Transformation as a change in coordinate system. (3)

VIEWING IN 3D: Projections – specifying arbitrary 3D viewing – The Mathematics of planar geometric projections – implementing planar geometric projections, Coordinate systems. (3)

OBJECT HIERARCHY: Geometric modeling- Characteristics of retained – mode graphics packages – Defining and displaying structure – Modeling transformations, Hierarchical structure networks. (3)

INPUT DEVICES – INTERACTION TECHNIQUES AND INTERACTION TASKS: Interaction hardware – Basic interaction tasks – Composite interaction tasks. (3)

DIALOGUE DESIGN : The form and content of user-computer dialogues – User interface styles – Important design considerations – Modes and syntax – Visual design – The design methodology (3)

USER INTERFACE SOFTWARE: Basic interaction – handling models - window management systems – output handling in window systems – Input handling in windows systems – Interaction –technique toolkits – User-interface management systems. (3)

REPRESENTING CURVES AND SURFACES: Polygon meshing – parametric cubic curves, parametric bicubic surfaces, quadric surfaces. (3)

SOLID MODELLING: Representing solids – Regularized Boolean set operations – Primitive instancing – Sweep representations – Boundary representations – Spatial – Partitioning representations – Constructive solid geometry – Comparison of representation – User interfaces for solid modeling. (4)

VISIBLE SURFACE DETERMINATION : Function of two variables – Techniques for efficient visible surface algorithms – Algorithms for visible line determination – The z-buffer algorithm – List – priority Algorithm – Area subdivision algorithms – Algorithms for octrees – Algorithms for curved surfaces – Visible ray tracing. (3)

REALISM: Fundamental difficulties – Rendering techniques for line drawing – Rendering techniques for shaded images – Improved object models – Dynamics – steropsis – Improved displays – Interacting with our other senses – Aliasing and antialiasing. (3)

ACHROMATIC AND COLORED LIGHT: Achromatic light – Chromatic color – Color Models for Raster Graphics – Reproducing Color – Using Color in Computer Graphics. (3)

ILLUMINATIONS AND SHADING : Illumination models – Shading models for polygons – Surface detail – Shadows – Transparency – Inter object reflections – Physically based illumination models – Extended light sources – Spectral sampling – Improved camera model – Global Illumination algorithms – Recursive ray tracing – Radiosity methods – The rendering pipeline. (4)

IMAGE MANIPULATION AND SHADING: Image Basics - Filtering – Image Processing – Geometric transformations of Images – Multipass transformation – Image Composition – Mechanism for Image Storage – Special Effects with images (4)

ANIMATION : Conventional and Computer assisted Animation – Animation languages – Methods of controlling animation - Basic rules of animation – Problems peculiar to animation. (3)

TEXT BOOKS:

1. Foley, Andries van Dam, Feinerand Hughes “Computer Graphics Principles & Practice”, Addison Wesley, 2013.

REFERENCES:

1. Donald Hearn and Pauline Baker M, Warren Karithers, “Computer Graphics with OPENGL”, Pearson Education, 2014.

TUTORIAL PRACTICE :

Implement the following using the OpenGL library in VC++

1. Using glRect function, draw : a) A flurry b) A checkerboard
2. Write the window to view port mapping functions, and use it to draw the sine curve in real world coordinates.
3. Using user defined lineTo and moveTo functions, plot the Fibonacci series.
4. Write the Canvas class and its supporting classes. Use the Canvas class to draw a simple meander.
5. Write functions to change the background and foreground colors.
6. Write a function to draw an n-sided polygon (using the basic Canvas class and line To and move To functions)
7. A program to draw the Sierpinski gasket.
8. A program to draw the graph of a given mathematical function f(x).
9. A program to read a data file that contains a collection of Polylines in the appropriate format and draw each polyline.
10. A parameterized function to display a house and call it many times by passing different values to form a village.
11. A program that displays a colored triangle and rectangle and rotates them at different angles along two axis.

