CBCS CURRICULUM OF

MASTER OF COMPUTER APLICATION

SUBJECT CODE = MCA

FOR POST GRADUATE COURSES UNDER RANCHI UNIVERSITY

Implemented from
Academic Session 2018-2021

Members of Board of Studies of CBCS Post- Graduate Syllabus in 3-Year Master of Computer Application(MCA) Degree as per Guidelines of the Ranchi University, Ranchi.

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   Head &Director, University Department of Mathematics & MCA, Ranchi University, Ranchi

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   Lecturer, University Department of Mathematics & MCA,, Ranchi University, Ranchi

   Dr. Ashish Mohan
   Lecturer, University Department of Mathematics & MCA,, Ranchi University, Ranchi

   Mr. Abhishek Kant (Convener)
   Lecturer, University Department of Mathematics & MCA,, Ranchi University, Ranchi

   Miss. Nazia Hasan
   Lecturer, University Department of Mathematics & MCA,, Ranchi University, Ranchi

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   Associate Professor, Department of Computer science & Engineering, BIT Mesra, Ranchi

   Mr. Rajat Shyam
   CEO, Lexicon Consultancy Pvt. Ltd., Ranchi

29/9/18

DR. Ram Akbal Tiwary
DIRECTOR, MCA, RU, Ranchi

Submitted for Publication at R.U. Website

1/11/18

Director MCA
Department of Mathematics
Ranchi University, Ranchi

Contents

COURSE STUCTURE FOR POSTGRADUATE DEGREE [MCA]

Table AI-1: Distribution of 150 Credits [*wherever there is a practical there will be no tutorial and vice –versa.]

Course	Papers Theory + Practical	Credits (MCA)
I. Ability Enhancement Course (EC)		
1. Foundation Course	**(FC)**	
Compulsory Foundation/ Elective Foundation	1 Paper	01X4=4
2. Mini Project	2 Papers	02X2=4
II. Core Course (CC)	**(CC)**	
Theory	20 Papers	20X4=80
Practical/ Tutorial*	06 Papers	06X4=24
III. Elective Course (EC)		
A. Generic Elective/ Interdisciplinary	**(GE - I to III)**	
Theory	3 Papers	03X4=12
Practical/Tutorial*	3 Papers	03X4=12
	(PROF EL - I to III)	
B. Professional Elective/ Project	03 Papers	03X4=12
Seminar	01 Paper	01X2=02
		Total Credit = 150

Table AI-1.1: Course structure for MCA Programme

Semester	Subject (Core) 32 Papers	Allied (Elective Courses) 4 Papers	Ability Enhancement (Compulsory Course) 1 Paper	Total Credits
Sem-I	Core-4 Papers Core Pr- 2 Papers (6X4=24 Credits)		Foundation Course FC (04 Credits)	**28 Credits**
Sem-II	Core-5 Papers Core Pr- 2 Papers (7X4=28 Credits)			**28 Credits**
Sem-III	Core- 4 Papers Core Pr- 1 Paper (5X4=20 Credits)	GE/DC - 1 Paper Elec Pr - 1 Paper (2x4=08 Credits)		**28 Credits**
Sem-IV	Core - 3 Papers Core Pr- 1 Paper (4X4=16 Credits)	GE/DC – 2 Papers Prof. El. – 1 Paper (3X4=12 Credits)	Mini Project-I (2 Credits)	**30 Credits**
Sem-V	Core - 4 Papers (4X4=16 Credits)	GE/DC – 2 Papers Prof. El. – 1 Paper (3X4=12 Credits)	Mini Project-II (2 Credits)	**30 Credits**
Sem-VI	----	Prof. Elective - Project/Internship (04 Credits) Pre Submission Seminar (02 Credits)		**06 Credits**
				Total = 150 Credits

COURSES OF STUDY FOR 3-YEAR M.C.A.

