Please refer page number 9 for syllabus structure with highlighted list of newly introduced courses.

University of Pune

Syllabus for Masters of Computer Application

From Academic Year 2013-2014

MCA (Part I) From Academic Year 2013-2014
MCA (Part II) From Academic Year 2014-2015
MCA (Part III) From Academic Year 2015-2016

(I) Introduction:

1. The name of the programme shall be Master of Computer Application (M.C.A) Integrated.

2. The knowledge and skills required planning; designing and build Complex Application Software Systems are highly valued in all industry sectors including business, health, education and the arts. The basic objective of the education of the Masters programme in Computer Application (M.C.A) is to provide to the country a steady stream of the necessary knowledge, skills and foundation for acquiring a wide range of rewarding careers into the rapidly expanding world of the Information Technology.

3. The Job Opportunities are:
   - Many graduates begin their career as a junior programmer and, after some experience, are promoted as system analysts. Other seek entrepreneurial role in the computer world as independent business owners, software authors, consultants, or suppliers of systems and equipments. Career opportunities exist in such areas as management software and hardware sales, technical writing, training others on computer, consulting, software development and technical support.
   - Application areas include transaction processing (such as order processing, airline reservations, banking system), accounting functions, sales analysis, games, forecasting and simulation, database management, decision support and data communications.

4. Specific elective courses to be offered in functional areas have to depend on student preferences, faculty availability and needs of the user systems in the region in which the educational institution is located

5. The M.C.A program is a mix of computer-related and general business courses. The computer related courses use microcomputers to introduce standard techniques of programming; the use of software packages including word processors, spreadsheets and databases; system analysis and design Tools. The general business courses include the functional areas of management like accounting, sales, purchase, inventory, and production. The course would emphasis the study and creation of business applications, rather than more programming Inclusion of projects in each semester improves student's technical orientation, understanding of IT environment and domain knowledge. It will build right platform for students to become successful Software professional. This would emphasize on domain knowledge of various areas, which would help the students to build software applications on it. The students are exposed to system development in the information-processing environment, with special emphasis on

Management Information Systems and Software Engineering for small and medium computer systems. Inclusion of Business Management Labs will help students to acquire thorough knowledge of management practices in organization. Subjects such as ERP, Information Security, Business Intelligence will work as new application domains. Major focus is also given on Mobile technologies so that student can choose Mobile Technologies as their career options. Also, exposure to microcomputer technology, micro-based systems design and micro applications software, including network and graphical user interface systems is provided. Advanced Internet and Web technology includes variety of new technologies. Soft skills techniques are covered in every semester, which will lead to overall personality development of the student and that will help them in their placement activities and to sustain in the organization successfully.

6. The M.C.A. Integrated programme will be a full-time three years Master's Degree Course of Computer Applications.

7. The new Curricula would focus on learning aspect from three dimensions viz. Conceptual Learning, Skills Learning and Practical / Hands on.

8. The inclusion of projects at each semester ensures the focus on applying the skill learnt at respective levels. It will enhance student's capability to work on various technologies, creativity. It will make appropriate platform for students to work in IT Industry. It will also improve documentation, Coding, Design standards in students. Inclusion of project for subject such as Mobile Computing will definitely improve student's innovativeness and creativity. Student's technical orientation, eagerness will be enhanced.

9. The Institutes should organize placement programme for the M.C.A students, by interacting with the industries and software consultancy houses in and around the region in which the educational Institution is located.

10. At the end of the syllabus various certifications possible for each Semester is given in the list. Students should try to do maximum certifications in their learning phase only to make their resume rich.

11. Ordinarily, in each class, not more than 60 students will be admitted.

(II) (A) Eligibility for Admission:

The eligibility criteria for admission for the MCA course will be as decided by the Competent Authority (Director, Technical Education-Government of Maharashtra, &/or AICTE, New Delhi)

1. A candidate who has either passed with minimum 45% of marks in the aggregate (40% in case of candidate who is domiciled in Maharashtra and belongs to the reserved categories i.e. S.C., S.T., D.T., N.T., O.B.C., S.B.C.)
   or
   appeared at the final year examination of a post 10+2 course of minimum three years duration leading to an award of Bachelor's Degree, in any discipline by the Association of Indian Universities or has passed with minimum 45% of marks in the aggregate (45% in case of candidate who is domiciled in Maharashtra and belongs to the reserved categories) or appeared at an examination considered equivalent there to would be treated as eligible

for Common Entrance Test(CET). Also the candidate must have passed mathematics/Business Mathematics & Statistics paper for 10+2 or graduation Level and Passed the CET conducted by Director of Technical Education MS with nonzero score for that year OR Passed the CET conducted by State level MCA Association with non-zero score for that year, Or Passed the AIMCET exam for that year.

2. However, a candidate would not be treated as eligible for admission to the MCA programme unless he/she passes his/her qualifying examination with requisite percentage on or before 30th September of the concerned academic year and also passes in the CET.

Generally, candidate passing all the papers that are generally covered over a period of minimum three years in one sitting are not considered eligible. Likewise, candidates possessing the qualifying degree although with requisite percentage of marks, whose duration is less than three years, are not considered eligible.

(B) Reservation of Seat:

The percentage of seat reserved for candidates belonging to backward classes only from Maharashtra State in all the Government Aided, Un-aided Institutions/Colleges and University Departments is as given below:

a)	Scheduled caste and Scheduled caste convert to Buddhism	13.0%
b)	Scheduled Tribes including those living outside specified areas	10.5%
c)	Vimukta Jain	(14 as specified)
d)	Nomadic Tribes (NT1)(28 before 1990 as specified)	2.5%
e)	Nomadic Tribes (NT2)(Dhangar as specified)	2.5%
f)	Nomadic Tribes (NT3)(Vanjari as specified)	2.5%
g)	Other Backward Class	19.0%
	Total	50.0%

1. Candidate claiming to belong to categories mentioned against (e),(f) and (g) above will have to furnish certificate from appropriate authority that the candidate's parents do not belong to Creamy Layer as per the relevant orders of the Government.
2. If any of the (a) to (g) categories mentioned above does not get the required number of candidates for the percentage laid down in a University area, the seats so remaining vacant shall be filled in from among the candidates of remaining reserved categories with reference to the inter-se-merit of all candidates belonging to the reserved categories from the same University area. However, the total reservation shall not exceed 50%. After doing so the seats remaining vacant shall be filled in with reference to inter-se-merit of all the candidates from the same University area.

(C) Selection Basis:

The selection would be done as per the guidelines given by the Director of Technical Education Maharashtra State time to time.

(III) Number of Lectures and Practical:

Lectures and Practical should be conducted as per the scheme of lectures and practical indicated in the course structure.

Practical Training and Project Work:

At the end of the sixth semester of study, a student will be examined in the course" Project Work".

1. Project work may be done individually or in groups in case of bigger projects. However if project is done in groups, each student must be given a responsibility for a distinct module and care should be taken to see the progress of individual modules is independent of others.
2. Students should take guidance from an internal guide and prepare a Project Report on "Project Work" in 2 copies to be submitted to the Director of the Institute by 30th April. Whenever possible, a separate file containing source-code listings should also be submitted. Every student should also submit at least 4 typed copies of their project synopsis. Their respective Institutes should forward one copy of this synopsis to each of the external panel members, in advance of the project viva dates.
3. The Project Synopsis should contain an Introduction to Project, which should clearly explain the project scope in detail. Also, Data Dictionary, DFDs, ERDs, File designs and a list of output reports should be included.
4. The project Work should be of such a nature that it could prove useful or be relevant from the commercial/management angle.
5. The project report will be duly accessed by the internal guide of the subject and marks will be communicated by the Director to the University along with the marks of the internal credit for theory and practical to be communicated for all other courses.
6. The project report should be prepared in a format prescribed by the University, which also specifies the contents and methods of presentation.
7. The major project work carry 200 marks for internal assessment and 300 marks for external viva. The external viva shall be conducted by a minimum of two external examiners. The mini project work would be departmental.
8. Project work can be carried out in the Institute or outside with prior permission of the Institute.
9. Project viva-voce by the University panel will be conducted in the month of April-May.

(V) Assessment:

In total 160 credits represent the workload of a year for MCA program.
Total credits=160, 1 credit = 15 lecture Hrs, 100 Marks SUBJECT= 4 CREDITS

Semester – I	27 credits
Semester – II	27 credits
Semester – III	27 credits
Semester – IV	27 credits
Semester – V	27 credits
Semester – VI	25 credits

Credit hours are based on the number of "contact hours" per week in class, for one term; formally, Semester Credit Hours. One credit will represent 12 to 15 teaching hours depending on technical and management subjects.

The final total assessment of the candidate is made in terms of an internal (concurrent) assessment and an external (university) assessment for each course. In total the internal(concurrent) to external(university) marks ratio is maintained 50 : 50.

In general

1. For each paper, 30% marks will be based on internal assessment and 70% marks for semester and examination (external assessment), unless otherwise stated.
2. The division of the 30 marks allotted to internal assessment of theory papers is on the basis of tutorial paper of 15 marks and seminars, presentations and attendance of 15 marks.
3. The marks of the mini project would be given on the basis of internal assessment of the project, project viva and project report.
4. The marks of the practical would be given on internal practical exam & oral.
5. The internal marks will be communicated to the University at the end of each semester, but before the semester and examinations. These marks will be considered for the declaration of the results.

(VI) Examination:

Examinations shall be conducted at the end of the semester i.e. during November and in May. However supplementary examinations will also be held in November and May.

(VII) Standard of Passing:

1. Every candidate must secure atleast Grade D in Concurrent Evaluation as well as University Examination as separate heads of passing for each course. Internal as well as external examination will be held in November and May.

Conversion of Marks to Grade Points & Grades: The marks shall be converted to grade points and grades using Table I below.

Table I: Points Grading System

Sr. No.	Marks	Grade	Grade Point
1	100 – 75	O – Outstanding	06
2	74 – 65	A – Very Good	05
3	64 -55	B – Good	04
4	54 – 50	C – Average	03
5	49 – 45	D – Satisfactory	02
6	44 – 40	E – Pass	01
7	39 – 0	F – Fail	00

(VIII) Reassessment of Internal Marks:

In case of those who have secured less than passing percentage of marks in internal i.e. less than 40%, the institute will administer a separate internal test. The results of which may be conveyed to the University as the Revised Internal Marks.

In case the result of the revised internal test is lower than the original marks then the original marks will prevail. In short, the rule is higher of the two figures should be considered.
However, the institute will not administer any internal test, for any subject for those candidates who have already secured 40% or more marks in the internal examination.

(IX) Backlog:

Candidates can keep terms for any semester of M.C.A., irrespective of the number of subjects in which he/she has failed in the previous MCA semester examinations.

(X) Board of Paper Setters /Examiners:

For each Semester and examination there will be one board of Paper setters and examiners for every course. While appointing paper setter /examiners, care should be taken to see that there is at least one person specialized in each unit course.

(XI) Class:

The performance of a student will be evaluated in terms of two indices, viz.

a) *Semester Grade Point Average (SGPA)* which is the Grade Point Average for a semester
b) *Cumulative Grade Point Average (CGPA)* which is the Grade Point Average for all the completed semesters at any point in time.

Semester Grade Point Average (SGPA): At the end of each semester, SGPA is calculated as the weighted average of GPI of all courses in the current semester in which the student has passed, the weights being the credit values of respective courses.

SGPA = Grade Points divided by the summation of Credits of all Courses.

$$SGPA = \frac{\sum \{C * GPI\}}{\sum C} \text{ for a semester.}$$

Where GPI is the Grade and C is credit for the respective Course.

Cumulative Grade Point Average (CGPA): Cumulative Grade Point Average (CGPA) is the grade point average for all completed semesters. CGPA is calculated as the weighted average of all GPI of all courses in which the student has passed up to the current semester.

Cumulative Grade Point Average (CGPA) for the Entire Course

$$SGPA = \frac{\sum \{C * GPI\}}{\sum C} \text{ for all semesters taken together.}$$

Where GPI is the Grade and C is credit for the respective Course.

IMPORTANT NOTE:
If a student secures F grade in either or both of Concurrent Evaluation or University Evaluation for a particular course his /her credits earned for that course shall be ZERO.

Award ofGrade Cards: The University of Pune under its seal shall issue to the learners a grade card on completion of each semester. The final Grade Card issued at the end of the final semester shall contain the details of all courses taken during the entire programme for obtaining the degree.

Final Grades: After calculating the SGPA for an individual semester and the CGPA for entire programme, the value shall be matched with the grade in the Grade Points & Descriptors Table as per the Points Grading System and expressed as a single designated GRADE (as per Table II) such as O,A, B, etc….

Table II: Grade Points & Descriptors

Sr. No.	Marks	Grade	Grade Point
1	100 – 75	O – Outstanding	06
2	74 – 65	A – Very Good	05
3	64 -55	B – Good	04
4	54 – 50	C – Average	03
5	49 – 45	D – Satisfactory	02
6	44 – 40	E – Pass	01
7	39 – 0	F – Fail	00

The description of the final grades shall be as follows:

O: Outstanding (Excellent Analysis of the topic - 75% and above)
Accurate knowledge of the primary material, wide range of reading, logical development of ideas, originality in approaching the subject. Neat and systematic organization of content, elegant and lucid style.

A: Very Good (Excellent Analysis of the topic - 65 to 74 %)
Accurate knowledge of the primary material, acquaintance with seminal publications, logical development of ideas. Neat and systematic organization of content, effective and clear expression.

B : Good (Good Analysis and treatment of the topic - 55 to 64 %)
Basic knowledge of the primary material, logical development of ideas. Neat and systematic organization of content, effective and clear expression.

C : Average (Some important points covered – 50 to 54%)
Basic knowledge of the primary material, logical development of ideas. Neat and systematic organization of content, good language or clear expression.

D: Satisfactory (Some points discussed – 45 to 49%)
Basic knowledge of the primary material, some organization of content, acceptable language or expression.

E: Pass (Any two of the above – 40 to 44%)

F: Fail (None of the above – 0 to 39%)

A student who secures grade E or above in a course is said to have completed /earned the credits assigned to the course. A student who completed the minimum credits required for the MCA programme shall be declared to have completed the programme.

NOTE:
The Grade Card for the final semester shall indicate the following, amongst other details:

a) Grades for concurrent and university evaluation, separately, for all courses offered by the student during the entire programme along with the grade for the total score.
b) SGPA for each semester.
c) CGPA for final semester.
d) Total Marks Scored out of Maximum Marks for the entire programme, with break-up of Marks Scored in Concurrent Evaluation and University Evaluation.
e) Marks scored shall not be recorded on the Grade Card for intermediate semesters.
f) The grade card shall also show the 10-point scale and the formula to convert GPI, SGPA, and/or CGPA to percent marks.

(XII) Medium of Instruction:
The medium of Instruction will be English.

(XIII) Clarification of Syllabus:
It may be necessary to clarify certain points regarding the course. The syllabus Committee should meet at least once in a year to study and clarify any difficulties from the Institutes.

(XIV) Revision of Syllabus:
As the computer technology is changing very fast, revision of the syllabus should be considered every 3 years.

(XV) Teaching and Practical Scheme:

Total credits=160, 1 credit = 15 lecture Hrs, 100 Marks SUBJETCT= 4 CREDITS

Newly introduced courses/subjects (from academic year 2013-14) are highlighted with yellow color. The courses/subjects from second Semester i.e. academic year 2013-14 are listed in 1.2.1.

University of Pune

Syllabus for Masters of Computer Application

For Academic Year 2012-2013

Semester I					
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**	**Credits**
1	IT11	Computer Organization	30	70	4
2	IT12	C Programming	30	70	4
3	IT13	Software Engineering	30	70	4
4	BM11	Principles and Practices of Management and Organizational Behavior	30	70	4
5	BM12	Business Process Domains with Cost and Financial Accounting	70		3
6	MT11	Discrete Mathematics	30	70	4
7	IT11P	Mini project using C	70		2
8	SS1L	Soft Skill – Word Power, Business English	30		1
9	BM12L	Business Process Domains with Cost and Financial Accounting	30		1
		Total	**350**	**350**	27

Semester II					
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**	**Credits**
1	IT21	Object Oriented Programming with C++	30	70	4
2	IT22	Database Management System	30	70	4
3	IT23	Operating system Concepts	30	70	4
4	BM21	Management Information System and Business Intelligence	30	70	4
5	IT24	Enterprise Resource Planning	30	70	4
6	BM22	Soft Skills	70		2
7	IT21L	Mini Project using C++	50		2
8	IT22L	Mini Project based on RDBMS Concept	50		2
9	SS2L	Soft Skill – Group Discussion	30		1
		Total	**350**	**350**	27

Semester III					
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**	**Credits**
1	IT31	Web Technologies	30	70	4
2	IT32	Data Communication And Computer Networks	30	70	4
3	IT33	Data Structure using C++	30	70	4
4	IT34	Advanced Database management System	30	70	4
5	IT35	Object Oriented Analysis And Design	30	70	4
6	MT31	Research Methodology and Tools	70		2
7	IT31P	Mini Project based on Web Technology	50		2
8	IT31L	Mini Project based on Data Structure concept	50		2
9	SS3L	Soft Skill – Technical Writing	30		1
		Total	**350**	**350**	27

Semester IV					
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**	**Credits**
1	IT41	Java Programming	30	70	4
2	IT42	Mobile Computing	30	70	4
3	IT43	Information Security And Audit	30	70	4
4	IT44	Design And Analysis of Algorithm		70	3
5	MT41	Optimization Technique	30	70	4
6	EC41	Elective - I	70		2
7	IT41L	Java Lab	50		2
8	IT41P	Mini Project Using Mobile Computing	50		2
9	SS4L	Soft Skill – Presentation Skill	30		1
10	EC41L	Business Scenario – Elective Lab	30		1
		Total	**350**	**350**	27

Semester V					
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**	**Credits**
1	IT51	Software Testing And Quality Assurance	30	70	4
2	IT52	Software Project Management	30	70	4
3	IT53	Emerging Trends in Information Technology	30	70	4
4	IT54	Advanced Development Technology		70	3
5	IT55	Advanced Internet Technology	30	70	4
6	EC51	Elective - II	70		2
7	IT51P	Mini project using AIT And ADT	50		2
8	IT51L	Case Tools Lab	50		2
9	SS5L	Soft Skill – Interview Skill	30		1
10	EC51L	Advance Technology – Elective Lab	30		1
		Total	**350**	**350**	27

Semester VI					
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**	**Credits**
1	IT61P	Project	**250**	**250**	**25**

Note : Elective subject choice is based on Cafeteria approach which encourages and allows students to choose elective subjects from across specializations. The list below offers wide ranging choice for students to opt for courses based on their aptitude and their career goals.