Total L: 45+T: 30=75

15XWAJ COMPUTER VISION AND IMAGE ANALYSIS

3 2 0 4

OVERVIEW: Computer Imaging Systems: Image formation and Sensing, Color representation, Image Acquisition, Image digitization, Noise, Image Representation. (4)

DIGITAL IMAGE ANALYSIS: Preprocessing, Binary Image Analysis, Edge detection - First order derivative, Second order detection, Color edge detection, Pyramid edge detection, Edge linking and boundary detection, Segmentation - Region based segmentation, clustering techniques, boundary detection, thresholding. (8)

IMAGE ENHANCEMENT: Gray-Scale Modification, Image Sharpening, Image Smoothing - Image Restoration - Noise Models, Noise removal using spatial filters, frequency domain filters, Geometric transforms, Image Reconstruction. (6)

IMAGE TRANSFORMS: Overview of discrete transforms, Fourier Transform, Discrete Cosine transform, Discrete Haar transform, Principal components transform, Discrete Wavelet Transform, Filtering. (6)

IMAGE FEATURE ANALYSIS: Overview, Feature Extraction - Shape, histogram, color, spectral, textural features, feature Analysis. Image Compression - Overview, Lossless compression methods, lossy compression methods. (5)

MORPHOLOGICAL OPERATIONS - Binary Dilation, Erosion, Opening and Closing, Hit-or-Miss Transform, Basic Morphological Algorithms, Extension to Gray-Scale Images. (4)

IMAGE COMPRESSION - Basic requirements, Types of compression, Coding Algorithms. (4)

APPLICATIONS – CBIR, CBVR, Activity Recognition, computational photography, Biometrics, stitching and document processing; Modern trends - super-resolution; GPU, Augmented Reality; cognitive models, fusion and SR&CS. (8)

TEXT BOOKS:
1. Umbaugh, S. E.,"Digital image processing and analysis: human and computer vision applications with CVIPtools", CRC press, 2010.
2. Nagabhushana S, "Computer Vision and Image Processing", New Age International, 2005.

REFERENCES:
1. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer-Verlag, 2011.
2. Richard Hartley and Andrew Zisserman, "Multiple View Geometry in Computer Vision", Cambridge University Press, 2004.
3. R.C. Gonzalez and R.E. Woods, "Digital Image Processing", Addison- Wesley, 2014.

TUTORIAL PRACTICE:
1. Implementation of Image segmentation and edge detection.
2. Implementation of feature extraction.
3. Implementation of image classification and clustering.
4. Developing simple image analysis applications.

Total L: 45+T: 30=75

15XWAK BIG DATA ANALYTICS

3 2 0 4

OVERVIEW– Big Data era – characteristics - Definition of data features – Big data value – Development – Challenges – Intelligent data analysis - .Nature of data - Evolution of database - Limitations of existing solutions. (4)

RELATED TECHNOLOGIES–Cloud computing – Relationship between cloud computing and big data - Internet of Things (IOT): IOT preliminaries – relationship between IOT and Big data; Data Centre – Hadoop – Preliminaries and Big Data – NoSQL - Hadoop eco system - Data loading techniques – Flume - Sqoop– Hive - Pig Latin - Mahout – HDFS- Map and Reduce. (12)

BIG DATA GENERATIONAND ACQUISITION:– Enterprise data – IOT data – Internet data – Biomedical data – Data generation from fields - Data Collection – Transportation - Preprocessing. (8)

BIG DATA ANALYSIS AND MINING: Traditional – Analytic methods – Architecture : Real-time vs Offline – analysis at different levels – different complexity – Stream Concepts – Stream data model and architecture – stream computing – sampling data in a stream – filtering streams – counting distinct elements in a stream – estimating moments – Real time analytics platform (RTAP) applications. (11)

MASSIVE DATA ANALYTICS: Map-reduce for machine learning, Nearestneighbor classifier, Multi-task learning, Topic model. (3)

APPLICATIONS – Application evolution – Fields: Structured, Text, Web, Multimedia, Network, Mobile traffic; Social Network – Healthcare and medical – Collective intelligence – smart grid. (7)

TEXT BOOKS:
1. Min Chen, Shiven Mao, Yin Zhang, Victor CM Leung, "Big Data: Related Technologies, Challenges and Future Prospects", Google (ebook), Springer.
2. EMC^2 Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley, 2015
3. Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things", Wiley, 2013
4. VlasiosTsiatsis, IoannisFikouras, Stefan Avesand, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", Academic Press Inc, 2014

REFERENCES:
1. Ravi Kannan, John Hopcroft, "Foundations of Data Science", 2013.
2. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer-Verlag, 2011.