Elective Group Code	**Elective Group**	**Course Code**	**Course title**
EC01	Business Intelligence	EC0101	Data Warehousing and BIG DATA
		EC0102	Data Mining
		EC0103	Business Intelligence Tools
		EC0104	Applications of Business Intelligence
EC02	Cloud Computing	EC0201	Virtualization
		EC0202	Cloud Computing Concepts
		EC0203	Cloud Solutions
		EC0204	Microsoft Azure Platform
EC03	Data Analysis	EC0301	Introduction to Statistics
		EC0302	Introduction to MS-Excel

		EC0303	Data Analysis using MS-Excel
		EC0304	Introduction to SPSS
EC04	Embedded Systems	EC0401	Introduction to Electronics
		EC0402	Embedded System Design and Implementation
		EC0403	Communication in Embedded Systems
		EC0404	Wireless Communication
EC05	Game Programming	EC0501	Introduction to Computer Graphics
		EC0502	Game Programming using Scratch
		EC0503	Game Programming using Flash
		EC0504	Game Programming using VC++
EC06	High Performance Computing	EC0601	Introduction to Parallel Processing
		EC0602	Programming with FORTRAN
		EC0603	Numerical Methods
		EC0604	Supercomputing in India
EC07	Information Security	EC0701	Ethical Hacking
		EC0702	Applications Information Security
		EC0703	Network Security
		EC0704	Digital Forensics
EC08	Linux Environment	EC0801	Linux Desktop Environment
		EC0802	Shell Programming
		EC0803	Linux System Administration
		EC0804	Linux Network Administration
EC09	Mobile Computing	EC0901	HTML5
		EC0902	JavaScript Programming
		EC0903	Mobile Computing Technologies
		EC0904	Android
EC10	Multimedia Computing	EC1001	Introduction to Multimedia Computing
		EC1002	Adobe Photoshop
		EC1003	Adobe Flash
		EC1004	Management of Digital Audio and Video
EC11	Net-Centric Computing	EC1101	HTML5
		EC1102	JavaScript Programming
		EC1103	AJAX Programming
		EC1104	Web Services
EC12	System Programming	EC1201	System Programming using C Language
		EC1202	System and Device Driver Programming
		EC1203	Embedded and Real-Time Operating Systems
		EC1204	System Programming using VC++
EC13	Mainframe Computing	EC1301	IBM Mainframe
		EC1302	COBOL
		EC1303	DB2
		EC1304	AS/400
EC14	Information Systems	EC1401	Enterprise Resource Planning
		EC1402	E-Commerce
		EC1403	Recommender System
		EC1404	Knowledge Management
EC15	Advanced Operating Systems	EC1501	Embedded Operating System
		EC1502	Real Time Operating System
		EC1503	Distributed Operating System
		EC1504	Mobile Operating System
EC16	Advanced Wireless Communication	EC1601	Wireless Networks and Mobile Systems
		EC1602	Mobile Ad-hoc Networks
		EC1603	Secure Wireless Communications

		EC1604	Programming Mobile Devices
EC17	Open Source Technologies	EC1701	Linux Operating System
		EC1702	Perl Scripting
		EC1703	PHP
		EC1704	Ruby
EC18	Distributed Computing	EC1801	GUI Programming in Java
		EC1802	Networking in Java
		EC1803	Developing Web Applications in Java
		EC1804	Java Web Services
EC19	Advanced Computer Networks	EC1901	Advanced Networking
		EC1902	Wireless Networks & Communication
		EC1903	Network Security
		EC1904	Network Hacking

Semester – 1

Semester I				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
1	IT11	Computer Organization	30	70
Objective: To give basic knowledge of microprocessor, its architecture, components, and their organization. This will introduce the hardware and upcoming processor architecture and its evolution with change in working style.				

Sr. No	Topic Details	Nos. of Session	%	Reference Books
1	**Introduction to Digital Computer** 1.1 Concept of Digital Computer 1.2 Types of Software – System software / 1.3 Application software / Utility Software. 1.4 Compilers, Interpreters, Assemblers, Linker, 1.5 Loader	**3**	**7.5**	**1,4,5,7**
2	**Data Representation and Boolean Algebra** 2.1 Binary, Octal, Hexadecimal and their inter-conversion 2.2 1's and 2's complement. 2.3 Binary Arithmetic. & Number Systems – BCD, EBCDIC, ASCII, De-Morgan's Theorem, Duality Theorem, K-Map, Sum of product, Product of Sum, Algebra Rules, Laws, Logic Circuits, NOT,AND, OR, NAND, NOR, XOR, XNOR, Gated diagrams	**6**	**15**	**2,5,7,14**
3	**Combinational Circuits & Sequential Circuits** 3.1 Half / Full Adder 3.2 Decoder / Encoder 3.3 Multiplexer / Demultiplexer, 3.4 Flip Flops - SR, D, JK, Master – Slave, Edge Triggered D flipflop with timing diagram 3.5 Shift Registers (Any one type) 3.6 Introduction to Counters, Synchronous & Asynchronous counter, Binary counter, mod-10 counter	**6**	**15**	**6,14**
4	**Memory System** 4.1 Memory Hierarchy 4.2 Primary Memory – DRAM, SDRAM, 4.3 DDR, RDRAM. ROM, PROM, EPROM, 4.4 EEPROM 4.5 Cache memory Structure 4.6 DMA, DMA interfacing with processor	**3**	**7.5**	**2**
5	**CPU Organization** 5.1 CPU Building Blocks 5.2 CPU Registers, System bus Characteristics, Interface basics with interface block diagram, concept of local	**10**	**25**	2, 3, 8, 12, 13

	bus with name of different local buses (only types) 5.3 Addressing Modes 5.4 Interrupt Concept, Interrupt types 5.5 Instruction and Execution cycle 5.6 Hardwired and Micro Program control 5.7 RISC vs. CISC 5.8 Pipelining – Data Path, Time Space Diagram, Hazards			
6	**Processor Architecture** 6.1 Components of Microprocessor, 6.2 16-Bit (80286) Architecture 6.3 32-Bit (80486) Architecture 6.4 Super scalar Concept 6.5 Pentium Processor Architecture 6.6 Itanium Processor architecture 6.7 64-Bit (Pentium Dual-Core) Architecture	**9**	**22.5**	**9,15**
7	**Multi-Processor Organization** 7.1 Parallel Processing 7.2 Concept and Block Diagram 7.3 Types (SISD,SIMD,MIMD,MISD) 7.4 Future Directions for Parallel Processors 7.5 Performance of Processors	**3**	**7.5**	**2,8,9,10**
	TOTAL	**40**	**100**	

Text Books and Reference Books:

1. Computer Organization & Architecture Carpinell, Pearson
2. Computer System Architecture Morris Man, Pearson, 3rd Edition.
3. Ad. Computer Architecture Kaithwang, Tata McGraw-Hill.
4. Digital Computer Electronics Malvino, Tata McGraw-Hill,4th Edition
5. Micro Computer Systems Yu Cheng Liu & Glann Gibson
6. Digital Electronics By Bartee, Mc-Graw-Hill
7. Introduction to Digital Computer Design V. Rajaraman & Radhakrishnan, PHI
8. Computer Organization and Architecture W. Stalling, Pearson, 8th Edition
9. Intel Micro Processors Barry Brey, Pearson, 7th Edition
10. Computer Organization & Design Pal Chaudhary,PHI, 3rd Edition
11. Microprocessor Architecture Ramesh Gaonkar, Penram International Publishing, 6th Edition.
12. Computer Architecture & Organization J.P. Hayes, McGraw-Hill,3rd Edition
13. Computer Organization Hemchar, Tata McGraw-Hill,5th Edition
14. Digital Logic and Computer Design Morris Mano
15. An Introduction to Intel Family of Processors -James Antonolcos,Pearson,3rd Edition

Semester I				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
2	IT12	C Programming	30	70
Objective: This is the first programming language subject student will learn. This subject will teach them programming logic, use of programming instructions, syntax and program structure. This subject will also create foundation for student to learn other complex programming languages like C++, Java etc.				

Sr. No	Topic Details	Nos. of Sessions	%	Reference Books
1	**An Overview of C** 1.1 A Brief History of C 1.2 Features & characteristics of C 1.3 Structure of a 'C' Program 1.4 Program Development Life Cycle 1.5 Complier Vs Interpreters 1.6 Compilation & Execution of C Program On Dos & Unix	2	5	1,2,3
2	**Variables, Data Types, Operator & Expression** 2.1 Character Set 2.2 C Tokens Keywords & Identifiers Constants Integer, Floating Point, Character, String, Enumeration 2.3 Backslash characters / Escape sequences 2.4 Data Types in C 2.5 Variables 2.6 Declaration & Definition 2.7 User-Defined Type declarations 2.8 Operators & Expressions Arithmetic, Relational, Logical, Increment Decrement , Bit wise, Assignment, Conditional 2.9 Type conversions in Expressions 2.10 Implicit Type Conversion 2.11 Explicit Type Conversions 2.12 Precedence & Associability of Operators.	3	8	1,2,3
3	**Built in I/O Functions** 3.1 Introduction 3.2 Console Input & Output functions 3.3 Formatted Input & Output (scanf/printf) 3.4 sprintf & sscanf	2	7	1,2,3

4	**Control Statements** 4.1 Introduction 4.2 Selection Statements If, Nested if, if….else, else if Ladder ternary operator, switch, Nested switch, conditional expression 4.3 Iterative Statements while loop, do-while loop, for loop 4.4 Jump Statements Goto & label, break & continue, exit() function 4.5 Compound Statements 4.6 Null Statements	4	7	1,2,3
5	**Array & String** 5.1 Single Dimension Arrays 5.2 Declaration, Initialization, Accessing array 5.3 Elements, Memory Representation 5.4 Multidimensional Arrays 5.5 Declaration, Initialization, Accessing array 5.6 Elements, Memory Representation 5.7 String (character array) 5.8 Declaration, Initialization 5.9 String Manipulation Functions	3	7	1,2,3
6	**Pointers** 6.1 Introduction 6.2 Memory Organization 6.3 Basics of Pointer 6.4 Application of Pointer 6.5 Pointer Expressions Declaration of Pointer, Initializing Pointer, De-referencing Pointer Void Pointer Pointer Arithmetic 6.6 Precedence of &, * operators 6.7 Pointer to Pointer 6.8 Constant Pointer 6.9 Dynamic Memory Allocation 6.10 sizeof(), malloc(), calloc(), realloc(), free() 6.11 Pointers and Arrays 6.12 Pointers and character string 6.13 Array of pointers	5	8	1,2,3
7	**Function** 7.1 Introduction 7.2 Types of functions 7.3 Declaration & Definition 7.4 Arguments & local variables 7.5 Parameter passing 7.6 Call by value & Call by reference 7.7 Passing arrays, strings to functions 7.8 Pointers to functions	5	9	1,2,3,8

	7.9 Recursion			
8	**Storage Classes & Scope** 8.1 Meaning of Terms 8.2 Scope - Block scope & file scope 8.3 Storage Classes Automatic Storage, Extern Storage, Static Storage, Register Storage	2	6	1,2,3
9	**Structure, Union, Enumeration & typedef** 9.1 Structures Declaration and Initializing Structure, Accessing Structure members, Structure Assignments, Array of Structures, Nested structure, Passing Structure to function, Structure Pointer, typedef keyword 9.2 Unions Declaration and Initializing Union, 9.3 Accessing union members, 9.4 Difference between Structure & Union **9.5** Enumerated data type	3	8	1,2,3,4
10	**C Preprocessor** 10.1 Introduction 10.2 Preprocessor Directive Macro Substitution, File Inclusion directive, Conditional Compilation directives	1	6	1,2,3
11	**File handling** 11.1 Introduction 11.2 Defining & Opening a File 11.3 Closing a File 11.4 Input/Output Operations on Files 11.5 Error Handling During I/O Operation 11.6 Random Access To Files	3	10	1,2,3
12	**Bitwise Operators** 12.1 Introduction Bitwise AND, OR, Excusive OR, Bitwise SHIFT Operators 12.2 Applications Masking, Internal Representation of Date 12.3 Bit Fields	2	8	1,2,3
13	**Graphics In C** 13.1 Introduction 13.2 Drawing Object in C Line, Circle, Rectangle, Ellipse 13.3 Changing Foreground & Background 13.4 Filling Object by Color	4	8	
14	**Command Line Arguments**	1	3	1,2,3
	TOTAL	**40**	**100**	

Text Books and References:

1. C: The Complete Reference: Herbert Schildt, Tata Mc-Graw Hill, 6th Edition
2. Magnifying C : PHI : Arpita Gopal
3. Let us C Solutions: Y.P. Kanetkar, BPB,10th Edition
4. Spirit Of "C": Moolish Cooper, JAICO.
5. Programming in C : S. Kochan, CBS.
6. C Programming Language: Kernighan & Ritchie, PHI,2nd Edition
7. Programming in C: R. Hutchison.
8. Graphics Under C: Y. Kanetkar, BPB.
9. Programming in ANSI C, E. Balgurusamy, Tata Mc-Graw Hill,5th Edition

Semester I				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
3	IT13	Software Engineering	30	70

Sr.No	Topic Details	Nos. of Sessions	%	Reference Books
1	**Overview of systems Analysis and design** 1.1 Basic System Development Life Cycle 1.2 Different approaches and models for System Development: Waterfall Prototyping Spiral (including WIN-WIN Spiral) RAD 1.3 Group Based Approach: JAD 1.4 Role & Skills of system Analyst	4	10	1,5,6,9
2	**Software Requirements Specification Techniques** 2.1 Requirements Anticipation 2.2 Requirements Investigation Fact finding methods 2.3 Requirements Specifications • Software requirement Specification (SRS) • Structure and contents of the requirements Specification • types of requirements - functional and non-functional • Quality criteria, • requirements definition, • IEEE standard SRS format, • Fundamental problems in defining requirements **Case studies on SRS should be covered**	8	18	1,2,10
3	**Information requirement Analysis** 3.1 Decision Analysis Tools Decision Tree,	9	22	

	Decision Table, Structured English 3.2 Functional Decomposition Diagram 3.3 Process modeling with Data Flow Diagrams 3.4 Entity Relationship Diagram: Identify Entity &Relationships 3.5 Data dictionary **Case Studies on Decision analysis tools FDDs, DFDs should be covered**			1,5,6,8,12
4	**Designing of Input, Output and Program** 4.1 Design of input & Control Objectives of Input Design, Data Capture Guidelines Design of Source Document, Input Validations 4.2 Design of output Objectives of Output Design Types Of Output 4.3 User Interface design: Elements of good design, Design issues Features of modern GUI, Menus, Scroll bars, windows, buttons, icons, panels, error messages etc. 4.4 Design of program Specification 4.5 Code Design **Case studies should be covered on the Topic**	6	18	1,4,8
5	**Maintenance** 5.1 Types of Maintenance and maintenance cost 5.2 Introduction to legacy systems 5.3 Reverse Engineering 5.4 Role of documentation in maintenance and types of documentation	4	10	1,3,8,10
6	**CASE TOOLS** 6.1 Introduction to CASE tools, 6.2 Types of CASE tools Project Management Tools. Analysis tools, Design tools, Programming tools, Prototyping tools, Maintenance tools, 6.3 Advantages and disadvantages of CASE TOOLs	4	10	1,4,5,9
7	**Current trends in Software Engineering** 7.1 Software Engineering for projects & products. 7.2 Introduction to Web Engineering and Agile process	5	12	1,8,9
	TOTAL	**40**	**100**	

References

1. Software Engineering by Pressman, TMH,7th Ed.
2. System Analysis and Design by Jalote,Narosa Pub, 3rd Ed
3. Software Engineering by Sommerville,Pearson,8th Ed
4. Software Engineering by W S Jawadekar,TMH.
5. System Analysis & Design methods by Whiten, Bentley,TMH,7th Ed.
6. System Analysis & Design by Elias Awad, Galgotia Pub,
7. Object Oriented Modeling & Design James Rumbaugh, PHI
8. Analysis & Design of Information System James Senn, TMH, 2nd Ed.
9. Analysis & Design of Information System V. Rajaraman,PHI,3rd Ed.
10. Software Engineering Concepts Richard Fairley,TMH.
11. Software Engineering Concept and cases By A. Renavilkar

Semester I				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
4	BM11	Principles and Practices of Management and Organizational Behavior	30	70
Objective: The basic management concepts and use of management principles in the organization will be introduced to student through this elaborative subject.				

Sr. No	Topic Details	Nos. of Sessions	%	Reference Books
1	**Management** 1.1 The need, scope 1.2 Meaning and Definition 1.3 The process of Management 1.4 Managerial levels/Hierarchy 1.5 Managerial functions Planning Organizing Staffing Directing	4	10	1,2,3,4
	Controlling 1.6 Managerial skills Technical Conceptual Human Resource 1.7 Types of managers Functional Specialize Generalize 1.8 Line and staff managers			

2	**Evolution of Management Thought** 2.1 Historical perspective 2.2 Classical Theories Taylor Fayol 2.3 Behavioral HR Approach Behavioral Science and Approach 2.4 Management Science Approach 2.5 System approach-with reference to management, organization and MIS 2.6 Contingency approach	4	8	1,2,3,4
3	**Managerial Decision Making** 1.1 Introduction 1.2 Decision making environment Open Systems Closed system Decision making under certainty Decision making under uncertainty Decision making under risk 1.3 Decision Types /models Structured decisions Unstructured decisions Programmable decisions Non programmable Decisions Classical Model Administrative model 1.4 Decision making tools Autocratic Participative Consultative 1.5 Decision Making Tools 1.6 Herbert Simson's Model 1.7 Principle of Rationality / Bounded Rationality	4	10	1,2,3,4
4	**Organization** 4.1 Introduction -definition 4.2 Need for Organization 4.3 Process of Organizing 4.4 Organizational structure Functional organization Product Organization Territorial Organization	4	10	5,6,7,8
5	**Organizational Behavior** 5.1 Definition / Concepts 5.2 Need /importance/ relevance 5.3 An overview	2	8	5,6,7,8
6	**Individual Behavior and Understanding Self** 6.1 Ego State 6.2 Transactional Analysis	4	10	5,6,7,8

	6.2 Johari Window			
7	**Group and Group Dynamics**	4	44	5,6,7,8
8	**Team Building**	4		
9	**Leadership**	3		
10	**Conflict Management**	4		
11	**Motivation : Concept, Theory X, Y and Z**	3		
	TOTAL	**40**	**100**	

Important Note: The topics in Units 3,4,5 and 6 should be covered with the help of at-least one exercise each. All topics in Organizational Behavior should be covered with the help of role plays, case studies, simulation, games etc.

Books Recommended:

1. Principles and Practices of Management — Shejwalkar
2. Essential of management 7th edition — Koontz H &Weitrich H TMH
3. Management Today Principles And Practices — Burton & Thakur
4. Mgmt. Principles and Functions — Ivancevich &Gibson, Donnelly
5. Organizational behavior — Stepheb Robbins Pearson 13th edition
6. Organizational behavior — Keith Davis
7. Organizational behavior — Fred Luthans TMH 10th edition
8. Organizational behavior — Dr.Ashwatthapa THI 7th edition

Semester I				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
5	BM12	Business Process Domains with Cost and Financial Accounting	70	

Objectives:

1. The processes and practices in business and their applications are taught in subject. The advance business applications like CRM and SCM are also introduced to student.
2. The financial aspect of business and management will be taught to student through this subject. This will benefit student in understanding and analyzing financial statements of a business.