3. Richard Hartley, Andrew Zisserman, “Multiple View Geometry in Computer Vision”, Cambridge University Press, 2004.
4. Olivier Hersent, David Boswarthick, “The Internet of Things: Key Applications and Protocols”, Wiley, 2012.
5. Anand Rajarama, Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2011.

TUTORIAL PRACTICE:
1. Implementation of data generation related concepts.
2. Implementation of data analysis concepts.
3. Developing applications.

Total L: 45+T: 30=75

OPEN ELECTIVES

15XWO1 ENTERPRENEURSHIP

3 2 0 4

INTRODUCTION TO ENTREPRENEURSHIP: Definition – Characteristics and Functions of an Entrepreneur – Common myths about entrepreneurs – Importance or Entrepreneurship. Seminar in R5 & R6. (5)

CREATIVITY AND INNOVATION: The role of creativity – The innovation Process – Sources of New Ideas – Methods of Generating Ideas – Creative Problem Solving – Entrepreneurial Process. (6)

DEVELOPING AN EFFECTIVE BUSINESS MODEL: The Importance of a Business Model – Starting a small scale industry - Components of an Effective Business Model. (5)

APPRAISAL OF PROJECTS: Importance of Evaluating Various options and future investments- Entrepreneurship incentives and subsidies – Appraisal Techniques. (8)

FORMS OF BUSINESS ORGANIZATION: Sole Proprietorship – Partnership – Limited liability partnership - Joint Stock Companies and Cooperatives. (4)

FINANCING THE NEW VENTURE: Determining Financial Needs – Sources of Financing – Equity and Debt Funding – Case studies in Evaluating Financial Performance. (8)

THE MARKETING FUNCTION: Industry Analysis – Competitor Analysis – Marketing Research for the New Venture – Defining the Purpose or Objectives – Gathering Data from Secondary Sources – Gathering Information from Primary Sources – Analyzing and Interpreting the Results – The Marketing Process**.** (5)

INTELLECTUAL PROPERTY PROTECTION AND ETH ICS: Patents – Copyright - Trademark- Geographical indications – Ethical and social responsibility and challenges. (4)

TUTORIAL PRACTICE:
Case studies

Total L:45+T:30=75

TEXT BOOKS:
1. Donald F.Kuratko and Richard M.Hodgetts, “Entrepreneurship”, South-Western.
2. The Dynamics of Entrepreneurial Development and Management, Vasant Desai, Himalaya Publishing House, 2010.

REFERENCES:

1. S.L.Gupta, Arun Mittal, Entrepreneurship Development, International Book House, 2012.
2. G. S. Sudha, Management and Entrepreneurship Development, Indus Valley Publication, 2009.
3. V. Badi, N. V. Badi , Business Ethics, R, Vrinda Publication (P) Ltd., 2012.
4. Prasanna Chandra Projects- Planning, Analysis, Financing, Implementation and review, TATA McGraw Hill, 2012.

15XWO2 COMPUTER FORENSICS

3 2 0 4

COMPUTER AND FORENSICS: Introduction – Stand-alone computer crimes –Computer evidence – Computer Forensics evidence and courts –Internet laws and statutes; Forensics process – Securing evidence – Law enforcement and methodology. (8)

FORENSICS EVIDENCE: Sources – Seizure – Collection – Integrity – Handling; Acquisition and Duplication of data. (8)

DATA ANALYSIS: Metadata extraction – File Signature analysis – System analysis – Examining unallocated space – Data carving – Recovering deleted data and partitions (6)

WINDOWS FORENSICS: Registry Analysis – Executable file analysis – Recycle Bin Forensics – Evidence Recovery from Print and Spool files. (5)

INTERNET FORENSICS: Domain Name Ownership Investigation – Email Forensics – Messenger Forensics – Browser Forensics. (6)

MOBILE DEVICE FORENSICS: Hand-held devices and Forensics – Reconstructing user's activities and deleted data. (4)

MEMORY FORENSICS AND MALWARE ANALYSIS: Memory data collection and Examination – Analyzing Windows and Linux systems for malware – Reverse Engineering tools and techniques. (6)

ANTI-FORENSICS: Erasing Evidence. (2)

TEXT BOOKS:

1. Marjie T. Britz, "Computer Forensics and Cyber Crime: An Introduction", Pearson Education, 2013.
2. Linda Volonino, Reynaldo Anzaldua, Jana Godwin, "Computer Forensics: Principles and Practices", Pearson/Prentice Hall, 2007

REFERENCES:

1. Chuck Easttom, "System Forensics, Investigation, and Response", Jones & Bartlett Publishers, 2014.
2. Satish Bommisetty, Rohit Tamma, Heather Mahalik, "Practical Mobile Forensics", Packt Publishing Ltd, 2014.
3. Robert Jones, "Internet Forensics ", O'Reilly Media, 2005.