PART I: Business Process Domain				
Sr. No	**Topic Details**	**Nos. of Session**	**%**	**Reference Books**
1	**Sales & Distribution** 3.1 Sales Budgeting – Market Segments / Customers / Products 3.2 Sales Analysis (While explaining this application consider an organization manufacturing multiple products with sales outlets spread across the country) 3.3 **Retail Marketing- New trends – Growth**	3	15	1,2,3,4
2	**Human Resource** 4.1 Employee Database 4.2 Recruitment – Techniques 4.3 Employee Appraisal – Performance, efficiency Leave Accounting and Payroll – Salary calculation and reporting, Income Tax calculation and reporting, Loan Accounting, PF and gratuity, Bonus, Ex-Gratia, Incentive, Super-annuation, Arrears Calculation	3	15	1,2,3,4

	4.4 **E-HR Software: Introduction**			
3	**Banking and e-Commerce** Savings Bank Accounting - Real time, **ATM and E-Banking**	3	15	1,2,3,4
4	6.1 **Supply Chain Management(SCM) – Introduction, Concept, Scope and advantages** 6.2 **Customer Relationship management (CRM) – Introduction, Concept, Scope and advantages** 6.3 **Forecasting : Demand forecasting and Planning**	3	15	1,2,3,4
	Note: Group based activities are expected for all above topics Business Process Domain: 40 Marks			

PART II : Cost and Financial Accounting				
Sr. No	**Topic Details**	**Nos. of Session**	**%**	**Reference Books**
5	**Financial Accounting**			
	1.1. Double Entry Accounting system, Concepts and conventions in accounting, Accounting process, Depreciation	5		2,3,4
	1.2. Journalisation – Rules for Journalisation, posting in a Ledger, subsidiary books, preparation of Trial balance	5	20	2,3,4
	1.3. Final Accounts – Preparation of Trading and profit and loss, Account and Balance sheet of a Proprietary Firm	5		2,3,4
6	**Cost Accounting**			
	1.1 Scope and Objectives of Cost Accounting – Classification and elements of cost, Advantages of Cost Accounting, Comparison between cost accounting and financial accounting.	3		1,2,3
	1.2 Techniques of Cost Accounting		20	1,2,3
	a) Marginal costing, Break-even chart, cost, volume profit analysis	5		
	b) Standard costing advantages, Variance analysis	4		
	c) Budgetary Control -Types of budgets and Flexible Budget Vs Fixed Budget, Preparation of Simple cash budget & Flexible budgets	4		
	1.3 Concept of Management Accounting – Objectives of Management Accounting, Comparison with Cost accounting	1		1,2,3
	Notes: Financial accounting: 30 marks Cost accounting : 30 marks, (equal weightage to be given for theory and practical problems)			

Part I : 40 Marks & Part II : 30 Marks

Recommended Books:

PART I : Cost and Financial Accounting

1. Cost and Management accounting — Satish Inamdar,Everest Pub,18th Ed.
2. Management Accounting — A.P. Rao, Everest Pub.
3. Management Accounting — Dr.Sanjay Patankar
4. Management Accounting — Khan and Jain, TMH.
5. Management Accounting — Dr.Mahesh Kulkarni,Career Pub,3rd Ed.

PART II: Business Process Domain

1. Personnel Management — C B Mammoria, Himalaya,29th Ed.
2. Engineering MIS for Strategic Business Process — Arpita Gopal Excel Books
3. Business Applications — Dr. Milind Oka, Everest Pub
4. Business India, India Today Magazines.

Semester I				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
6	MT11	Discrete Mathematics	30	70
Objective: This is the first mathematics subject which revises the knowledge acquired previously by the student. Logic, Relations and Functions, Algebraic structures, combinotorics will be introduced in this course.				

Sr. No	Topic details	Nos. of Sessions	%	Reference Books
1	**Mathematical logic** 1.1 Propositions (Statements) 1.2 Logical connectivity's, NOT , AND ,OR ,□ ,□,□ 1.3 Compound statements form, truth tables, tautology, implications and equivalence of statements forms logical identities 1.4 Normal forms: disjunctive normal form and simplification. Conjunctive normal form, logical implications, valid arguments, methods of proof. Theory of inference of statement calculus, predicate calculus, qualifiers free and bound variables, theory of inference of predicate calculus.	10	25	1 to 7
2	**Relations and functions:** 2.1 Relation defined as ordered n-tuple 2.2 Unary, binary, ternary, n-ary 2.3 Restrict to binary relations 2.4 Complement of a relation, converse 2.5 Relation , compositions, matrix 2.6 representation and its properties 2.7 Graphical representation of relation – 2.8 Digraphs ,Properties of binary relation – 2.9 Reflexive, irreflexive, symmetric, Asymmetric, transitive Equivalence, equivalence classes, transitive closure– Warshall's algorithm. 2.10 Functions : definitions and only bijection	7	17	1 to 6

3	**Permutations & Combinations** 3.1 Addition principle, multiplication principle, 3.2 Bijection principle, r-permutations of n elements, 3.3 r-combination of n elements, binomial coefficients, 3.4 circular permutations, permutations with repetitions, 3.5 Multinomial theorem, combinations with repetitions, 3.6 Distribution of objects- 3.7 Distinct objects in distinct cells 3.8 Indistinguishable objects in distinct Cells	10	21	1 to 7
4	**Number of non-negative integer solutions** of linear equations with conditions ,Binomial identities	4	8	1 to 6,7
5	**Principle of Inclusion & Exclusion** Formula Derangement- restrictions on relative positions	4	8	1 to 7
6	**Algebraic structures:** 6.1 Operations on sets-Unary, binary, ternary 6.2 definitions of algebraic systems 6.3 (Restrict to binary operations) 6.4 Properties – closure, idempotent, associative, 6.5 communicative, associative, commutative, 6.6 identity, inverse Semi group, Monoid, , abelian group, permutation group, multiplicative abelian 6.7 group, cyclic group 6.8 Subgroups: Cosets, right cosets, left cosets, 6.9 normal subgroups,[For cosets only definitions, No derivations and proofs] , 6.10 Group codes: In group codes only properties without derivations and problems on following subtopics should be covered . 6.11 Weight and Hamming distance, minimum distance of code , generation of codes using parity checks – even parity, odd parity , parity check matrix – Hamming code, for detection and correction errors , Problems on encoding function n decoding functions Application of residue –arithmetic to computers group codes	5	21	1 to 7

Reference No.	Book Name	Author
1	Discrete Mathematical Structure	By Kolman,PHI,6th Ed.
2	Discrete Mathematics	By C.L.Liu,TMH,3rd Ed
3	Discrete Mathematical Structure	By Rosen,TMH,6th Ed
4	Discrete Mathematical Structure	By R.K. Sharma
5	Discrete Mathematical Structure	Shankar Rao
6	Discrete Mathematical Structure	By Boxwala,Modak,And Andhar
7	Probability and Combinatorics	Deepak Apte

Semester I				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
7	IT11P	Mini project using C	70	
Objective : To make practice of developing a good web application using the techniques students have learnt during the semester, a small project will be done by the student as an assignment. Students are expected to spend 6 hours per week. At the end of semester the students are expected to understand how Information Systems work.				

Semester I				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
8	*SS1L	Soft Skill – Word Power, Business English	30	
Objective : To improve the vocabulary of English and comfort ability with business English. Use of language lab is also encouraged and lot of hearing practice, reading and understanding exposure should be given to the students. **After completion of 1st year students can appear for Cambridge English exam.**				

Semester I				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
9	BM12L	Business Process Domains with Cost and Financial Accounting	30	
Objective : Students are expected to undertake domain analysis of various business domains and think in terms of analysis and development of information systems for them. Packages like tally needs to be studied in detail to understand accounting process of any standard organization.				

Semester – II

Semester II				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
1	IT21	Object Oriented Programming with C++	30	70
Objectives: By the end of the course students will be able to write C++ programs using more esoteric language features, utilize OO techniques to design C++ programs, use the standard C++ library, exploit advanced C++ techniques				

Sr. No	Topic Details	Nos. of Sessions	%	Reference Books
1	**Principle of OOP's** 1.1 Introduction 1.2 Procedural Vs Object Oriented Programming 1.3 Classes, Object, Data Abstraction, 1.4 Encapsulation, Inheritance, Polymorphism 1.5 Dynamic Binding, Message Passing 1.6 Object Oriented Languages 1.7 Object Based languages	2	5	3
2	**Basics of C++** 2.1 A Brief History of C & C++ 2.2 C Vs C++ 2.3 A Simple C++ Program 2.4 Application of C++ 2.5 Structure & Class 2.6 Compiling & Linking	1	3	1,3
3	**Expression** 3.1 Tokens, Keywords, Identifiers & Constants, 3.2 Basic Data Types, User-Defined Data Types, 3.3 Symbolic Constant, Type Compatibility, 3.4 Reference Variables, Operator in C++, 3.5 Scope Resolution Operator, 3.6 Member De-referencing Operators, 3.7 Memory Management Operators, 3.8 Manipulators, Type Cast Operator	2	6	1,3
4	**Functions In C++** 4.1 The Main Function, Function Prototyping 4.2 Call by Reference, Call by Address, 4.3 Call by Value, Return by Reference 4.4 Inline Function, Default Arguments 4.5 Const Arguments, Function Overloading,	2	9	1,2,3

	4.6 Friend Function			
5	**Classes & Objects** 5.1 A Sample C++ Program with class 5.2 Access specifiers 5.3 Defining Member Functions 5.4 Making an Outside Function Inline 5.5 Nesting of Member Functions 5.6 Private Member Functions 5.7 Arrays within a Class 5.8 Memory Allocation for Objects 5.9 Static Data Members, Static Member 5.10 Functions, Arrays of Objects2 5.11 Object as Function Argument4s 5.12 Friend Functions, Returning Objects, 5.13 Const member functions 5.14 Pointer to Members, Local Classes 5.15 Object composition & delegation	4	9	1,3
6	**Constructor & Destructor** 6.1 Constructor 6.2 Parameterized Constructor 6.3 Multiple Constructor in a Class 6.4 Constructors with Default Arguments 6.5 Dynamic Initialization of Objects 6.6 Copy Constructor 6.7 Dynamic Constructor 6.8 Const Object 6.9 Destructor	2	8	1,3
7	**Operator Overloading & Type Conversion** 7.1 Defining operator Overloading 7.2 Overloading Unary Operator 7.3 Overloading Binary Operator 7.4 Overloading Binary Operator Using Friend function 7.5 Manipulating of String Using Operators 7.6 Type Conversion 7.7 Rules for Overloading Operators	4	6	1,3
8	**Inheritance** 8.1 Defining Derived Classes 8.2 Single Inheritance 8.3 Making a Private Member Inheritable 8.4 Multilevel Inheritance 8.5 Hierarchical Inheritance 8.6 Multiple Inheritance, Hybrid Inheritance 8.7 Virtual Base Classes, Abstract Classes 8.8 Constructor in Derived Classes 8.9 Nesting of Classes	4	7	1,3
9	**Pointer, Virtual Function & Polymorphism** 9.1 Introduction 9.2 Pointer to Object, This pointer	3	6	1,3

	9.3 Pointer to Derived Class, 9.4 Virtual Function, 9.5 Pure Virtual Function, 9.6 Early Vs Late Binding			
10	**The C++ I/O System Basics** 10.1 C++ Streams, C++ Stream Classes 10.2 Unformatted I/O Operation 10.3 Formatted I/O Operation 10.4 Managing Output with Manipulators	1	6	1,3
11	**Working with Files** 11.1 Introduction 11.2 Classes for File Stream Operation 11.3 Opening & Closing Files 11.4 Detection of End of File 11.5 More about Open( ): File modes 11.6 File pointer & manipulator 11.7 Sequential Input & output Operation 11.8 Updating a File : Random Access 11.9 Command Line Arguments	4	8	1,3
12	**Template** 12.1 Generic Function, 12.2 A function with Generic Data Types, 12.3 Explicitly Overloading a Generic Function, 12.4 Overloading a Function Template, 12.5 Using Standard Parameter with Template Functions, 12.6 Generic Function Restriction, 12.7 Applying Generic Function : Generic Sort, 12.8 Generic Classes, 12.9 An Example with Two Generic Data Types 12.10 Using Non-Type Arguments with Generic Class, 12.11 Using Default Arguments With Template Classes, 12.12 Explicit Class Specification, 12.13 The typename & export keywords	3	8	1,3
13	**Exception handling** 13.1 Exception Handling Fundamentals 13.2 The try Block, the catch Exception Handler 13.3 The throw Statements 13.4 The try/throw/catch sequence 13.5 Exception Specification 13.6 Unexpected Exception 13.7 Catch – All Exception Handlers 13.8 Throwing an exception from handler 13.9 Uncaught Exception	3	8	1,3
14	**Introduction to Standard Template Library** 14.1 STL Programming Model, Sequence 14.2 Container Adapter, Integrator 14.3 Algorithms, Predicates, Allocators	2	6	1,6,3
15	**Namespace**	1	2	1,6,3

	15.1 Introducing Namespaces 15.2 Referring to Members of a Namespace 15.3 The using namespace Statement 15.4 Defining A Namespaces 15.5 Nested Namespaces 15.6 Unnamed Namespaces 15.7 Namespace Aliases			
16	**New Style Casts & RTTI** 16.1 New-Style Casts, dynamic_cast, static_cast, reinterpret_cast 16.2 const_cast, Runtime Type Information 16.3 (RTTI), A Simple Application of Run-Time 16.4 Type ID, Ttypeid Can be Applied to Template Classes	2	3	1,6,3

Reference Books :

1. C++: The Complete Reference Herbert Schildt,TMH,5th Ed.
2. Let us C++ Kanetkar,BPB,2nd Ed
3. Object Oriented Programming with C++ E. Balagurusamy,TMH,4th Ed.
4. C++ Primer Stanley Lippman & Lajoi,Pearson,3rd Ed.
5. C++ Programming Language Bjarne Stroustrup, Pearson, 3rd Ed.
6. C++ Programming Bible Al Stevens & Clayton Walnum, Wiley Pub.

Note: Recommended to use VC++ IDE to teach Topic no 14,15,and 16

Semester II				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
2	IT22	Database Management System	30	70
Objective : The concepts related to database, database models, SQL and database operations are covered in this subject. This creates a strong foundation for application database design. Also the students are made aware of the connection between DBMS and the subjects like Data structures-tree, graphs ,Operating system – File Storage , Discrete Mathematics – Relational Operations, Software Engineering – DFD.				

Sr. No	**Topic Details**	**Nos. of Session**	**%**	**Reference books**
1	**Basic concepts** 1.1 Database and Need for DBMS 1.2 Characteristics of DBMS 1.3 Database Users 1.4 3-tier architecture of DBMS (its advantages over 2-tier) 1.5 Views of data-schemas and instances 1.6 Data Independence	2	10	1,2,3,6,9

2.	**Data Models** 2.1 **I**ntroduction to various data models – 2.2 Record based & Object based 2.3 Cardinality Ratio & Relationships 2.4 Representation of entities, attributes, relationship attributes, relationship set 2.5 Generalization, aggregation 2.6 Structure of relational Database and different types of keys 2.7 Structure of non-SQL database	5	15	1,2,5,6,9
3.	**Relational Model** 3.1 Codd's rules 3.2 Relational data model & relational algebra Relational model concept Relational model constraints Relational Algebra 3.3 Relational database language 3.4 Data definition in SQL, Views and 3.5 Queries in SQL, Specifying constraints and Indexes in SQL, Specifying constraints management systems, Oracle / Ingres/ SQL Server / My SQL	5	20	1,2,5,6,9, 10,11
4	**Relational Database design** 4.1 Database Design – ER to Relational 4.2 Functional dependencies 4.3 Normalization Normal forms based on primary keys (1 NF, 2 NF, 3 NF, BCNF, 4 NF, 5 NF) 4.4 Loss less joins and dependency preserving decomposition	7	20	2,6,9,11
5	**Transaction And Concurrency control** 5.1 Concept of transaction, ACID properties 5.2 Serializibility 5.3 States of transaction, 5.4 Concurrency control 5.5 Locking techniques 5.6 Time stamp based protocols 5.7 Granularity of data items 5.8 Deadlock	5	15	2.6,11
6	**Storage and File Structure** 6.1 Overview of physical storage media 6.2 RAID 6.3 Tertiary storage 6.4 Storage access 6.5 File organization 6.6 Organization of records in files 6.7 Data dictionary storage	5	5	1,2,5,6
7	**Crash Recovery and Backup** 7.1 Failure classifications 7.2 storage structure 7.3 Recovery & Atomicity	6		

	7.4 Log base recovery 7.5 Recovery with concurrent transactions 7.6 Failure with loss of Non-Volatile storage 7.7 Database backup & recovery from catastrophic failure 7.8 Remote Backup System		10	2,6
8	**Security and privacy** 8.1 Database security issues 8.2 Discretionary access control based on grant & revoking privilege 8.3 Mandatory access control and role based access control for multilevel security 8.4 Encryption & public key infrastructures	4	5	6
9	**Non- SQL Database**	1		

Reference books:

1.	Introduction to database systems	C.J.Date, Pearson.
2.	Database system concept	Korth, TMH,5th Ed.
3.	Principles of Database Management	James Martin, PHI.
4.	Engineering MIS for Strategic Business Processes	Arpita Gopal Excel Books
5.	Computer Database organization	James Martin, PHI,3rd Ed.
6.	Fundamentals of Database Sysems	Elmasri Navathe, Pearson,5th ed.
7.	Object-oriented modeling and design	Rumbaugh and Blaha, PHI.
8.	Object-oriented analysis and design	Grady Booch,Pearson,3rd Ed.
9.	Database Management Systems	Bipin Desai, Galgotia Pub.
10.	Database system practical Approach to design, implementation & management	Connoly & Begg, Pearson,4th Ed.
11.	Database Management systems	Ramakrishnan & Gehrke, McGraw-Hill,3rd Ed.

Note:
1. PL/SQL to be covered as lab sessions
2. Oracle Lab will be covered as Lab demo sessions.
3. Relational Calculus need not be covered in depth.
4. Case studies on ER diagram, Normalization and SQL should be covered

Semester II				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
3	IT23	Operating system Concepts	30	70
Objective : The core structure, functions and design principles of operating system will be introduced with this subject.				

Sr. No	Topic Details	Nos. of Sessions	%	Reference Books
1	**Introduction** 1.1 OS Definition, features and functionalities 1.2 Logical View , User View, 1.3 Concept of System Calls & System Programs (Only concept) 1.4 Concept of OS structure 1.5 Concept of Virtual Machine	3	7.5	5,2
2	**Process Management** 2.1 Process Concept 2.2 Process Control Block 2.3 Process operations : Create, Kill, suspend, resume, wakeup, 2.4 Interprocess Communication, IPC types 2.5 IPC in Client-Server, RTOS	4	11	2
3	**CPU Scheduling** 3.1 Scheduling Concept 3.2 Scheduling Criteria 3.3 Scheduling algorithms 3.4 Numerical exercise based on algorithms 3.5 Scheduling Evaluation 3.6 Simulation Concept	6	16	2
4	**Process Synchronization & Deadlock** 4.1 Synchronization concept 4.2 Synchronization Requirement 4.3 Critical Section Problem & Solutions 4.4 Monitors 4.5 Deadlock concepts 4.6 Deadlock prevention & avoidance with single instance and multiple instances of resources 4.7 Deadlock Detection with single instance and multiple instances of resources 4.8 Numerical exercise based on Deadlock 4.9 Deadlock Recovery	8	20	2
5	**Memory Management** 5.1 Concept 5.2 Memory Management Techniques 5.3 Contiguous & Non Contiguous allocation 5.4 Logical & Physical Memory 5.5 Conversion of Logical to Physical address 5.6 MFT and MVT with search algorithms 5.7 Numerical exercise based on search algorithms 5.8 Paging, Segmentation 5.9 Numerical exercise based on logical to physical address conversion using Paging and segmentation. 5.10 Segment with paging 5.11 Virtual Memory Concept 5.12 Demand paging Page Replacement algorithm with numerical exercises Allocation of Frames	7	17.5	5,2

	5.13 Thrashing			
6	**File management** 6.1 File Structure 6.2 Protection 6.3 FILE system Implementation 6.4 Directory structure 6.5 Free Space Management 6.6 Allocation Methods 6.7 Efficiency & Performance 6.8 Recovery	**3**	**3.5**	**1,2,4**
7	**Disk Management** 7.1 Disk Structure 7.2 Disk Scheduling algorithm 7.3 Numerical exercise based on Disk algorithms 7.4 Disk management 7.5 Swap Space concept and Management 7.6 RAID structure 7.7 Disk performance issues	**4**	**12**	**2**
8	**Distributed Operating System** 8.1 Difference Between Distributed & Centralized OS 8.2 Advantages of Distributed OS 8.3 Types of Distributed OS 8.4 Concept of Global OS 8.5 NOS Architecture	**3**	**7.5**	**1,2,3**
9	Case study of window OS, Non-window OS Introduction to Mobile OS with its different types (Android concept features can be covered here)	**2**	5	**Internet sources**

Reference Books :

1. Operating System : Achyut Godbole,TMH,2nd Ed.
2. Operating System : Galvin,Wiley,8th Ed.
3. System Programming & OS : D.M. Dhamdhere, TMH,2nd Ed.
4. Red Hat Bible Core Fedora Linux : Christopher Negus (Wiley Pub.)
5. Operating System : Andrew Tanenbaum, PHI,3rd Ed.

Semester II				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
4	BM21	Management Information System and Business Intelligence	30	70
Objective: This subject will teach the student foundations of Management Information System along with exposure to modern business information systems.				

Sr. No	Topic Details	Nos. of Session	%	Reference Books
1.	**System and Information Concepts** 1.1 General Model 1.2 Types of systems 1.3 Subsystems 1.4 Feedback control 1.5 Systems approach to organization 1.6 Law of requisite variety 1.7 Control by exception 1.8 Information Concepts 1.9 Types of Information 1.10 Quality of Information 1.11 Value of Information 1.12 Mini cases related to Feedback Control	5	10	1,2,4,7
2.	**Management Information System** 2.1 Definitions 2.2 Role of MIS 2.3 MIS in Academics 2.4 Structure of MIS based on management activity and functions 2.5 System and Information concepts to MIS	5	10	1,2,3,4
3.	**Decision Making Systems, Modeling and Analysis** 3.1 Decision Making Definition and Concept 3.2 Phases of Decision Making Process 3.3 Modeling Process 3.4 Static and Dynamic Models 3.5 Sensitivity Analysis 3.6 Heuristic programming 3.7 Simulation	6	15	1,2,4
4.	**Decision Support System** 4.1 DSS Definition 4.2 Characteristics & Capabilities of DSS15 4.3 DSS Application 4.4 Case Study	5	10	3,5,7
5.	**Expert System** 5.1 Basic concepts of Expert System 5.2 Structure of Expert System 5.3 How Expert System works 5.4 Expert System Application 5.5 Comparison of Conventional & Expert System 5.6 Case Study	6	10	3,4,7
6.	**Executive Information and Support Systems** 6.1 Enterprise & Executive Information System Concept and Definition 6.2 Enterprise & Executive Support System Concept and Definition 6.3 Information needs of Executives 6.4 Characteristics and benefits of EIS 6.5 Comparing and Integrating EIS and DSS.	5	10	1,3,4,6

7.	**Business Intelligence** 7.1 Definition of Problem (Corporate problems & Issues) 7.2 Concept of data mart, data warehousing and data mining , data visualization and presentation 7.3 Designing physical database 7.4 Deploying and supporting DW/BI system 7.5 BI Architecture – spread sheets, concept of dashboard, OLAP, decision engineering, LIS 7.6 BI Tools – concept of dashboard 7.7 BI Application in various domains 7.8 BI Analytics (discriminant analysis and logistic regression, cluster analysis, principle component analysis) 7.9 Hands on training on data mining software XLMiner	8	35	3,6 Reference websites

References:

1. Management Information System - Gordan Devis, Margrethe H. Oison,TMH,3rd Ed.
2. Information Systems for Modern Management - Robert Murdick, Joel e. Ross, PHI, 3rd Ed.
3. Decision Support & Intelligent System - Efraim Turban, Pearson, 8th Ed.
4. Management Information System - Waman S..Jawadekar, TMH,4th Ed.
5. Analysis and Design of Information System -V.Rajaraman,PHI,2nd Ed.
6. Business Intelligence: Practices, Technologies, and Management- Rajiv Sabherwal, Irma Becerra-Fernandez
7. Management Information systems- Dr. Shubhalaxmi Joshi, Smita Vaze, Himalaya Pub.

Websites:

1. http://www.amazon.com/Data-Mining-Business-Intelligence-Applications
2. www.ibm.com/insights/in
3. *www.sas.com*

Open source BI Tools –

http://www.pentaho.com/
https://www.jaspersoft.com/

Semester II				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
5	IT24	Enterprise Resource Planning	30	70
Objective : To learn ERP systems its structure, modules, benefits, implementation and post implementation issues thru real-life cases.				

Sr No.	Topic Details	Nos. of Session	%	Reference Books
1	**Enterprise Resource Planning** 1.1 Introduction 1.2 What Is ERP? 1.3 Need of ERP. 1.4 Advantage of ERP 1.5 Growth of ERP	4	10	1
2	**ERP and related technologies** 2.1 Business Process Re-Engineering (BPR) 2.2 Management Information System (MIS) 2.3 Decision Support System (DSS) 2.4 Executive Support System (ESS) 2.5 Data Warehousing, Data Mining 2.6 On-Line Analytical Processing (OLAP) 2.7 Supply Chain Management 2.8 Customer Relationship Management	20	35	2
3	**ERP Modules and Vendors** 3.1 Finance 3.2 Production Planning, Control and Management 3.3 Sales and Distribution 3.4 Human Resource Management 3.5 Inventory Control System 3.6 Quality Management 3.7 ERP market, Comparison of Current ERP Packages and Vendors, like; SAP, Oracle, PeopleSoft, BAAN etc. 3.8 Disadvantages of non-ERP sys. Importance of ERP vise versa In-house applications 3.9 Benefits of integration 3.10 Standardization of data code	6	20	2 .
4	**ERP Implementation Life Cycle** 4.1 Evaluation and selection of ERP package 4.2 Project planning, Implementation, 4.3 Team Training and Testing 4.4 End User Training and Going Live 4.5 Post Evaluation and Maintenance 4.6 Role of organization management & vendor	5	15	3
5	**ERP Case Studies** 5.1 Post Implementation review of ERP packages 5.2 in manufacturing, Services and Others Organizations, 5.3 Customization of ERP for different types of Industries.	5	20	3

Reference:

1. Enterprise Resource Planning : Alexis Leon, TMH,2nd Ed.
2. ERP Ware: ERP Implementation Framework : V.K. Garg &N.K. Venkita Krishnan, PHI.
3. ERP Concepts & Planning : V.K. Garg &N.K. Venkita Krishna, PHI, 2nd Ed.

Colleges are encouraged to invite the ERP vendors and demonstrate Programming languages used for developing and customization of ERP and also study the Post implementation changes in the organization.

Semester II				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
6	BM22	Soft Skills	70	

Objectives:

1. To encourage the all round development of students by focusing on soft skills.
2. To make student aware about the importance, the role and the content of soft skills through instruction, knowledge acquisition, and practice.
3. To develop and nurture the soft skills that help develop student as a team member, leader, and all round professional in long run have been identified and listed here for references. As the time professional in long run have been identified and listed here for references the time allotment for the soft skill laboratory as small and the fact that the skills are nurtured over years, students are encouraged to follow these skills as self study and self driven process.

GuideLine: List of Reference Books is mentioned Topicwise at the end of Soft Skills Syllabus.

Sr. No	Topic Details	Nos. Of Sessions	%	References
1	1.1 Self Development and Assessment 1.2 Self-Assessment 1.3 Self-Awareness, 1.4 Perception and Attitudes 1.5 Values and Belief System 1.6 Personal Goal Setting 1.7 Career Planning, 1.8 Self-Esteem, 1.9 Building of Self-Confidence	10	15	
2	2.1 Components of communication, Principles of communication barriers, listening skills Verbal Communication 2.2 Includes Planning 2.3 Preparation 2.4 Delivery, Feedback and Assessment of activities like Public speaking Group Discussion Oral Presentation skills, Perfect Interview Listening and observation skills, Body language 2.5 Use of Presentation graphics, 2.6 Use of Presentation aids, Study of communication.	10	25	

3	3.1 Written Communication 3.2 Technical Writing-Technical Reports 3.3 Project Proposals, 3.4 Brochures, 3.5 Newsletters, 3.6 Technical Articles 3.7 Technical Manuals 3.8 Official/Business Correspondence Business letters Memos 3.9 Progress report, Minutes of meeting, Event reporting, Use of style, Grammar and Vocabulary for effective technical writing, 3.10 Use of: Tools, Guidelines for technical writing, Publishing	12	25	
4	4.1 Ethics and Etiquettes 4.2 Business Ethics 4.3 Etiquettes in social as well as Office settings 4.4 Email etiquettes 4.5 Telephone Etiquettes 4.6 Engineering ethics and ethics as an IT professional, Civic Sense.	3	15	
5	5.1 Other Skills 5.2 Managing time 5.3 Meditation 5.4 Understanding roles of Engineer and their Responsibility 5.5 Exposure to work environment And culture in today's job Places 5.6 Improving Personal Memory, Study skills that include Rapid reading, Notes taking, Complex problem solving, creativity.	5	20	

Guidelines for term-work: Marks 50 List of Possible Assignments:

1. Write a personal essay and or resume or statement of purpose which may include:
   - Who am I (family background, past achievements, past activities of significance)
   - Strength and weakness (how to tackle them) (SWOT analysis)
   - Personal Short-term Goals, long-term goals and action plan to achieve them
   - Self-assessment on soft-skills
2. Student could review and present to a group from the following ideas
   - Book review
   - Biographical Sketch
   - Any topic such as an inspirational story/personal values/beliefs/current topic
   - Ethics and etiquettes and social responsibilities as professional.
3. Student will present to a group from the following ideas

- Multimedia based oral presentation on any topic of choice (Business/Technical)
- Public speaking exercise in the form of debate or elocution on any topic of Choice

4. Student will undergo two activities related to verbal/non-verbal skills from Following
   - Appearing for mock personal interviews
   - Participating in group discussion on current affairs/Social Issue/ethics and etiquettes
   - Participating in games, role-playing exercises to highlight nonverbal skills.
5. Student will submit one technical document from the following:
   - Project proposal
   - Product brochure
   - Literature survey on any one topic
   - User Manual
   - Technical Help
6. Student will submit one business document from the following
   - A representative official correspondence
   - Minutes of meeting
   - Work progress report
7. Students will participate in one or two activities from following:
   - Team games for team building
   - Situational games fro role playing as leaders, members -Organizing mock events -Conducting meetings
8. Faculty may arrange one or more sessions from following :
   - Yoga and mediation
   - Stress management, relaxation exercises and fitness exercises -Time management and personal planning sessions -Improving memory skills -Improving leadership skills -Improving English conversation skills -Reading comprehension skills & notes taking skills 9. Students' own SWOT Analysis

Students are expected to keep a personal record of any six activities that they conduct in the soft skill laboratory in the form of a journal. All students need note to do the same assignments. Institute having a freedom within the framework to customize set of activities to be followed.

Assessment Guidelines for term-work assessment

1. Written Communications 20 marks
   - Students could submit for example
   - Personal resume, essay
   - Technical document or business document
2. Spoken communication 20 marks
   - One elocution event of say 8-10 minutes individually
   - One group discussion or group presentation event
3. Overall participation in soft skills based lab activities 10 marks
   - Attendance and enthusiasm
   - Participation and contribution in event management, organizing
   - Group games, group exercises, interpersonal skills observed

- Quality of journal for soft skills laboratory indicating personal progress, participation.

4. Guidelines for batch wise Time management for laboratory sessions
   (Two hour session at a time)
   - Batches could be of size 25 to 30 students.
   - Written communication exercises could be done for whole batch at same time.
     (3 Sessions)
   - Spoken communications exercises can be done with around 10-15 students covered in one two hour slot so total need for exercises.
     (2 sessions)
5. Group discussions could be done for groups of 5-8 students at a time for half so total need for two group discussions for each student of the batch will be required.
   (2 sessions)
6. Sessions could be organized for trainers to give directions, knowledge, experience sharing or common viewing of training material on Video etc.
   (4 sessions)
7. Group exercises for team building, role playing and interaction with professional.
   (3 sessions)

References for students for self-improvement by self-study

Topic 1: Any good book like

1. You Can Win - Shiv Khera - Macmillan Books - 2003 Revised Edition
2. 7 Habits of Highly effective people - Stephen Covey, Pocket Books
3. Business Communication? Asha Kaul, PHI
4. Business Communication - M. Balasubramanyam

Topic 2 and 3:

1. John Collin, "Perfect Presentation", Video Arts MARSHAL
2. Jenny Rogers " Effective Interviews", Video Arts MARSHAL
3. Raman Sharma, " Technical Communications", OXFORD
4. Sharon Gerson, Steven Gerson "Technical writing process and product", Pearson Education Asia, LPE third edition.
5. R. Sharma, K. Mohan, Business correspondence and report writing", TAG McGraw Hill ISBN 0-07-044555-9
6. Video for technical education catalog, National education and Information Films Ltd. Mumbai.
7. Management training and development catalog, National education and Information Films Ltd. Mumbai.
8. XEBEC, "Presentation Book 1,2,3", Tata McGraw-Hill, 2000,ISBN 0-40221-3

Topic 4 and 5:

1. Tim Hindle, "Reducing Stress", Essential Manager series Dk Publishing
2. Sheila Cameron, "Business student Handbook", Pitman Publishing
3. Dr. R. L. Bhatia, " Managing time for competitive edge"

4. Lorayne Lucas "Memory Book"
5. Robert Heller, "Effective leadership", Essential Manager series Dk Publishing
6. Newstrom Keith Davis," Organizational Behavior', Tata McGraw-Hill, 0-07-460358-2

It is proposed that expert from industry be invited to conduct lectures and workshops to understand the industry soft-skill requirement.

Semester II				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
7	IT21L	Mini Project using C++	50	

Objective : This project work provides hands-on for OOP and C++ language learnt in theory session.

C++ Programming concepts on class, inheritance, abstraction, encapsulation, dynamic binding, polymorphism, I/IO systems, exception handling should be covered

Semester II				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
8	IT22L	Mini Project based on DBMS concept	50	

Objective : This project work will enhance database handling, data manipulation and data processing skills through SQL & PL/SQL, which will help them in developing data centric computer applications.

Sr. No.	Topic Details
1	Overview of RDBMS, Oracle introduction
2	Introduction of SQL DDL, DML, DTL Basic Data Types Char, varchar/varchar2, long, number, Fixed & floating point Date, CLOB, BLOB
3	Table Constraint definition Commands to create table
4	Commands for table handling Alter table, Drop table, Insert records
5	Commands for record handling Update, Delete Select with operators like arithmetic, comparison, logical Query Expression operators Ordering the records with orderby Grouping the records
6	SQL functions Date, Numeric, Character, conversion Group functions avg, max, min, sum, count
7	Set operations Union, Union all, intersect, minus
8	Join concept Simple, equi, non equi, self, outer join

9	Query & sub queries
10	Synonym introduction, object type Create, synonym as alias for table & view, drop
11	Sequence Introduction, alter sequence, drop
12	View Intro, create, update, drop
13	Index Introduction, create
14	Primary introduction to DBA User create, granting privileges (Grant, Revoke, Commit, Rollback, Savepoint)
15	Report writer using SQL Title, Btitle, skip, pause, column, SQL, Break on, computer sum
16	Introduction of PL/SQL Advantages of PL/SQL Support of SQL Executing PL/SQL
17	PL/SQL character set & Data Types Character, row, rowed, Boolean, binary integer, number Variable, constant
18	PL/SQL blocks Attribute % type, %rowtype, operators, function comparison numeric, character, date Control structure Condition - if Interactive- loop, for, while Sequential – goto
19	Composite data types Record- declaration, refer, record assignment Table- Declaration, table attributes (Count, delete, exists, first, last, next, prior)
20	Database Triggers Definition, syntax, parts of triggers Types of triggers, enabling & disabling triggers
21	Sub programs Definition Features Cursors
22	Procedures Definition, creating, Parameter
23	Function Definition & implementation
	Total sessions: 40

Recommended Books:

1. Understanding ORACLE — Perry J. & Later J., BPB Pub.
2. Understanding SQL — Martin Gruber, BPB publication
3. SQL — Scott Urman
4. ORACLE PL/SQL Programming — Scott Urman
5. SQL, PL/SQL the programming language of Oracle — Ivan Bayross, BPB Pub, 4th Ed.

Lab Exercises
Exercise1 1. Create table Salespeople with fields snum, sname, city, commission 2. Orders table with field's onum, odate, snum, amt 3. Customers table with field's cnum, cname, city, rating, snum

Exercise 2

1. Add at least 10 records
2. Display all the records with all sales peoples information.
3. Display the details of fields sname, commission
4. Display the odate, snum, onum, amt from orders table.
5. Display snum from orders table without duplications.
6. Display name & city of salesman where city is "Pune
7. Display all details of customer where rating is 100.
8. Display all details from customer table where salespersons number is 1001.
9. Display the numbers of sales persons, with orders currently in the orders table without any repeats.
10. Display all customers where rating is more than 200
11. Display all customers where city is 'Mumbai' rating is more than 100.
12. Display all customers where city is either 'Pune' or 'Mumbai'
13. List all customers not having city 'Pune' or rating more than 100
14. List all orders between order dates 10/03/05 to 30/3/05
15. Display all orders more that 1000 amt.
16. Display names & cities of all salespeople in 'Pune' with a commission above
17. Display all customers excluding those, with rating less than equal to 100, unless they are located in 'Nagar'
18. Display all sales persons names starting with character 'G'
19. Display all sales persons names starting with character 'G', the 4th character is 'A' & the rest of characters will be any.
20. Find all records from customers table where city is not known i.e. NULL.
21. Display all the customer's names begins with a letter A to G.
22. Assume each salesperson has a 12% commission on order amt. Display orderno, snum, commission for that order.

Exercise 3

1. Display all the customers' records, arranged on name.
2. Display all customers records arranged on rating in desc. Order.
3. Display all sales persons records arranged on snum
4. Display the count for total number of customers in customers table.
5. Display the count of snum in order table without duplication of snum.
6. Display the counts of all orders for Feb05
7. Display the count of different non-NULL city values in the customer's table.
8. Display the maximum outstanding amount as blnc+amt
9. Display the minimum rating within customers table.
10. Display average of amt.
11. Display sales persons number wise maximum amt from order table.
12. Display the largest order taken by each salesperson on each date.
13. Display the details of maximum orders above 3000.
14. Display details of orders order number & date wise
15. Display customer's highest ratings in each city.
16. Write a query that totals the orders for each day & places the results in descending order.