TUTORIAL PRACTICE:

1. Implementation of data analysis techniques.
2. Implementation of system analysis concepts.
3. Implementation of email forensics concepts.
4. Implementation of hand-held device forensics activities.

Total L: 45+T: 30=75

15XWO3 WIRELESS NETWORKS

3 2 0 4

WIRELESS FUNDAMENTALS: Introduction to cellular networks,-wireless local area networks- Spectrum allocations Radio propagation models-Narrowband digital modulation and wireless fading environments. – Modern Communications Systems – MAC – SDMA – TDMA – FDMA - CDMA - Cellular and Ad-hoc-Concepts. (7)

WLAN TECHNOLOGIES: wireless network architectures – 802.11 PHYs – 802.11 MAC – WPA and 802.11i: Security – 802.11e: MAC Enhancements for Quality of Service – Related Wireless Standards (Hyperlan, HomeRF, Bluetooth, Zigbee, Wireless USB)- WiFi and Wi MAX Standards. (8)

AD HOC AND SENSOR NETWORKS: Ad hoc Network- Characteristics- Table-driven and Source-initiated On Demand routing protocols, Hybrid protocols - Routing in intermittently connected mobile networks. Wireless Sensor networks- Classification, MAC and Routing Protocols. (8)

MOBILE NETWORK AND TRANSPORT LAYERS: Mobile IP – Dynamic Host Configuration Protocol-Mobile Ad Hoc Routing Protocols–Multicast routing-TCP over Wireless Networks – Indirect TCP – Snooping TCP – MobileTCP – Fast Retransmit / Fast Recovery – Transmission/Timeout Freezing-Selective Retransmission – Transaction Oriented TCP- TCP over 2.5 / 3G wireless Networks . (8)

WIRELESS PANs MANs – Physical and MAC layer details, Wireless PANs – Architecture of Bluetooth Systems, Physical and MAC layer details, Standards-WLAN deployment issues- Interference – Resource Allocation. (6)

FUTURE TRENDS: Emerging WLAN Related Technologies – 802.11 Trends – Cellular – 802.16 – 802.20 – 802.22 – UWB, Cognitive Radios, RFID – 4G and Data Communications Convergence. (8)

TEXT BOOKS:
1. Gary. S. Rogers and John Edwards, "An Introduction to Wireless Technology", Pearson Education, 2012.
2. SivaRam Murthy C and B.S Manoj, "Ad hoc Wireless Networks Architecture and Protocols", Pearson Education, 2005.
3. KavehPahlavan, Prashant K. Krishnamurthy, "Principles of Wireless Networks: A unified approach", John Wiley, 2011.

REFERENCES:
1. William Stallings, "Wireless Communication and Networks", Pearson Education, 2009.
2. Dharma Prakash Agrawal and Qing-An Zeng, "Introduction to Wireless and Mobile Systems", Thomson Press, 2007.
3. Feng Zhao and Leonidas Guibas, "Wireless Sensor Networks-An Information Processing Approach", Elsevier, 2004.
4. Clint Smith, P.E. and Daniel Collins, "3G Wireless Networks", Tata McGraw Hill, 2007.
5. Ivan Stojmenovic, "Handbook of Wireless Networks and Mobile Computing", John Wiley, 2006.
6. SavoGlisic, " Advanced Wireless Communications 4G Technologies", Wiley Publications, 2006.

TUTORIAL PRACTICE:
1. Study of NS-2 simulator.
2. Simulation of a IEEE 802.11 LAN under various conditions using NS-2 simulator.
3. Simulation of a priority MAC protocol using NS-2 simulator.
4. Simulation of different routing protocols using simulators.
5. Simulation of TCP over error-prone wireless network using NS-2 simulator.
6. Development of Mobile application using blue tooth.