Exercise 4

1. Add a column curr_bal in orders table for current balance
2. Increase commission of all sales persons by 200.
3. Delete all orders where odate is less than 5-2-05

Exercise 5

1. Display names of all customers matched with the salespeople serving them.
2. Find all orders by customers not located in same cities as their Salespersons.
3. Display each order number followed by the name of customer who made it.
4. Calculate the amount of salespersons commissions on each order by a customer with a rating above 100.
5. Display the pairs of salespeople who are living in the same city. Exclude combinations of sales people with themselves as well as duplicate rows with the order reversed.
6. Display the names & cities of all customers with same rating as Hoffman

Exercise 6

1. Write a query that uses a sub-query to obtain all orders for the customer named 'Gopal'. Assume you do not know the customer number.
2. Write a query that produces the names & ratings of all customers who have above-average orders.
3. Write a query that selects the total amt in orders for each salesperson for whom this total is greater than the amount of the largest order in table.

Exercise 7

1. Create a union of two queries that shows the names, cities 7 ratings of all customers. Those with a rating of 200 or greater will also have ratings "high rating", while the others will have the words "low rating".
2. Write a command that produces the name & number of each salesperson & each customer with more than one current order. Put results in alphabetical order.

Exercise 8

1. Create an index that would permit each salesperson to retrieve his or her orders grouped by date quickly.
2. Create a view that shows all of the customers who have highest ratings.
3. Create a view that shows number of salespeople in each city.

Exercise 9

1. Write a PL/SQL block of code that first inserts a record in an 'emp' table. Update the salary by Rs. 2000. then check to see that the total salary does not exceed 20000. if so, undo the updates made to the salaries.
2. HRD manager has decided to raise the salary of employees by 0.15. Write a PL/SQL block to accept the employee number & update the salary of that emp. Display message based on the existence of record in employee table.
3. When any such raise in salary, a record for the same is maintained in emp_raise table. It includes the employee no, the date of raise & the actual raise.
4. Create a stored function to perform item_id check operation. Which accepts a item_id & returns a flag as per the id exist or not.
5. Application using database triggers -
   Create a transparent audit system for a table Client_master. The system must keep track of the records that are being deleted or updated. When the record is deleted or modified the original record details & date of operation are stored in audit table & then the delete & update is allowed to go.

Semester II				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
9	SS2L	Soft Skill – Group Discussion	30	

Objectives: This course enables students to understand web page site planning, management and maintenance. The course explains the concepts of developing advanced HTML pages with the help of frames, scripting languages, and evolving technologies like DHTML, and XML.

Semester – III

Semester III				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
1	IT31	Web Technologies	30	70

Course Objectives:
This course enables students to understand web page site planning, management and maintenance. The course explains the concepts of developing advanced HTML pages with the help of frames, scripting languages, and evolving technologies & scripting like DHTML, jQuery, AJAXand XML.

Sr. No	Chapter Details	Nos. of Sessions	Weightage %	Reference Books
1	**HTML & CSS** 1.1 WWW, W3C,Common HTML Tags, Types of HTML tags, Text formatting tags, List tags, Image Mapping, Tables, Frames, Forms 1.2 Concept of style sheet, Types of Style sheet 1.3 Inline Style Sheet, External Style sheet and examples on it 1.4 Embedded Style Sheet and Examples 1.5 Text formatting properties, Border Properties in CSS and examples 1.6 and tag, use of it, Color property in CSS 1.7 Use of Classes in CSS, more Examples on CSS	4	15	1, 3, 11, 12
2	**2. Javascript** 2.1 Concept of script, Types of Scripts,Introduction to javascript 2.2 Variables, identifiers constants in javascript and examples of each. 2.3 Operators in javascripts, various types of javascript operators 2.4 Examples on javascript operators, 2.5 Control and looping structure, examples 2.6 examples on control and looping structures(if, if…else, for, while, do while, switch, etc….) 2.7 Concept of array, how to use it in javascript , types of an array, examples 2.8 methods of an array , examples on it. 2.9 Event handling in javascript with examples 2.10 Math and date object and examples on it. 2.11 String object and examples on it, and some predefined functions	8	25	2, 3, 11, 12

	2.12 DOM concept in javascript, DOM objects 2.13 Window navigator, History object and its methods, 2.14 Location object with methods and examples 2.15 Validations in javascript , some examples on it. 2.16 Some form validation programs.			
3	**jQuery& AJAX** 3.1 Introduction to jQuery, Syntax Overview 3.2 Anatomy of a jQuery Script, Creating first jQuery script 3.3 Traversing the DOM, Selecting Elements with jQuery, 3.4 Refining & Filtering Selections, Selecting Form Elements 3.5 Working with Selections - Chaining, Getters & Setters 3.6 CSS, Styling, & Dimensions 3.7 Manipulating Elements - Getting and Setting Information about Elements, Moving, Copying, and Removing Elements, Creating New Elements 3.8 Manipulating Attributes, Utility Methods 3.9 Events - Connecting Event to Elements, Namespacing Events, Event handling, Triggering Event handlers, Event Delegation 3.10 Animating effects - animate(), click(), hover(), toggle() 3.11 Plugins - Create a basic plugin, Finding & Evaluating Plugins, Writing Plugins, Tabs, Panels and Panes examples 3.12 jQuery UI and Forms 3.13 AJAX Overview, jQuery's AJAX related methods, Ajax and Forms, Ajax Events	10	20	4, 5
4	**Apache HTTP Server** 4.1 Concept of Web Server, Obtaining and Installing Apache Http Server on Windows and Linux 4.2 Editing httpd.conf configuration file, Configuration directives in httpd.conf - ServerRoot, PidFile, ServerName, 4.3 Add site to /etc/hosts file, DocumentRoot, ErrorLog, Listen, Directory, Files, Location, Redirect, Virtual Hosts, Modules 4.4 Creating .htaccess, .htpasswd file, Configuring httpd.conf to allow authentication via .htaccess 4.5 Secure Web server - Editing ssl.conf configuration file, Create SSL certificate, Certificate Authority (CA), server key, Certificate Signing Request (CSR),	10	20	6, 7
5	**XML**	8	20	8, 9, 10, 11

	5.1 Concept of XML,features of XML 5.2 Writing XML elements, attributes , etc. 5.3 XML with CSS, programs on it. 5.4 XML with DSO, programs on it. 5.5 XML Namespace, XML DTD, programs on it. 5.6 XML schemas, writing simple sheet using XSLT 5.7 SAX Parser, DOM Parser 5.8 Introduction to SOAP, Examples on XML			

Reference Books:

1. Complete reference HTML, TMH, 4th Ed.
2. JavaScript Bible, Wiley Pub.
3. HTML, DHTML, JavaScript, Perl & CGI Ivan Bayross, BPB Pub, 3rd Ed.
4. Learning jQuery - Jonathan Chaffer, Karl Swedberg
5. Professional Ajax, 2nd Edition Wrox Press
6. Apache Server 2.0: The Complete Reference - Ryan B. Bloom, TMH Pub.
7. Apache HTTP Server Reference Manual - for Apache version 2.2.17 – Apache Software Foundation
8. Internet Technology at work Hofstetter fred, TMH.
9. Beginning XML Wrox Press
10. XML how to program Deitel & Deitel, Pearson Pub.
11. Programming the World Wide Web Robert W. Sebesta,Pearson,4th Ed.
12. Web enabled commercial applicationdevelopment using HTML, DHTML, JavaScript, PERL-CGI, BPB Pub,3rd Ed.

Reference Sites:

1. http://www.w3schools.com
2. http://www.apache.org

Note: Any editor like front page or Visual Interdev will be taught to the students. For HTML as well as ASP, It will be taught for practical purpose only and will not be considered for the exams.

Semester III				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
2	IT32	Data Communication And Computer Networks	30	70
Objective : Various computer networks, technologies behind networks and application protocols, e-mail and communication protocols along with introduction to advance network technologies like LTE, Cloud computing, Grid computing will be introduced to the students through this subject.				

Sr. No	Topic Details	Nos. of Sessions	%	Reference Books
1	**Data Communication Networks and Reference Models** 1.1 Components, Data Representation, Data Flow 1.2 Network Criteria, Network Models, Categories of Networks, 1.3 Connection oriented N/Ws 1.4 Connectionless N/Ws, Wireless LAN, Gigabit, 1.5 Interconnection of Networks: Internetwork. 1.6 Protocol Layering, OSI model 1.7 TCP/IP Model, OSI vs. 1.8 TCP/IP	**5**	**12.5**	**1,2,4**
2	**Physical communication**: 2.1 Hardware Architecture 2.2 Topologies, Media: guided and unguided, Devices, Transmission Techniques 2.3 Twisted Pair, Coaxial Cable, Fiber optics, Wireless Transmission Switching 2.4 Circuit Switching, Message Switching, 2.5 Packet Switching	**3**	**7.5**	**1,2,5**
3	**Link Layer Communication** 3.1 Error detection and correction techniques, framing, flow and error control, HDLC, P2P protocol.	**4**	**10**	**1,2**
4	**IP Addressing & Routing** 4.1 Internet Protocol, IP packet format, Addressing: Physical Addresses, Logical Addresses, 4.2 Port Addresses, Specific Addresses. 4.3 IP addresses – Network part and Host Part 4.4 Network Masks, Network addresses and 4.5 Broadcast addresses, Address Classes, 4.6 Loop back address, 4.7 **Routing**: Types of routing protocol, Border Gateway Protocol (BGP), Routing Information Protocol(RIP), Open Shortest Path First(OSPF). 4.8 IP routing concepts, 4.9 Routing Tables, Stream & Packets 4.10 TCP does? TCP – a reliable pipe, 4.11 TCP connection – Multiple conversations, Port Numbers	**6**	**15**	**1,2,4**
5	**IPv6** 5.1 Introduction, packet format, addressing scheme, security, applications and limitations of IPv6. IPv4 Vs IPv6.	**3**	**7.5**	**2**
6	**Domain Network Services (DNS)** 6.1 Domain Names, Authoritative Hosts, 6.2 Delegating Authority, Resource Records, 6.3 SOA records, DNS protocol, DHCP & Scope 6.4 Resolution	**3**	**7.5**	**1,2**
7	**Network Applications** (HTTP, Email, etc) 7.1 Hyper Text Transfer Protocol (HTTP) 7.2 HTTP communications - HTTP request,	**10**	**25**	**2**

	7.3 Request Headers, Responses, Status Code, 7.4 Error Status Code 7.5 Email- Sending & Receiving Emails, Email 7.6 Addressing, Message Structure 7.7 MIME–Multipurpose Internet Mail Extensions 7.8 SMTP–Simple Mail Transfer Protocol with 7.9 examples 7.10 Mail Exchangers – Delivering a message, 7.11 Mail Boxes 7.12 POP – Post Office Protocol 7.13 IMAP – Internet Message Access Protocol 7.14 FTP – File Transfer Protocol 7.15 Telnet – Remote Communication Protocol 7.16 Proxy Server, Proxy Web Servers			
8	**Network Security** 8.1 Threat: Active attack, Passive Attack, Cryptography: Symmetric and Asymmetric key cryptography, Security services, Digital signature, IPSec, SSL, VPN, Firewall: Packet filter, application gateway, Unicode.	**4**	**10**	**3,7,1**
9	**Advance Network Technologies** 9.1 WiFi-IEEE standards- 802.3,802.4,802.5,802.11, 802.11x, WiMax, LTE, Cloud Computing, Grid computing, HSPA, IPTV, FTTH, GPON	**2**	**5**	**1,2**

Reference:

1. Computer Networks — Andrew S. Tanenbaum, Pearson,5th Ed
2. Data Communications and Networking — Behrouz A. Forouzan , TMH,4th Ed.
3. Cryptography and Network Security — Atul Kahate , TMH, 2nd Ed.
4. Network Essential Notes — GSW MCSE Study Notes
5. Internetworking Technology Handbook — CISCO System
6. Computer Networks and Internets with
7. Internet Applications — Douglas E. Comer
8. Cryptography and Network Security — William Stalling

Semester III				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
3	IT33	Data Structure using C++	30	70
Objective : The basic algorithms related to handling data like stack, lists, queue, trees and graphs are introduced in this subject. The implementation of these algorithms will be taught using previously learned C programming language.				

Sr. No	Topic Details	Nos. of Sessions	%	Reference Books
1	1.1 Introduction 1.2 Data Definition 1.3 Data Object 1.4 Data Types Built-in Data Type Derived Data Type 1.5 Data Structure 1.6 Implementation of Data Structure	**2**	**5**	**1,2,3**
2	**Array** 2.1 Array as Data Structure 2.2 Storage Representation of Arrays 2.3 Applications of Arrays 2.4 Polynomial Representation Using Arrays Addition of Two Polynomial Multiplication of Two Polynomial 2.5 Sparse Matrices Addition of Sparse Matrices Transpose of a Sparse Matrix	**5**	**12.5**	**1,2,3**
3	**Linked List** 3.1 Introduction 3.2 Drawback of Sequential Storage 3.3 Concept of Linked List 3.4 Implementation of Linked List 3.5 Operation of Linked List Creating a List Displaying a List Inserting an element in the List 3.6 Deleting an element 3.7 Other Operation & Applications Reversing a Linked List 3.8 Concatenation of Two Lists 3.9 Representation of Polynomial 3.10 Circular Linked List & Operation 3.11 Doubly Linked List & Operation 3.12 Doubly Circular Linked List & Operation 3.13 Difference between an array and Linked list 3.14 Generalized Linked List 3.15 Header Linked List	**8**	**20**	**1,2,3**
4	**Stack** 3.1 Introduction 3.2 Definition 3.3 Operation on Stack 3.4 Static & Dynamic Implementation of a Stack 3.5 Application of Stack 3.6 Recursion 3.7 Infix, Prefix & Postfix expression 3.8 Matching Parentheses in an 3.9 Expression	**5**	**12.5**	**1,2,3**
5	**Queue**	**5**	**12.5**	**1,2,3**

	5.1 Introduction 5.2 Definition of a Queue 5.3 Operation on a Queue 5.4 Static & Dynamic Implementation of Queue 5.5 Types of Queue Circular Queue Priority Queue 5.6 DEQueue 5.7 Application of Queue 5.8 Job Scheduling Reversing Stack using Queue			
6	**Tree** 6.1 Tree Terminology 6.2 Binary Tree 6.3 Binary Tree Representation 6.4 Binary Search Tree (BST) Creating a BST Binary Search Tree Traversal Preorder Traversal Inorder Traversal Postorder Traversal	**5**	**12.5**	**1,2,3**
7	**Binary Threaded Tree** 7.1 AVL tree 7.2 B tree introduction to B tree insertion in B tree deletion from B tree introduction to B+, B* tree 7.3 Expression Tree 7.4 Threaded Binary Tree	**5**	**12.5**	**1,2,3**
8	**Graph** 8.1 Introduction 8.2 Graph Representation Adjacency Matrix Adjacency List 8.3 Graph Traversals Depth First Search Breadth First Search 8.4 Applications of Graph	**5**	**12.5**	**1,2,3**

Reference Books:

1	Data Structures Using C and C++	Langsam Y, PHI,2nd Ed.
2	The Essence of Data Structures using C++	Brownesy,Kan
3	Magnifying Data Structures	Arpita Gopal
4	Data Structures Using C ++	Malik D S
5	Data Structures in C ++	Kutty N.S., Padhye P.Y.
6	Practical Approach to Data Structures	Hanumanthappa
7	Data Structure Using C++	Kasiviswanath N.
8	Principles of Data Structures Using C and C++	Das Vinu V.

9	Data Structure and Algorithms in C++	Joshi Brijendra Kumar
10	Data Structures and Algorithms in C++	Drozdek Adam
11	Data Structures Using C++	Malik D S, CENGAGE Learning Pub.
12	Data Structures with C++: Schaums Outlines	Hubbard John
13	Data Structures: A pscudocode approach with C++	Gilberg R.F., Forouzan B.A.,Cengage
14	Data Structure Using C ++	Jayalakshmi
15	Data Structures Using C and C++ (Tenenbaum)	Tenenbaum, Pearson Pub.
16	Data Structure through C++	Y.P. Kanetkar, BPB,2nd Ed.
17	Fundamental of DS using C++	Horowitz Sahani, Galgotia pub.
18	DS using C++	Abhyankar

Semester III				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
4	IT34	Advanced Database management System	30	70

Objective: To study the further database techniques beyond which covered in the second year, and thus to acquaint the students with some relatively advanced issues. At the end of the course students should be able to: gain an awareness of the basic issues in objected oriented data models, learn about the Web-DBMS integration technology and XML for Internet database applications, familiarize with the data-warehousing and data-mining techniques and other advanced topics.

Sr. No	**Topic Details**	**Nos. of Session**	**%**	**Reference books**
1.	**Advance Database Management System – Concepts & Architectures** 1.1 Centralised 1.2 Client-Server 1.3 Server system Transaction servers Data servers Cloud based servers 1.4 Parallel 1.5 Distributed 1.6 Web based system Web architecture (2 tier , 3 tier, N-tier Architecture) Web services – SOAP	**4**	**5**	**1,4,7**
2	**Parallel Databases** 2.1 Introduction 2.2 I/O parallelism 2.3 Inter-query and Intra-query parallelism, 2.4 Inter-operational and Intra-operational parallelism 2.5 Design of parallel systems	**5**	**15**	**1,4**

	2.6 Parallelism on Multicore processors			
3	**Distributed Databases** 3.1 Introduction, 3.2 Homogeneous and Heterogeneous Databases 3.3 Distributed data storage, 3.4 Distributed transactions 3.5 Commit protocols 3.6 Concurrency control 3.7 Availability 3.8 Cloud based databases, 3.9 Directory systems	**5**	**15**	**1,4**
4.	**Specialty Databases & Applications** 4.1 Object based Databases – OR & OO - Overview of Object- Oriented concepts & characteristics - Database design for OODBMS - Objects, OIDs and reference types - Database design for ORDBMS - Comparing RDBMS, OODBMS & ORDBMS 4.2 Temporal databases 4.3 Spatial data & Geographic database 4.4 Multimedia data 4.5 Mobility & Personal databases	**8**	**25**	**1, 4, 5, 6, 7**
5.	**Data Warehousing** 5.1 Introduction to Data warehousing 5.2 Architecture 5.3 Warehouse schemas, 5.4 Dimensional data modeling- star, snowflake schemas, fact constellation 5.5 OLAP and data cubes 5.6 Operations on cubes 5.7 Data preprocessing -need for 5.8 preprocessing, data cleaning, data integration & transformation, data reduction	**5**	**15**	**1, 2,4,6,7**
6.	**Knowledge Base Systems & Data Mining** 6.1 Data mining as a part Knowledge Discovery process Introduction to machine learning & data mining 6.2 Association rules 6.3 Market-basket Model, support & confidence Apriori Algorithm Sampling Algorithm Frequent-pattern Tree Algorithm Partition Algorithm Other types of Association rules 6.4 Classification Decision tree induction Bayesian classifiers 6.5 Clustering k-means Algorithm	**8**	**15**	**1,2,6**

	6.6 Approaches to other data mining problems Discovery of sequential patterns Discovery of patterns in time series Regression Neural Networks Genetic Algorithms Text mining Data-visualization 6.7 Applications of Data Mining			
7.	**Data exchange through XML** 7.1 Structure of XML data 7.2 XML schema 7.3 XML Document & Databases schema Storing & Extracting XML document 7.4 XML Querying XML data XPath XQuery 7.5 Application Program Interface to XML 7.6 XML Applications	**5**	**10**	**1,6**

Reference Books

1. Database system concepts', 6th Edition –Abraham Silberschatz, Henry Korth, S, Sudarshan, (McGraw Hill International)
2. Data Mining: Concepts and systems - Jiawei nan, Micheline Kamber, (MorganKaufmann publishers)
3. Database systems : "Design implementation and management"- Rob Coronel, 4thEdition, (Thomson Learning Press)
4. Database Management Systems - Raghu Ramkrishnan, Johannes Gehrke Second Edition, (McGraw Hill International)
5. Database Management System - Alexis Leaon, Mathews Leon, (leon press)
6. Fundamentals of Database Systems - Remez Elmasri , Shamkant Navathe,Pearson,5th Ed
7. Database Systems – a Practical approach to design , implementation & Management - Thomes M. Colnnolly, Carolyn E. Begg, Pearson 4th Ed.

Semester III				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
5	IT35	Object Oriented Analysis And Design	30	70

Objectives:

1. After completing this course students will be able to:
2. Understand the issues involved in implementing an object-oriented design
3. Analyze requirements and produce an initial design
4. Develop the design to the point where it is ready for implementation
5. Design components to maximize their reuse
6. Learn to use the essential modeling elements in the most recent release of the Unified Modeling Language - UML 2.0

Sr. No	Topic Details	Nos. of Sessions	%	Reference Books
1	**Introduction** 1.1 Two views of software Developments: SSAD and OOAD. Why Object –Orientation? **The Object Paradigm** 1.2 Object and classes 1.3 Abstraction and encapsulation 1.4 Methods and Message 1.5 Interfaces, Inheritance and Polymorphism 1.6 Access Control – 1.7 The Business case for OO Developments	**5**	**12**	**1,2,3,4,5**
2	**Object Oriented Methodologies** 2.1 Some of the object Oriented Methodology:- 2.2 Object Oriented Design -Booch 2.3 Object Modeling Techniques - Rumbaugh 2.4 Object – Oriented Analysis - Cood Yourdon 2.5 Object – Oriented Software engineering – Ivar Jacobson Unified Approach 2.6 Diagramming and Notational Techniques using the UML 2.7 UML Notation 2.8 {Analysis Diagramming Techniques.} == Introduction to all (ten) Diagram 2.9 { Design Diagramming Techniques} 2.10 Generalization / Specialization. 2.11 Aggregation and composition 2.12 Association , Cardinality, Navigability, Icons, relationships and adornments.	**6**	**14**	**3,4,5,6,7,8**
3	**Object-Oriented Systems Development Process** 3.1 Rational Unified Process 3.2 Four Major phases:- Inception , Elaboration, Construction, Transition Requirements Engineering 3.3 Problem analysis. 3.4 Understanding Stockholders need Type of requirements. 3.5 Use-case Model: Writing Requirements	**4**	**14**	**3,4,5**
4	**Analysis** 4.1 Behavioral Analysis 4.2 Domain Analysis or Business Object Analysis 4.3 Use-case Driven Object Oriented analysis 4.4 The UML approach. Develop use-case Model Use-case Description Documentation Activity Diagram 4.5 Identify the classes. Introduction to different approaches for identifying classes	**8**	**15**	**3,4,5**

	"Noun Phrase" approach "Conman Class Pattern" approach "CRC" approach Usecase Driven Approach. 4.6 Containment and Composition 4.7 Aggregation 4.8 Inheritance, SubTypes and IS-A Hierarchies. 4.9 Association and Link Relationships. 4.10 Diagramming System Events.			
5	**Design Phases** 5.1 Translating Analysis Concept into Design. 5.2 Optimizing classes and Objects: The Multi-tiered Architecture View 5.3 Mapping System functions to objects. 5.4 Object-to-Object Visibility. 5.5 Collaboration Diagram 5.6 Sequential Diagram 5.7 Specification Class Diagram 5.8 Specifying Object Interfaces. 5.9 Designing the Data Access layer. 5.10 Design User Interface layer 5.11 Designing System Interfaces, Controls and Security.	**6**	**15**	**3,4,5,10**
6	**Design Refinement** 6.1 Designing for Extensibility 6.2 Design for reusability. 6.3 Portioning class space 6.4 Checking Completeness and correctness.	**3**	**8**	**10**
7	**Persistent Object and Database Issues** 7.1 The Cood Data Management Domain. 7.2 Object Persistence 7.3 Object-oriented Database Management System 7.4 Object- Oriented verses Relational Database. 7.5 Mapping object to Relational Data structure.	**3**	**8**	**4,5,10**
8	**Testing of Object oriented applications** 8.1 Introduction to Testing Strategies. 8.2 Impact of Object Orientation on Testing. 8.3 Testing Business Process. 8.4 Design Matrix 8.5 Discovering reusable pattern.	**3**	**8**	**4,5**
9	**Patterns** 9.1 Benefits of patterns. 9.2 Using patterns During Analysis. 9.3 Using Pattern During Design	**2**	**6**	**6**

References

1. Object Oriented Analysis and Design with Applications by Grady Booch., Benjamin / Cummings , 1994., Pearson Pub.
2. Object – Oriented Modeling and Design by J Rumbaugh, M Blaha, W . Premerlani ,PHI Pub.
3. Magnifying Object Oriented Analysis and Design by Arpita Gopal and Netra Patil : PHI Publication
4. Principles of Object- Oriented Software Development - Anton Eliens , Addison Wesley.
5. Object Oriented System Development - Ali Bahrami McGRAW-HILL International Edition.
6. Object-Oriented Software Engineering - Ivar Jacobson Pearson Education INC
7. Applying UML And Pattern by Craig Larman Pearson Education INC
8. UML Distilled Martin Flowler - Pearson Education INC
9. The Unified Modeling Language User Guide -Grady Booch, James Rumbaugh, Ivar Jacobson-Pearson Education INC
10. The Unified Modeling Language Reference Guide -Grady Booch, James Rumbaugh, Ivar Jacobson-Pearson Education INC
11. Design Object- Oriented Software - Rebecea Wrifs- Brock. Brian Wilkerson, Lauren Wiener
12. Object Oriented Analysis and Design- Bennett , Simon McGraw Hill.
13. Designing Flexible Object Oriented System with UML - Charless Richter, Techmedia
14. Instant UML – Muller – Apress LP
15. UML Instant – Thomas A Pendar – Wiley Publication
16. UML in Nutshell ,O'reilly Pub.

Semester III				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
6	MT31	Research Methodology and Tools	70	
Objective : Research is a tool which helps the manager to identify, understand and solve management problems. Research improves the decision making ability of the manager. The objective of the subject is to create scientific attitude towards solving a management problem and impart knowledge about tools available for carrying out research.				

Sr. No	**Topic Details**	**Nos. of Session**	**%**	**Reference Books**
1	Introduction and overview	**1** Lecture	**8**	
2	The nature of Computer Science(CS) research; what is research?	**3** Lectures	**8**	
3	Literature searches, information gathering	**1** Lecture **1** Practical	**8**	
4	Reading and understanding research papers	**2** Lectures **1** Tutorial	**6**	

5	Technical writing, referencing, bibliographies	**4** Lectures, **1** Tutorial, **5** Practicals	**8**	
6	Presentation skills, written and oral	**2** Lectures	**7**	
7	Choosing or proposing a project	**2** Lectures	**6**	
8	Project planning, tools and techniques for planning	**2** Lectures, **1** Practical	**10**	
9	Project conduct, time management, risk management, team working	**2** Lectures	**9**	
10	Commercial and economic considerations in IT research and IT industry	**3** Lectures, **1** practical	**8**	
11	Review of legal, ethical, social and professional (LSEP) issues including data protection and standards	**2** Lectures	**8**	
12	Research Methods in Computer Science and Engineering (introduction)	**2** Lectures	**5**	
13	Research Methods (for Software Engineering)	**2** Lectures	**5**	
14	Measured-based research methods in Computer Engineering	**2** Lectures	**4**	

Note: Use of SPSS, MATLAB-Statistical Tool Box, etc. for additional knowledge is recommended.

1. Christian W. Dawson: Projects in Computing and Information Systems (A Student's Guide). Addison Wesley, 2005.
   Justin Zobel: Writing for Computer Science. Springer, 2004
2. Research Methodology Methods And Techniques C.R. Kothari, New Age International Pub,2nd Ed
3. Research Methodology Concepts And Cases Deepak Chawla, Neena Sondhi, Vikas Pub.
4. Business Research Methods By By William G.Zikmund, Thomson South-Western, CENGAGE Learning.

Semester III				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
7	IT31P	Mini Project based on Web Technology	50	

Objective: To make practice of developing a good web application using the techniques and scripting students have learnt, they have to do a mini project as an assignment.

- Students are expected to develop dynamic web projects, based on HTML, DHTML, JavaScript / VBScript and ASP. Documentation need not be stressed in this mini project.

- The marks of project will be based on following:
  - Screens, Forms, Validations: 30 marks
  - Database handling, creating dynamic pages: 20 marks

Semester III				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
8	IT31L	Mini Project Based on Data Structure Concept	50	

Objective: The practical implementation of data structure will be done by students through this lab work, which will built efficient programming skills in students.

IT31 (internal) Lab Assignments (Recommended)

1. Addition and Multiplication of Two Polynomials.
2. Addition and Transpose of Sparse Matrices.
3. Singly Linked List: Create, Display, Insertion, Deletion, Search, Reverse
4. Singly Circular Linked List: Create, Display, Insertion, Deletion, Search,
5. Doubly Linked List: Create, Display, Insertion, Deletion, Search, Reverse
6. Stack Implementation
7. Stack Application: Inter conversion of Infix, Prefix & Postfix
8. Stack Application: Palindrome & Matching Parenthesis.
9. Queue Implementation
10. Queue Application: Job Scheduling.
11. Binary Search Tree Implementation: Creation, Insertion, Deletion, Copy, Mirror, Traversal (Preorder, Post order, In order).
12. Graph Application: Depth First Search, Breadth First Search, And Shortest Path Algorithm.

Semester III				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
9	*SS3L	Soft Skill – Technical Writing	30	

Semester – IV

Semester IV				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
1	IT41	Java Programming	30	70
Objective: To enable the students to understand the core principles of the Java Language and use visual tools to produce well designed, effective applications and applets.				

Sr. No	Topic Details	Nos. of Sessions	%	Reference Books
1	**Introduction to Core Java** Introduction 1.1 Features of JAVA 1.2 JDK Environment & Tools (javac, java, appletviewer, javadoc, jdb) Object Oriented concepts with respect to Java Difference between C++ & JAVA Java Programming Fundamentals Structure of java program, data types, variables, Operators, Keywords, Naming conventions, Decision making statements, Iterative statements, Type casting, Arrays (One dimensional & Multidimensional) String (String Arrays, String Methods, StringBuffer) 1.3 Creating classes & objects 1.4 Constructors (with all types) 1.5 Garbage collection & finalize() method. 1.6 Implementation of Inheritance Single, Multilevel, Hierarchical, Use of super keyword, super constructor, this keyword 1.7 Implementation of polymorphism Method overloading, Method overriding 1.8 Nested & inner classes 1.9 Modifiers & Access control (Default, public, private, protected, private protected) 1.10 Final variables, Methods & classes 1.11 Abstract methods & classes 1.12 Interfaces 1.13 Packages Packages concept, Creating user defined package, Java built in packages (Java.lang, java.util) 1.14 Exception Handling Exception types, Using try catch, Multiple catch,Nested try, throw, throws, finally, user defined exceptions	**6**	**20**	**1,2,3,7**

2	**Applet As Java Applications** 2.1 Introduction 2.2 Applet Life Cycle 2.3 Applets specific methods & Related HTML references 2.4 An Applet Skeleton 2.5 The HTML APPLET Tag with all attributes. 2.6 Creating an Applet 2.7 Displaying it using Web Browser, appletwiewer.exe 2.8 Passing parameters to applet 2.9 Advantages and Disadvantages of Applet Vs Applications	**2**	**8**	**1,2,7**
3	**Abstract Windows Toolkit** 3.1 Components and Graphics 3.2 Containers, Frames and Panels 3.3 Layout Managers 3.4 Border layout, Flow layout, Grid layout, Card layout 3.5 AWT all components Event delegation Model Event source and handler Event categories, Listeners, interfaces Anonymous classes, Adapter Classes Swing Libraries Model view Controller design pattern Different layout, menus dialog boxes, text input	**5**	**8**	**1,2,7**
4	**Java Input Output** 4.1 Java IO package 4.2 Byte/Character Stream 4.3 Buffered reader / writer 4.4 File reader / writer 4.5 Print writer 4.6 File Sequential / Random	**4**	**8**	**1,2,7,8**
5	**Java Collection Framework** 5.1 Collections Overview 5.2 The Collection Interfaces Collection Interface, List Interface, Set Interface, SortedSet Interface The Collection Classes ArrayList Class, LinkedList Class, HashSet Class, TreeSet Class Accessing a Collection via an Iterator 5.3 The Map Interfaces Map Interface, SortedMap Interface The Map Classes HashMap, TreeMap 5.4 The Legacy Interfaces Enumeration Interface The Legacy Classes 5.5 Vector , Stack Hashtable	**5**	**10**	**3,6,7**
6	**JDBC** 6.1 Java database connectivity, JDBC Architecture, JDBC API,	**4**	**12**	**6**

	6.2 Types of JDBC drivers 6.3 Steps to create JDBC Application 6.4 Writing first JDBC applications 6.5 Types of statement objects (Statement, PreparedStatement and CallableStatement) 6.6 Types of resultset, ResultSetMetadata 6.7 Inserting and updating records 6.8 JDBC and AWT 6.9 Connection pooling			
7	**Multithreading** 7.1 Multithreading concepts 7.2 Thread Life cycle 7.3 Creating multithreaded application (Using Thread Class & Using Runnable Interface) 7.4 Thread priorities 7.5 Thread synchronization 7.6 Inter thread communication	**4**	**10**	**1,2,7,8**
8	**Networking with Java** 8.1 Networking basics Sockets, port Proxy servers Internet addressing 7 URL 8.2 java.net – networking classes and interfaces 8.3 Implementing TCP/IP based Server and Client 8.4 Datagrams – Datagram packet, Datagram server and client 8.5 URL connections	**4**	**8**	**7,8**
9	**RMI** 9.1 Introduction & Architecture of RMI 9.2 Stubs & skeleton 9.3 Java rmi classes and interfaces 9.4 Writing simple RMI application 9.5 Parameter passing in remote methods (marshalling and unmarshalling)	**4**	**10**	**6,8**
10	**Java Beans** 9.1 Java Beans Introduction, design pattern 9.2 Writing simple bean 9.3 Beans persistence & introspection	**2**	**6**	**6**

Reference Books:

1. Core Java 2 Volume - I Cay S Horstmann, Fary Cornell, Sun Microsystems Press, 8th Ed.
2. Core Java 2 Volume - II Cay S Horstmann, Fary Cornell, Sun Microsystems Press, 8th Ed.
3. Programming with Java, A Primer E.Balguruswami, McGraw-Hill, 4th Ed.
4. Inside Servlets Dustine R Callway, Pearson Pub.
5. Developing Java Servlets James Goodwill, Techmedia,2nd Ed.
6. Complete Reference- J2EE Jim Keogh, TMH.
7. Java 2 Complete Reference Patric Naughton, Herbert Schildt, TMH,7th Ed.
8. Beginning Java Networking Chad Darby, John Griffin & others

Semester IV				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
2	IT42	Mobile Computing	30	70
Objective : To introduce network, system, techniques and applications in Mobile Wireless Computing.				

S.No	Topic Details	No of Sessions	%	Reference Books
1.	**Introduction to Mobile Communications and Computing** Mobile Computing (MC): Introduction to MC, applications, limitations, and architecture. **Cellular Overview** Cellular networks, Cellular concept, location management, Handoffs	**2**	**4**	**1,7**
2.	**Wireless LANs and Application overview** 2.1 WLAN 2.2 Wireless applications 2.3 Mac issues(Hidden and exposed terminals, Near and far terminals), 2.4 Mobile IP 2.5 Mobile ad-hoc networks(MANET) 2.6 TCP Issues 2.7 Disconnected operations 2.8 Data broadcasting 2.9 Mobile agents	**4**	**5**	**1**
3.	3.1 **GSM** • Air-interface, channel structure, timing, • Mobile Services (Bearer, Tele-and-supplementary services) • System Architecture - Radio subsystem - Network and switching subsystem - Operation subsystem • Protocols 3.1 Localization and calling 3.2 Handover 3.3 Value Added Services - SMS - Cell Broadcast Service - MMS - Location Services 3.2 **WAP** • Architecture	**5**	**8**	**1**

	• Protocol stack • Application environment, - application demo			
4	**Access Technologies** Blue Tooth, GPRS, 802.11, CDMA 3 **Mobile Phone Technologies (1G, 2G, 2.5G, 3G)**	**3**	**3**	**3,7**
5	**Database Issues** 5.1 Hoarding techniques 5.2 Caching invalidation mechanisms 5.3 Client server computing with adaptation, 5.4 Power-aware and context-aware computing, 5.5 Transactional models, query processing, recovery, and quality of service issues.	**2**	**6**	**8**
6	**Platform/Operating Systems for application development** 6.1 Palm OS 6.2 Windows CE 6.3 Embedded Linux 6.4 J2ME (Introduction) 6.5 Symbian (Introduction)	**2**	**8**	**1**
7	**Android application development** 7.1 Overview of Android 7.2 Devices running android 7.3 Why Develop for Android 7.4 Features of android 7.5 Architecture of Android, Libraries 7.6 Software development kit	**3**	**8**	**4,5**
8	**Designing the user interface**. 8.1 Introducing views and view groups, 8.2 Introducing layouts, Creating new views, 8.3 Creating and using Menus	**2**	**8**	**4,5**
9	**Starting with Application Coding** 9.1 Introducing Intents 9.2 Introducing Adapters 9.3 Using Internet Resources 9.4 Introducing Dialogs 9.5 Capturing Date and Time 9.6 Validating and Handling Input data	**3**	**10**	**4,5**
10	**Accessing Location Based Services Application** 10.1 Selecting Location Provider 10.2 Finding your location. 10.3 Creating map based activities	**2**	**6**	**4**
11	**Data Storage, retrieval and Sharing** 11.1 File system in android 11.2 Internal and external storage 11.3 Saving and loading files 11.4 File Management tools	**3**	**10**	**4,5**

12	**Introduction to SQLite** 12.1 Creating SQLite database, 12.2 Editing Tasks with SQLite 12.3 Cursors and content values 12.4 Working with Android database.	**3**	**10**	**4**
13	**Peer to peer to communication** 13.1 Accessing Telephony Hardware 13.2 Introducing Android Instant Messaging 13.3 GTalk Service : Using, binding & Making connection 13.4 Managing chat Sessions 13.5 Sending and receiving Data messages 13.6 Introducing SMS 13.7 Using, sending & Listening SMS Messages	**3**	**7**	**4**
14	**Accessing Android Hardware** 14.1 Audio, Video and Using the camera. 14.2 Introducing Sensor Manager 14.3 Android Telephony 14.4 Using Bluetooth 14.5 Manage network and Wi-Fi connections	**2**	**5**	**4,5**
15	**Publishing Android Application to Market**	**1**	**2**	**6**

References:

1. Mobile Communications J. Schiller, Addition Wesley Publication
2. GSM System Engineering A.Mehrotra, Addition Wesley Publication
3. Understanding WAP M. Heijden, M. Taylor, Artech House Publication
4. Professional Android™ Application Development Wrox Publications, Reto Meier
5. Hello Android, Introducing Google's Mobile Development Platform, Ed Burnette, Pragmatic Programmers,ISBN: 978-1-93435-617-3
6. Sams teach yourself Android application development, Lauren Dercy and Shande Conder, Sams publishing
7. Mobile Computing: Asoke K Talukdar, Roopa R. Yavagal, TataMcGrawHill
8. Hansmann, Merk, Nicklous, Stober, "Principles of Mobile Computing", Springer, second edition

Semester IV				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
3	IT43	Information Security And Audit	30	70

Objective: To create awareness about the values of Information and how the Information security practices are meticulously implemented in IT companies worldwide.