Total L:45+T:30 = 75

15XWO4 RANDOMIZED ALGORITHMS

3 2 0 4

INTRODUCTION: Randomized algorithms, randomized quick sort, Karger's min-cut algorithm Las Vegas and Monte Carloalgorithms, computational models and complexity classes. (5)

MOMENT, DEVIATION AND TAIL INEQUALITIES: Occupancy problem**,** Markov and Chebyshev inequalities- randomized selection- coupon collector's problem, the Chernoff bound- routing in a parallel computer- a wiring problem. (7)

PROBABILISTIC METHODS: Overview of the method-maximum satisfiability - finding a large cut , Expander graphs. (5)

MARKOV CHAINS AND RANDOMWALKS: Markov chains, Random walk on graphs - connectivity in undirected graphs – Expanders and rapidly mixing random walks. (6)

DATA STRUCTURES AND GRAPH ALGORITHMS: Random Treaps, hashing – hash tables – perfect hashing, skip lists **-** Fast in-cut. (6)

ONLINE ALGORITHMS: Paging problem-adversary models- paging against an oblivious adversary-relating the adversaries-the adaptive online adversary, k-server problem. (5)

PARALLEL AND DISTRIBUTED ALGORITHMS: Sorting on a PRAM – Maximal Independent sets. (4)

NUMBER THEORETIC ALGORITHMS:, Polynomial roots and factoring, primality testing. (3)

DERANDOMIZATION: The method of Conditional Probabilities – Derandomizing max-cut algorithm – Constructing pairwise independent values modulo a prime - Pairwise independent – large cut. (4)

TEXT BOOKS:
1. Motwani R and Raghavan P, "Randomized Algorithms", Cambridge University Press, 2010.
2. Michael Mitzenmacher and Eli Upfal, "Probability & Computing: Randomized Algorithms and Probabilistic Analysis", Cambridge University Press, 2009.

REFERENCES:
1. Thomas H Cormen, Charles E Leiserson and Ronald L Rivest, "Introduction to Algorithms", MIT Press, 2009.
2. Anany Levitin, "Introduction to Design and Analysis of Algorithms", Pearson Education, 2011.

TUTORIAL PRACTICE:
1. Implementation of randomized quick sort and solve real time problems using it.
2. Find solution for s-t min-cut problem adapting min cut algorithm.
3. Implementation of randomized selection and problems related to it.
4. Implementation of treap data structure.

5. Problems using randomized hash table.
6. Implement the shortest path and fast min-cut algorithms.
7. Implementation of randomized primality testing.
8. Implement the K-server on-line algorithms.

Total: L:45+T:30 = 75

15XWO5 DATA VISUALIZATION

3 2 0 4

INTRODUCTION: Information visualization – Theoretical foundations – Information visualization types – Design principles - A framework for producing data visualization. (8)

STATIC DATA VISUALIZATION – tools – working with various data formats. (4)

DYNAMIC DATA DISPLAYS: Introduction to web based visual displays – deep visualization – collecting sensor data – visualization – D3 framework - Introduction to Many eyes and bubble charts (10)

MAPS – Introduction to building choropleth maps (3)

TREES – Network visualizations – Displaying behavior through network graphs (10)

BIG DATA VISUALIZATION – Visualizations to present and explore big data – visualization of text data and Protein sequences (10)

TEXT BOOKS:

1. Ware C and Kaufman M, "Visual thinking for design", Morgan Kaufmann Publishers, 2008.

REFERENCES:

1. Chakrabarti S, "Mining the web: Discovering knowledge from hypertext data ", Morgan Kaufman Publishers, 2003.
2. Fry, "Visualizing data", Sebastopo, O'Reily, 2007.

TUTORIAL PRACTICE:

Note : Explore software like R, Python, Google Vision, Google Refine, and ManyEyes; Data sets are available on Gap minder, Flowing data

1. Visualization of static data.
2. Visualization of web data.
3. Visualization of sensor data.
4. Visualization of protein data.