Prerequisites: Fundamentals of computers and Networking technologies, Internet concepts and applications, Dat abase concepts, Exposure to programming languages.

Sr . No	Topic Details	Nos. of Session	%	Reference Books
1	**Introduction to Information Security:** 1.1 History and evaluation of Information security CIA triangle 1.2 Components of IS, Control in IT environment, Information security Management system, components of ISMS and conceptual framework 1.3 Steps for developing ISMS.	**4**	10	1,2,7
2	**Need of Information security:** 2.1 Threats to information security, Risk to Information systems 2.2 Information security in organization, Introduction to cyber crimes and attacks 2.3 Information security policy, policy definition and security life cycle.	**5**	10	3,6,10
3	**Information Security Policy and Standards:** 3.1 Security principles 3.2 Types of Information security policies- Administrative and Technical 3.3 A structure and framework of compressive security policy, policy infrastructure, policy design life cycle and design processes, PDCA model, 3.4 Security policy standards and practices - BS7799, ISO/IEC 17799, ISO 27001. Auditing tools such as ISO 27001 ISMS TOOL KIT, NGS AUDITOR, Windows password auditor, ISO IES 27002 2005 IS AUDIT TOOL	**8**	17	1,2,4,10,11 Websites 3,4,5
4	**Domains of IT security-** 4.1 user/accepted usage/ access, data access, physical access 4.2 Internet access, e-mail, digital signature, outsourcing, software development and acquisition, hardware acquisition 4.3 Network and telecom, BCP and DRP, security organization structure. 4.4 Domains related security based case studies.	**10**	30	1,2,3,4,5,7,11
5	**IT Governance** 5.1 What is IT Governance, good governance, objectives and dimensions, foundation, structure, processes 5.2 IT governance framework- COBIT, ITIL, ISO 17799, IT governance maturity model .	**4**	10	7,8,9
6	6.1 Auditing concepts ISA need, concept, standards, performance, steps, 6.2 Techniques, methodologies, around and through	**4**	10	8,9,10

	computer, Controls – Concept objectives, types, risk.			
7	**Controls** 7.1 Input, process, validation, output, logical access, physical access 7.2 Database, network, environment, BCP, Evidence collection, evaluation and Reporting methodologies.	**4**	10	3,4,8,9
8	**Ethical hacking**	**1**	3	

Reference Books:

1. Information security policies, procedures and standards by Thomas Pettier.
2. Information security Management Hand book- 5th Edition-HAROLD F. TIPTON
3. Computer security by Alfred Basta, Wolf Halton
4. Information security policies- Thomas R.Peltier, Peltier R. Peltier
5. Electronic Signature law by L Padmavathi
6. Network Security by Ankit Fadia
7. Security Plus study guide by Michael Cross, Norrris Johnson
8. Information systems control and Audit by Ron Weber, Pearson Pub.
9. IS control journals from ISACA
10. Information Systems Security: Security Management, Metrics, Frameworks And Best Practices (With Cd) : Nina Gobole
11. Information Security policies made easy version 10: Charles Cresson Wood

Reference websites:

12. www.searchsecurity.techtarget.com
13. www.secure-byte.com
14. www.security-internal-audit.com
15. www.ngssecure.com/services
16. www.pcisecuritystandards.org

Semester IV				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
4	IT44	Design And Analysis of Algorithm		70
Objective : To understand and learn advance algorithms and methods used in computer science to create strong logic and problem solving approach in student..				

Sr. No	Topic Details	Nos. of Sessions	%	Reference Books
1	**Introduction** 1.1 Algorithm, analysis 1.2 Time complexity and space complexity 1.3 O-notation, Omega notation and Theta notation, 1.4 Heaps and Heap sort, Sets and disjoint set, union and find algorithms. 1.5 Sorting in linear time. 1.6 Tower of Hannoi	**5**	**12.5**	**1,2**
2	2.1 Heaps and Heap sort 2.2 Sets and disjoint set 2.3 Union and find algorithms. 2.4 Sorting in linear time.	**4**	**10**	**1,2,3**
3	**Divide And Conquer** 3.1 Divide and Conquer 3.2 General Strategy 3.3 Exponentiation. Binary Search 3.4 Quick Sort 3.5 Merge Sort	**4**	**10**	**1,2,3**
4	**Greedy Method** 4.1 General Strategy, Knapsack problem 4.2 Job sequencing with Deadlines 4.3 Optimal merge patterns 4.4 Minimal Spanning Trees 4.5 Dijkstra's algorithm.	**7**	**17.5**	**1,2**
5	**Dynamic Programming** 5.1 General Strategy 5.2 Multistage graphs 5.3 OBST, 0/1 Knapsack 5.4 Traveling Salesperson Problem 5.5 Flow Shop Scheduling	**6**	**15**	**1,2**
6	**Backtracking** 6.1 Backtracking: General Strategy 6.2 N- Queen's problem 6.3 Graph Coloring 6.4 Hamiltonian Cycles, 0/1 Knapsack	**6**	**15**	**1,2**
7	**Branch and Bound** **7.1** General Strategy, 0/1 Knapsack **7.2** Traveling Salesperson Problem	**5**	**12.5**	**1,2**
8	**NP-HARD AND NP-COMPLETE PROBLEMS** Basic concepts, of NP-Hard And NP-Complete Problems (Only concepts should be covered)	**3**	**7.5**	**1,2**
Internal marks for DAA should be based on the following programs which can be solved and implemented using any language o Towers of Hannoi in Topic - I o N-Queens problem in Topic –VI o Knapsack problem in Topic – IV, V, VI & VII				

Reference Books

1. Bressard, "Fundamental of Algorithm." PHI
2. Horowitz/Sahani, "Fundamentals of computer Algorithms", Galgotia.
3. Magnifying Data Structures, Arpita Gopal : PHI Publications
4. Thomas H Cormen and Charles E.L Leiserson, "Introduction to Algorithm" PHI
5. A. V. Aho and J.D. Ullman, "Design and Analysis of Algorithms", Addison Wesley

Semester IV				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
5	MT41	Optimization Technique	30	70
Objective: To introduce the linear programming and related optimization theories to solve real life /simulated problems.				

Sr. No	Topic details	Nos. of Sessions	%	Reference Books
1	**Linear Programming** 1.1 Various definitions, statements of basic theorems and properties, Advantages, 1.2 Limitations and Application areas of Linear Programming 1.3 Linear Programming – The Graphical method – Graphical Solution methods of Linear Programming problem, 1.4 Problems, Phase II of the Simplex Method, 1.5 Primal and Dual Simplex Method, 1.6 Big –M method. 1.7 Transportation Problem and its solution, 1.8 Assignment Problem and its solutions by Hungarian Method	**10**	**27**	**4,8,6,9**
2	**Sequential model and related Problems** Processing n jobs through A) 1 machine and B) 2 machines	**6**	**15**	**1 to 6**
3	**Queuing Theory** 3.1 Characteristics of Queuing Models 3.2 Transient and Steady states of the System 3.3 Model – I [(M/M/1) : (FCFS / ∞ /∞)] 3.4 Model II – Generalization of Model 3.5 [(M/M/1) : (FCFS / ∞ / ∞)] (Birth-Death Process) 3.6 Miscellaneous Problems	**7**	**17**	**2,5**
4	**Replacement Theory** 4.1 Replacement of items that deteriorates. When money value is consider & Problems	**4**	**9**	**3,1**

	4.2 Replacement of items that fails suddenly 4.3 Individuals and Group Replacement-Miscellaneous Problems			
5	**INVENTORY THEORY** 5.1 Inventory Model Building 5.2 Single item deterministic Model 5.3 Inventory Control Models without strategies 5.4 Inventory Control Models with shortages	**5**	**11**	**5,8**
6	**PERT & CPM** 6.1 Basic differences between PERT and CPM. 6.2 Arrow Networks, time estimates, Earliest expected time Latest – allowable occurrences time Forward Pass Computation Backward Pass Computation 6.3 Representation in Tabular Form 6.4 Critical Path 6.5 Probability of meeting scheduled date of completion, 6.6 Calculation on CPM network. 6.7 Various floats for activities 6.8 Critical path updating projects. 6.9 Operation time cost trade off Curve project 6.10 Time cost – trade off Curve- 6.11 Selection of schedule based on Cost Analysis, Crashing the network	**8**	**21**	**4,6,7,8,9**

References :

Reference No.	Book Name	Author
1	Introduction to Operation Research : A Computer Oriented Algorithm Approach	By Filet B. E.
2	Fundamentals of Queuing Theory	By Gross D. and Ilaris C.M.
3	Introduction to Operation Research	By Hiller F. and Lieberman G. J., TMH,8th Ed.
4	Operations Research	By Kanti swarup, Gupta P.K. and ManMohan, S.Chand And Sons, 15th Ed.
5	Mathematical Programming technique	By Kambo N.S., East-West Press.
6	Optimization Methods in Operations Research and System Analysis	By Mital K.V.,New Age Pub., 3rd Ed
7	The Critical Path Method	By Saffer L.R., Fitter J.B. and Meyer W.L.
8	Operation Research	By J.K. Sharma, McMillon,4th Ed.
9	Operation Research	By Taha H.A.,PHI,7th Ed.

Semester IV				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
6	EC41	Elective - I	70	

Semester IV				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
7	IT41L	Mini Project based on Java	50	
Objective: This project work will provide hands on practice to student to enhance their Java Programming Skills. Java concepts such as Interfaces, Packages, Exception Handling, Applet, multithreading, Abstract Windows Toolkit, Java Input Output, Networking, JDBC, RMI, Java Beans can be included.				

Semester IV				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
8	IT41P	Mini Project Using Mobile Computing	50	

1. XHTML, ChTML Web Site Development
2. Setup WAP2 between Access point and Laptop
3. Bluetooth link between Laptop and Mobile Phone, File Transfer, Application Install,
4. Security Setting
5. Mobile Device Simulator
6. Mobile Handset Programming
7. Design of Touch Screen User Interface

Semester IV				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
9	SS4L	Soft Skill – Presentation Skill	30	

Semester IV				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
10	EC41L	Elective – I Lab	30	

Semester – V

Semester V				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
1	IT51	Software Testing And Quality Assurance	30	70
Objective: To enable student to learn Software Testing and Quality Assurance good practices with the help of various software testing techniques, Strategies, tools and case studies.				

Sr. No	Topic Details	Nos. of Sessions	%	Reference Books
1	**Software Quality Assurance Fundamentals** 1.1 Definition of Quality, QA, QC, SQA 1.2 SQA Planning & Standards 1.3 SQA Activities 1.4 Building blocks of SQA 1.5 Quality factors 1.6 Software Quality Metrics 1.7 Process Improvement- Process and Product Quality - CMM, Six Sigma	**6**	**15**	**1,2,7**
2	**Software Reliability** 2.1 Reliability Measures 2.2 Reliability models	**2**	**5**	**1**
3	**Software Verification & Validation Activities** 2.1 Verification & Validation Concepts 2.2 Verification & Validation Planning 2.3 Software inspections 2.4 Automated static Analysis 2.5 Clean room Software Development 2.6 **Case Study** : Software Inspection Checklist preparation	**3**	**7**	**1,2,7**
4	**Software Testing Fundamentals** 4.1 Definition & Objectives 4.2 Types of software bugs 4.3 Bug life cycle 4.4 Testing lifecycle 4.5 Test Plan 4.6 Test Cases – Definition, Test Case Designing 4.7 **Case Studies on Test Plan & Test Case**	**7**	**18**	**1,4,5**

5	**Black Box & White Box Testing** 5.1 Functional Testing (Black Box) Equivalence partitioning, BVA, Cause- 5.2 Effect graphing, Syntax testing 5.3 Structural Testing (White Box) Coverage testing, Statement coverage, 5.4 Branch & decision coverage, Path coverage 5.5 Domain Testing 5.6 Non functional testing techniques: Localization, Internationalization Testing 5.7 Black box vs. White Box	**5**	**12**	**1,5,6**
6	**Different types of Testing** 6.1 Unit Testing 6.2 Integration Testing 6.3 System Testing – Performance, Load, Stress, Security, Recoverability, compatibility testing 6.4 Regression Testing 6.5 Installation Testing 6.6 Usability Testing 6.7 Acceptance Testing- Alpha testing & Beta testing 6.8 Static vs. Dynamic testing 6.9 Testers workbench 6.10 Manual vs. Automatic testing	**6**	**15**	**1,3,4,5,7**
7	**Static & Dynamic Testing** 7.1 Static Testing Techniques 7.2 Review types: Informal Review, Technical or peer review, Walkthrough and Review Meeting 7.3 Review Reporting & Record keeping, Review guidelines 7.4 Data flow analysis 7.5 Control flow analysis 7.6 Cyclometric Analysis 7.7 **Case Study : Cyclometric Complexity**	**6**	**15**	**1,5,6**
8	**Testing specialized Systems and Applications** 8.1 Testing object oriented software 8.2 Testing Web based Applications 8.3 Computer Aided Software testing tools (CAST) (only type & their purpose should be covered)	**5**	**13**	**3,4**

Reference Books:

1. Software Engineering R. Pressmen – TMH,7th Ed.
2. Software Engineering Sommerville, Pearson,8th Ed
3. Introducing Software Testing Louise Tamres
4. Effective Methods for software Testing William Perry, Wiley Pub,3rd Ed.
5. Software Testing in Real World Edward Kit, Pearson Pub.
6. Software Testing Techniques Boris Beizer, dreamTech pub,2nd Ed.
7. Software Testing By Ron Patton, TechMedia Pub.

Websites:

1. www.effectivesoft.com
2. www.sei.cmu.edu
3. www.softwarerisk.com
4. www.iist.org

Semester V				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
2	IT52	Software Project Management	30	70
Objective: To learn process of software project management, cost estimation, use of project management tools, configuration management, user roles and software teams.				

Sr. No	**Topic Details**	**Nos. of Sessions**	**%**	**Reference Books**
1	**Project Management Framework** 1.1 Project Management Overview 1.2 Project Organization 1.3 Project Communication and Documentation 1.4 PMLC 1.5 Risk Management • Identification of Risks • Risk Analysis • Risk Planning and Monitoring	**8**	**18**	**2,3,6,9**
2	**Software Project Estimation** 2.1 Overview of Project Estimation 2.2 Method of Estimations (With Case Studies) COCOMO-I COCOMO-II DELPHI Cost Estimation 2.3 NPV, ROI, Payback models 2.4 Function Point Analysis (Case Study) 2.5 Rayleigh Curve	**13**	**25**	**2,3,6,7,8,10**
3	**Project Management Tools** 3.1 CPM & PERT – Case study on Network Diagram 3.2 Project Management through Microsoft Project (Ms-Project) • Introduction • Gantt Chart	**6**	**16**	**6,5,6**

4	**Change (Configuration) Management** 4.1 Change Management Plan 4.2 Change Management Process 4.3 Versioning and Version control 4.4 Defect Management 4.5 Release Management Process 4.6 Configuration Management Tools	**6**	**15**	**2,3,4,5**
5	**Software Team Management** 5.1 Team structure 5.2 Team Types 5.3 Team Management and Communication 5.4 Group Behavior 5.5 Leadership and Motivation 5.6 Performance Management	**4**	**13**	**4,9**
6	**Role of user in Project Management** 6.1 User role in Project Management 6.2 User role in PMLC 6.3 User role in System Implementation	**3**	**13**	**4,9**

References:

Sr.No.	**Book**	**Author**
1	Software Project Management	Edwin Bennatan
2	Software Engineering	Roger S. Pressman, McGraw-Hill,7th Ed.
3	Software Engineering Concepts	Richard Fairly, TMH.
4	Software Project Management	S. A. Kelkar,PHI Pub.
5	Software Engineering	IAN Sommerville, Pearson, 8th Ed.
6	System Analysis and Design Methods	Whitten, Bently and Dittman, TMH,7th Ed.
7	Software Engineering	K.K. Aggrawal
8	Information Technology Project Management	Kathy Schwalbe
9	Software Project Management	Pravin Muley,
10	Operation Research	V K Kapoor, S. Chand And Sons,8th Ed.

Semester V				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
3	IT53	Emerging Trends in Information Technology	30	70
Objective: To make students aware with the changes in technologies, applications and systems around us.				

Sr. No	**Topic Details**	**Nos. of Session**	**%**	**Reference Books**
1	**Social Networking:** Definition, Overview of Social Networking Sites, **Types of Social Networking Sites:** General purpose, Niche Advantages of Social Networking Sites, Drawbacks of Social Networking Sites, Features And Need of Social Networking, Security Issues with Social Networking Sites, Examples	**8**	**20**	
2	**Cloud Computing:** Definition, Cloud Architecture, Cloud Storage, **Cloud Types:** The NIST Model, The Cloud Cube Model, Deployment Models, Service Models **Cloud Computing Service Models:** 1. Infrastructure as a Service(IaaS) 2.Platform as a Service(PaaS) 3. Software as a Service(SaaS) **Benefits of Cloud Computing** **Disadvantages of Cloud Computing** **Cloud Security**	**8**	**20**	**2,6**
3	**Enterprise Content Management**: ECM Introduction, Definition, Process, Types of Content, Examples **Content Management System(CMS)** Overview and examples, **Electronic Document Management(EDM) :** introduction, Need, Examples	**6**	**20**	**5**
4	**e-Learning**: Definition, Introduction, Types of e-Learning: 1.Learner-led e-Learning 2.facilitated e-Learning 3.Instructor-led e-Learning 4. Embedded e-Learning Telemonitoring And e-Coaching **e-Learning Models**: 1. WBT 2.CBT	**8**	**20**	**1**

	3.LMS 4.LCMS 5.Virtual School Systems **e-Learning Tools And Technologies:**E-Mail,Online Discussion, Chat and Instant Messaging,Voting,Whiteboard, Application Sharing,Conferencing, Online Meeting Tools **Standards for e-Learning** **Case Study**			
5	**e/m-Commerce:** **e-Commerce** definition, Models of e-Commerce, **Electronic Payment Systems:** Credit/Debit Cards, Smart Cards, Paypal, e-Billing,e-Micropayments Point Of Sales System(POS): Meaning, Uses **m-Commerce:** Overview of mobile-Commerce, Attributes of m-Commerce, Drivers of m-Commerce, m-Commerce Security issues, Mobile ATM(ICICI Bank Case Study) Applications of m-Commerce: 1.Mobile Financial Applications, m-wallet 2.Mobile Shopping 3.Advertising And Content provision **Case-Study**	**10**	**20**	**3,4**

References:

Sr. No.	**Book**	**Author**
1.	E-Learning Tools and Technologies	William Hortan, Katherine Hortan,Wiley Pub.
2.	Cloud Computing Bible	Barrie Sosinsky,Wiley India pub
3.	E-Commerce	C.S.V. Murthy,Himalaya Pub.
4.	E-World (Excel Publications)	Arpita Gopal and Chandrani Singh
5.	Electronic Commerce A Managerial Perspective	Efraim Turban, Pearson Pub.
6.	Decision Support Systems and Intelligent Systems	Efraim Turban, Jay Aronson, Pearson,7th Ed
7.	Cloud computing	Michael Miller, Pearson Pub.
8.	Internet (Use of Search Engines Google & yahoo etc)	

Semester V				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
4	IT54	Advanced Development Technology		70
Objective: To teach student application development technology currently available. **GUIDELINES FOR SUBJECT:** Prefer .NET Framework 4.0 and Visual Studio 2010				

Sr. No	Topic Details	Nos. of Session	%	Reference Books
1	**Creating Web Forms Applications** 1.1 Creating an ASP.NET Web Application Project 1.2 Responding to Events 1.3 Where Does Processing Occur? 1.4 Namespace Fundamentals 1.5 Maintaining State Information	**4**	**12**	
2	**Creating a User Interface** 2.1 Using Controls 2.2 Validating Data 2.3 Navigating Between Forms 2.4 Navigation between Pages	**5**	**10**	
3	**Data Binding** 3.1 Bind Data to the UI 3.2 Transform and Filter Data	**3**	**8**	
4	**Storing and Retrieving Data with ADO.NET** 4.1 Accessing Data with ADO.NET 4.2 Using Data Sets on Web Forms 4.3 Processing Transactions	**7**	**12**	
5	**Catching and Correcting Errors** 5.1 Using Exception Handling 5.2 Using Error Pages 5.3 Logging Exceptions	**4**	**10**	
6	**Web Services** 6.1 Creating Web Services 6.2 Discovering Web Services 6.3 Instantiating and Invoking Web Services	**4**	**10**	
7	**Testing Web Applications** 7.1 Creating Tests 7.2 Running Tests	**3**	**10**	
	7.3 Debugging			
8	**Building and Deploying Web Applications** 8.1 Building a Web Application 8.2 Deploying a Web Application 8.3 Creating an Installation Program	**4**	**12**	
9	**Maintaining Security** 9.1 Authenticating and Authorizing Users 9.2 Using Windows Authentication 9.3 Using Forms Authentication	**4**	**8**	

10	**Use of Ajax on the web forms** 10.1 Introduction to Ajax Controls 10.2 Using Ajax controls on web forms	**2**	**8**	

Reference Books :

1. Microsoft ASP.NET 4.0 Step by Step - George Shepherd, Microsoft Press
2. Mastering ASP.Net - BPB Publication
3. ASP.net – The Complete Reference- Tata McGraw Hill
4. ASP.NET Programming – Murach

IT55-Advanced Internet Technology

Semester V				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
5	IT55	Advanced Internet Technology	30	70
Objective: To provide extension to web development skills acquired in 3rd semester. Struts, Servlets, Java Beans, JSP and PHP are introduced for student to enhance their skills.				

Sr. No	**Chapter Details**	**Nos. of Session**	**%**	**Reference Books**
1	**Internet Basics, PERL & CGI** 1.1 HTTP request and response, cookies basics, HTTP /1.1, 1.2 CGI architecture 1.3 Intro PERL with Features, Working with Strings and Arrays, File Handling, Pattern matching & formatting, Creating and using subroutines, 1.4 Using PERL for CGI scripting **Note:** Apache Http server is used at server side	**6**	**5**	**1,2,3**
2	**Apache Tomcat Server** 2.1 Obtaining and Installing Apache Tomcat, 2.2 Tomcat Directory Structure - bin, conf, logs, server, work, temp, webapps, 2.3 Web Application Directory Structure, Deploying HTML and JSP Pages, 2.4 Configuring Tomcat - Editing server.xml, 2.5 Deploying Web Applications - Deployment Descriptors, web.xml configuration file 2.6 Tomcat Manager - Deploying and Managing	**6**	**10**	**9**

	Web Application using the Tomcat Manager, Creating a WAR File 2.7 Configuring Tomcat to Connect to a Database 2.8 Configuring Security on Tomcat, Granting Permissions to Java Apps			
3	**Servlets** 3.1 Introduction 3.2 Servlet vs CGI, Servlet API Overview 3.3 Servlet Life Cycle 3.4 Coding: Writing & running simple servlet 3.5 Generic servlet, HTTPServlet, ServletConfig, ServletContest 3.6 Writing servlet to handle Get & Post methods, reading use request data 3.7 Session tracking in servlets, 3.8 Servlets & JDBC. 3.9 Writing threadsafe servlet Note: Apache Tomcat server is used at server side.	**7**	**25**	**4,5**
4	**JSP** 4.1 Why JSP? 4.2 JSP Directives 4.3 Writing simple JSP page, Scripting Elements 4.4 Default Objects in JSP, JSP Actions 4.5 Managing Sessions using JSP 4.6 JSP with beans, JSP & Databases 4.7 Error Handling in JSP 4.8 Introduction to custom tag Note: Apache Tomcat server is used at server side.	**7**	**20**	**6,7,8**
5	**Spring-Hibernate Fraemwork** 5.1 Overview of the Spring Framework 5.2 Inversion of Control / Dependency Injection Concepts 5.3 Aspect Oriented Programming 5.4 Spring MVC Architecture 5.5 Bean Factory and Application Context, Attaching and Populating beans, Injecting data through setters and constructors 5.6 Listening on events, Publishing events, Spring MVC Layering 5.7 DispatcherServlet, Writing a Controller, DAO, Models, Services, Spring Configuration File 5.8 Error handling Strategy 5.9 JDBC with Spring - Working with the HSQLDB Database 5.10 Hibernate with Spring, Benefits of using Spring with Hibernate, Working with Hibernate objects, 5.11 Hibernate configuration in Spring 5.12 Hibernate Sessions, Hibernate Query	**14**	**25**	**10, 11**

	Language, Executing Queries 5.13 DAO Persistence ORM, Hibernate Mapping 5.14 Integrating Spring MVC with Hibernate in web application			
6	**PHP** 6.1 Obtaining, Installing and Configuring PHP 6.2 **Introduction** PHP and the Web Server Architecture Model, Overview of PHP Capabilities 6.3 CGI vs. Shared Object Model PHP HTML Embedding Tags and Syntax 6.4 Simple PHP Script Example 6.5 PHP and HTTP Environment Variables 6.6 PHP Language Core Variables, Constants and Data Types, and Operators 6.7 Decision Making , Flow Control and Loops 6.8 Working with Arrays 6.9 Working with Strings and functions Outputting Data, 6.10 Include and Require Statements 6.11 File and Directory Access Operations 6.12 Error Handling and Reporting Considerations 6.13 Processing HTML Form Input from the User 6.14 Creating a Dynamic HTML Form with PHP 6.15 Login and Authenticating Users 6.16 Using GET, POST, SESSION, and COOKIE variables 6.17 Session Management and Variables 6.18 Working with Cookies, 6.19 Sending Email 6.20 Introduction to Object-oriented PHP: Classes and Constructors 6.21 **Database Operations with PHP** Built-in Database Functions, Connecting to a MySQL(or Any Other Database), Creating Database, Dropping Database, Selecting a Database, Building and Sending the Query to Database Engine, Retrieving , Updating and Inserting Data Note: Apache Http server is used at server side	**10**	**15**	**12, 13, 14**

References:

1. Teach Yourself PERL in 21 days Pearson Education.
2. Programming the World Wide Web Robert W. Sebesta
3. Web enabled commercial application development using HTML, DHTML, JavaScript, PERL-CGI Ivan Bayross.

4. Inside Servlets Dustine R. Callway
5. Developing Java Servlets James Goodwill
6. Professional JSP Wrox press
7. Complete reference JSP
8. Java Server Programming Vol-I Wrox press
9. Professional Apache Tomcat – Wrox Press
10. Agile Java Development with Spring, Hibernate and Eclipse by Anil Hemrajani
11. Professional Java Development with the Spring Framework - Wrox Press
12. Beginning PHP5
13. Complete Ref. PHP
14. Beginning PHP, Apache, MySql web development

Reference Sites:
http://www.springsource.org/india
http://www.apache.org

Semester V				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
6	EC51	Elective - II	70	

Semester V				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
7	IT51P	Mini project using AIT And ADT	50	

Objective : The objective of this mini project is to gear up student for preparation of final project in Semester-VI.

The objective of this mini project is to gear up student for preparation of final project in Semester-VI. Student will select individually Commercial or Technical project based on Application Development Technologies learnt in Semester IV. Each student will have to prepare proper documentation consisting of SRS, Modeling Techniques, Development Strategies and Implementation and Testing Strategies. Student may use any Design Methodologies such as SSAD, OOAD and UML etc. This is a documentation project only. The project work will be presented by student using Power Point Presentation Tool to the panel of internal teachers appointed by the Director of the concerned Institute/College. The Institute may appoint external expert from industry or academics if it feels so. The students will be assessed internally by such panel for this project.

Semester V				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
8	IT51L	Case Tools Lab	50	

Objective : To make student accustom with various automated tools used for Software Design and Development, Testing, Project Management etc.

1. Use of diagramming tools for system analysis
   Preparing Data Flow Diagrams & Entity Relationship Diagrams
2. Use of Tools
   To design User Interfaces

Report generation
(Using VB /Oracle Developer)

3. MS - project
   Its use in project scheduling
4. Use of any Automated Testing Tools
5. Win Runner
   a) Record Context Sensitive b)Record Analog c)Database check point d)Bit map Check Point e) Synchronization point
6. S/W Configuration Management Tools
   a) Source Code Control System (SCCS)
   b) make in UNIX

Note: Student has to check there own developed software through win runner

Semester V				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
9	SS5L	Soft Skill – Interview Skill	30	

Semester V			
Subject Code	**Subject Title**	**Internal**	**External**
EC51L	Elective – II Lab	30	

Semester – VI

Project Evaluation Phases Recommended

Phase	Description	Internal	External	TimeLine
1	SRS Document	50	50	3nd Week
2	Design document	50	50	7th Week
3	Executable/User Interface	50	50	12th Week
4	Test plan and Documentation	50	50	16th Week
5	Project Viva/Presentation	50	50	20th Week

General Instruction Regarding Preparation of Project Report
For MCA-III - SEM-VI

TYPING

1. The typing shall be standard 12 pts in double spaced using black ink only
2. Margins must be Left 2 inches Right 1.5 inches Top 2 inches Bottom 1.5 inches
3. Paper A4 size Bond Paper

COPIES

Two hard-bound copies
(Black Rexine with Golden Embossing as per format displayed herewith)
One original and one clean Xerox Copy.

FORMAT FOR TITLE PAGE AND FOR EMBOSSING

PROJECT REPORT

ON

NAME OF THE SYSTEM NAME

OF THE COMPANY

BY

NAME OF STUDENT

UNIVERSITY OF PUNE

MASTER IN COMPUTER APPLICATION

INSTITUTE

PUNE-4110..

20012-20015

The Guidelines regarding the documentation and scope of project are mentioned here below:

MCA-III SEM-VI (COMMERCIAL SYSTEM PROJECTS)

Project Report should be submitted in following format for Commercial Application Projects viz. Payroll, Sales, Purchase, Inventory, Book Shop, Examination system etc. Where VB, Access, Oracle, ASP and Java is used.

2 Blank Pages at beginning Title Page
Certificate from Company
Certificate from Guide
Acknowledgement
Index with printed Page Numbers

Chapter 1 : INTRODUCTION

1.1 Company Profile
1.2 Existing System and Need for System
1.3 Scope of Work
1.4 Operating Environment - Hardware and Software

Chapter 2 : PROPOSED SYSTEM

2.1 Proposed System
2.2 Objectives of System
2.3 User Requirements

Chapter 3 : ANALYSIS & DESIGN

3.1 Data Flow Diagram (DFD)
3.2 Functional Decomposition Diagram (FDD)
3.3 Entity Relationship Diagram (ERD)
3.4 Data Dictionary
3.5 Table Design
3.6 Code Design
3.7 Menu Tree
3.8 Menu Screens
3.9 Input Screens
3.10 Report Formats
3.11 Test Procedures and Implementation

Chapter 4 : USER MANUAL

4.1 User Manual
4.2 Operations Manual / Menu Explanation
4.3 Forms and Report Specifications

Drawbacks and Limitations Proposed
Enhancements Conclusion
Bibliography ANNEXURES:
ANNEXURE 1 : INPUT FORMS WITH DATA

Project report should be submitted in following format for project using OOAD, Embedded System, WAP and other technologies and Web Deployed Systems where C, C++, J2EE, .NET, OOAD and JAVA, SDK's, API's are used.

MCA-III SEM VI ***** TECHNICAL PROJECTS ********

2 Blank Pages at beginning Title
Page
Certificate from Company
Certificate from Guide
Acknowledgement
Index with printed Page Numbers

CHAPTER 1 : INTRODUCTION

1.1 Company Profile
1.2 Existing System and Need for System
1.3 Scope of Work
1.4 Operating Environment - Hardware and Software
1.5 Detail Description of Technology Used

CHAPTER 2 : PROPOSED SYSTEM

2.1 Proposed System
2.2 Objectives of System
2.3 User Requirements

CHAPTER 3 : ANALYSIS & DESIGN

3.1 Object Diagram
3.2 Class Diagram
3.3 Use Case Diagrams
3.4 Module Hierarchy Diagram
3.5 Component Diagram
3.6 Deployment Diagram (in case of Web Deployment)
3.7 Module Specifications
3.8 Interface Diagram (in case of WAP and Embedded Systems)
3.9 Web Site Map Diagram (in case of Web Site)
3.10 User Interface Design (Screens etc.)
3.11 Table specifications (in case back end is a database)
3.12 Test Procedures and Implementation

CHAPTER 4 : USER MANUAL

4.1 User Manual
4.2 Operations Manual / Menu Explanation
4.3 Program Specifications / Flow Charts

Drawbacks and Limitations
Proposed Enhancements
Conclusion
Bibliography
ANNEXURES:

ANNEXURE 1 : USER INTERFACE SCREENS
ANNEXURE 2 : OUTPUT REPORTS WITH DATA (if any)
ANNEXURE 3 : SAMPLE PROGRAM CODE (which will prove sufficient development is done by the student)
2 Blank Pages at the end.

Recommended Certifications (MCA ++)

End of Semester – 1

- **Business English – University of Cambridge**
  http://www.cambridgeesol.org/index.html

- **Certified Software Development Associate**
  (IEEE computer society certification)
  http://www.computer.org/portal/web/certification/csda

- **QAI global Institute (Certification by Roger Pressman)**
  Certified software Business Analyst
  Certified Associate Business Analyst
  http://www.qaiglobalservices.com/qaiglobalinstitute/BA_Prep/csba.asp

End of Semester – II

- **Relevant Oracle Certifications**
  http://education.oracle.com

- **Red-Hat**
  Red Hat Certified System Administrator (RHCSA)
  http://www.redhat.com/certification/rhct/
  Red Hat Certified Engineer (RHCE)
  http://www.redhat.com/training/certifications/rhce/

- **Microsoft certifications (MCSE)**

http://www.microsoft.com/learning/en/us/certification/cert-overview.aspx

End of Semester – III

- **CCNA/CCNP Wireless Certification**
  http://www.cisco.com/web/learning/le3/le2/le0/le9/learning_certification_type_home.html

- **IBM-Rational Certifications**
  http://www-03.ibm.com/certify/certs/rl_index.shtml

- **IBM Business Analytics: Cognos and SPSS**
  http://www-03.ibm.com/certify/certs/ba_index.shtml

- **Sun Solaris Certifications**

Sun Certified System Administrator (SCSA) Sun Certified Network Administrator (SCNA)
End of Semester – IV • **Java Certifications (**SCJP/SCSA/SCNA) http://java.sun.com/new2java/articles/certification.html http://www.whizlabs.com/scja/scja.html • **.Net Certifications** http://www.microsoft.com/learning/en/us/certification/mcsd.aspx • **Testing Certifications** Certified Associate in Software Testing (CAST) http://softwarecertifications.org/qai_cast.htm (certified Information System Auditor (may not be for the students -) http://www.isaca.org/Certification/CISA-Certified-Information-Systems-Auditor/Pages/default.aspx • PMI Certifications
End of Semester - V • **The Foundation Certificate in IT Service Management (ITIL V3 Foundation Certification)** http://www.itilfoundation.org/
Other useful links for certification exams http://www.certificationguru.co.in/ www.softwarecertifications.org http://www.whizlabs.com/scjp/scjp.html

Reference Websites / Useful e-leaning sites for all subjects

1. Free lectures on computer science subjects from : IISc Bangalore, IIT Bombay, IIT Delhi, IIT Kanpur, IIT Kharagpur, IIT Madras, MIT Computer, Portland Community College, Stanford, The University of New South Wales, UC Berkeley ,University of Washington, Harvard
   http://freevideolectures.com/

2. Other e-learning sites:

   http://nptel.iitm.ac.in
   www.youtube.com

Semester I		
Subject Code	**Subject Title**	**Useful Websites**
IT11	Computer Organization	www.intel.com www.intel.in
IT12	C Programming	http://www.lysator.liu.se/c/bwk-tutor.html (Brian W. Kernighan)
IT13	Software Engineering	http://www.research.ibm.com/softeng/
BM11	Principles and Practices of Management And Organizational Behavior	
*BM12	Business Process Domains with Cost And Financial Accounting*	
MT11	Discrete Mathematics	

Semester II		
Subject Code	**Subject Title**	**Useful Websites**
IT21	Object Oriented Programming with C++	www.cplusplustutor.com
IT22	Database Management System	www.oracle.com
IT23	Operating system Concepts	http://windows.microsoft.com http://www.linux.org/ http://www.redhat.com/
BM21	Management Support System And Business Intelligence	http://www.ibm.com/in/en/
IT24	Enterprise Resource Planning	http://www.sap.com/
*BM22	Soft Skills*	

Semester III		
Subject Code	**Subject Title**	**Useful Websites**
IT31	Web Supporting Technologies	www.w3schools.com www.devguru.com
IT32	Data Communication And Computer Networks	http://www.cisco.com/web/learning/le21/learning_events_home.html
IT33	Data Structure using C++	
IT34	Advanced Database management System	www.oracle.com www.nosqldatabases.com http://www.ibm.com/in/en/
IT35	Object Oriented Analysis And Design	http://www-01.ibm.com/software/in/rational/
*MT31	Research Methodology and Tools*	http://www-01.ibm.com/software/in/analytics/spss/

Semester IV		
Subject Code	**Subject Title**	**Useful Websites**
IT41	Java Programming	http://www.java.com http://www.oracle.com

IT42	Mobile Computing	
IT43	Information Security And Audit	http://www.isaca.org
*IT44	Design And Analysis of Algorithm*	
MT41	Optimization Technique	

Semester V		
Subject Code	**Subject Title**	**Useful Websites**
IT51	Software Testing And Quality Assurance	http://www.learnqtp.com
IT52	Software project Management	http://www.pmi.org.in/
IT53	Emerging Trends in Information Technology	
IT54	Advanced Development Technology	http://www.php.net/ http://www.javascriptkit.com www.w3schools.com http://www.rspa.com http://struts.apache.org/ www.springsource.com/
IT55	Advanced Internet Technology	www.w3schools.com

Internal [30] Marks Breakup	
Unit Test Marks	5
Prelim Marks	5
Assignment	5
Presentations/Case-Study/Group Activity	10
Attendance	5
Total Marks	**30**

Practical[50] Marks Breakup	
Practical Hands on	40
Viva-voce	5
Assignments	5
Total Marks	**50**

Mini Project[50] Marks Breakup	
SRS/ Synopsis	10
Diagrams	10
Database	10
Forms	10
Project Report/Viva/Final Presentation	10
Total Marks	**50**