Total: L:45+T:30 = 75

15XWO6 APPLIED GRAPH THEORY

3 2 0 4

BASIC CONCEPTS: Graphs - directed and undirected, subgraphs, graph models, degree of a vertex, degree sequence, Havel-Hakimi theorem, Hand-shaking lemma. Connectivity, walk, path, distance, diameter. Isomorphic graphs. Common classes of graphs – regular, complete, petersen, cycle, path, tree, k-partite, planar, hypercube, Spanning trees – Matrix tree theorem, graph decomposition. (6+4)

CONNECTIVITY: Vertex and edge connectivity, Vertex and edge cuts, relationship between vertex and edge connectivity, bounds for connectivity. Harary's construction of k-connected graphs. (8+4)

EULERIAN AND HAMILTONIAN GRAPHS: Eulerian graphs, Route inspection problem, Hamiltonian graphs, Gray codes and Hypercubes, Travelling sales person problem. (8+5)

MATCHING, VERTEX-COLORING AND DOMINATION: Matching (unweighted), Perfect matching, Hall's theorem, assignment problem, augmenting path algorithm. Vertex-coloring – bounds, assignment of frequencies, fast register allocation, scheduling problem. Dominating set, domination number, bounds, connected dominating set in Ad Hoc Networks. (11+8)

PLANAR GRAPHS: Properties, Kuratowski's statement, triangulation of polygons using vertex coloring, construction of Voronoi diagrams, Delaunay triangulations. (7+5)

RANDOM GRAPHS: Random graph – Definitions of G (n, p) and G(n, M) models, power law degree distribution, Web graph models, applications to social networks. (5+4)

TEXT BOOKS:
1. Anthony Bonato, "A Course on Web Graphs", American Mathematical Society, 2008.
2. Haynes T W, Hedetniemi and Slater P J, "Fundamentals of Domination in Graphs", CRC Press, 2015.
3. Jonathan Gross and Jay Yellen, "Graph Theory and its Applications", CRC Press, 2005.

REFERENCES:
1. Douglas B West, "Graph Theory", Prentice Hall, 2009.
2. Albert-LászlóBarabási, "Network Science", Barabasi Lab, 2012.

TUTORIAL PRACTICE:
Case Studies

Total L:45+T:30=75

15XWO7 CRYPTOGRAPHY

3 2 0 4

INTRODUCTION: Security Problems in computing – security goals –attacks – Services and mechanisms (3)

BASICS OF NUMBER THEORY: Divisibility –– Euclidean and Extended Euclidean algorithms, Modular arithmetic- Computing modular inverse – modular exponentiation- efficient algorithms, generators and primitive roots in groups, Fermats little theorem, Chinese remainder theorem-PRNG (6)

SYMMETRIC KEY CRPTOSYSTEM: Introduction - Encryption building blocks - stream ciphers and block ciphers, substitution cipher – transposition cipher – modern symmetric key ciphers – Data Encryption Standard (DES) - Advanced Encryption standard (AES) – RC4 (8)

PUBLIC KEY CRYPTOGRAPHY: Concept of public key cryptography – RSA cryptosystem- - the RSA problem – Integer factorization problem, Discrete log problem,- El Gamal cryptosystem, Elliptic curve cryptosystem (10)

DATA INTEGRITY TECHNIQUES : Symmetric techniques- Cryptograhic hash fuctions – MAC, asymmetric techniques – Digital signatures – RSA signature, EL Gamal signature, Digital signature standard algorithm, strong security notion for digital signatures- provable security for ElGamal signature (10)

AUTHENTICATION AND KEY DISTRIBUTION PROTOCOLS: Data originauthentication and entity authentication, challenge and response--Diffie Hellman key predistribution, session key distribution – The Needham Schroeder scheme, Kerberos – Certificates (8)

TEXT BOOKS:
1. Douglas R Stinson, "Cryptography Theory and Practice", CRC Press, 2006.
2. Wenbo Mao," Modern Cryptography- Theory and Practice", Pearson Education, 2008
3. Behrouz A Forouzan, DebdeepMukhopadhyay, "Cryptography and Network Security", Tata McGraw Hill, 2010.

REFERENCES:
1. Richard E Smith, "Internet Cryptography", Pearson Education, 2008.
2. William Stallings, "Cryptography and Network Security: Principles & Practice ", Pearson Education, 2009.
3. Roberta Bragg, Mark Rhodes Ousley and Keith Strassbery, "The complete reference, Network Security", Tata McGraw Hill, 2008.

TUTORIAL PRACTICE:
Case Studies

Total L:45+T:30=75