Table AI-2 Subject Combinations allowed for M. C. A. Programme (150 Credits)

Core Subject **CC** **26 Papers**	Discipline Centric/ Generic Elective/ Professional Elective Course **DC/ GE/ PR** **10 Papers**	Ability Enhancement Course **Mini Project** **2 Papers**	Foundation Course **FC** **1 Paper**

Table AI-2.1 Semester wise Examination Structure for Mid Sem & End Sem Examinations:

Sem	Core, Allied SE/GE/DC & Compulsory FC Courses				Examination Structure		
	Paper	**Paper code**	**Credit**	**Papers**	**Mid Semester Theory (F.M.)**	**End Semester Theory (F.M.)**	**End Semester Practical/ Viva (F.M.)**
I	Foundation Course	FCMCA101	4	Effective Organizational Communication	30	70	--
	Core Course	CCMCA102	4	Programming Concepts & Implementation (C)	30	70	--
	Core Course	CCMCA103	4	Operating System	30	70	--
	Core Course	CCMCA104	4	Discrete Mathematics With Graph Theory	30	70	--
	Core Course	CCMCA105	4	Computer Architecture	30	70	--
	Practical's on Core	CPMCA106	4	Programming Concepts & Implementation (C) Lab	30	--	70
	Practical's on Core	CPMCA107	4	Unix Lab	30	--	70
II	Core Course	CCMCA201	4	E-Commerce	30	70	--
	Core Course	CCMCA202	4	Database Management System	30	70	--
	Core Course	CCMCA203	4	Data Structure Through C++	30	70	--
	Core Course	CCMCA204	4	Automata Theory	30	70	--
	Core Course	CCMCA205	4	Data Communication and Networking	30	70	--
	Practical's on Core	CPMCA206	4	DBMS Lab	30	--	70
	Practical's on Core	CPMCA207	4	Data Structure Through C++ Lab	30	--	70
III	Elective	ECMCA301	4	Language Elective-I A. Java Programming OR B. Dot Net Programming	30	70	--
	Core Course	CCMCA302	4	Network Security and Cryptography	30	70	--
	Core Course	CCMCA303	4	Compiler Design	30	70	--
	Core Course	CCMCA304	4	Analysis & Design of Algorithm	30	70	--
	Core Course	CCMCA305	4	IT Industries Management	30	70	--
	Practical's on Core	CPMCA306	4	Cyber Security Lab	30	--	70
	Practical's on Elective	EPMCA307	4	Language Elective-I Lab A. Java Programming Lab OR B. Dot Net Programming Lab	30	--	70

IV	Elective	ECMCA401	4	Language Elective-II A. Advanced Java Programming OR B. Advanced Dot Net Programming	30	70	--
	Core Course	CCMCA402	4	Soft computing & Neural Network	30	70	--
	Core Course	CCMCA403	4	Enterprise Resource Planning	30	70	--
	Core Course	CCMCA404	4	Software Engineering	30	70	--
	Practical's on Core	CPMCA405	4	HTML5,CSS, CASE Tools Lab	30	--	70
	Practical's on Elective	EPMCA406	4	Language Elective-II Lab A. Advanced Java Programming Lab OR B. Advanced Dot Net Programming Lab	30	--	70
	PROF EL-I	PRMCA407	4	Professional Elective-I A. Cloud Computing OR B. Data Warehousing and Data Mining OR C. Parallel and Distributed Algorithm OR D. Numerical and statistical Methods OR E. Distributed Database OR F. Internet Of Things	30	70	--
	Ability Enhancement Course	PRMCA408	2	Mini Project-I (Srs & Design)	--	--	50
V	Elective	ECMCA501	4	Language Elective-III A. Php, Java Script & JQuery Programming OR B. Python Programming	30	70	--
	Core Course	CCMCA502	4	Artificial intelligence	30	70	--
	Core Course	CCMCA503	4	Business Intelligence	30	70	--
	Core Course	CCMCA503	4	Business Intelligence	30	70	--
	Core Course	CCMCA504	4	Computer Graphics	30	70	--
	Practical's on Elective	EPMCA506	4	Language Elective-III Lab A. Php, Java Script & JQuery Programming Lab OR B. Python Programming Lab	30	--	70
	PROF EL-II	PRMCA507	4	Professional Elective-I A. Pattern Recognition OR B. Natural Language Processing OR C. Optimization Techniques OR D. Information Retrieval OR E. Machine Learning	30	70	--
	Ability Enhancement Course	PRMCA508	2	Mini Project-II (Implementation & Testing)	--	--	50
VI	PROF EL-III	PRMCA601	2	Pre Submission Seminar	--	--	50
		PRMCA602	4	Final Project/ Internship	--	--	100

Note:

There are two papers in language elective out of which one to be selected. Regular classes will be arranged for each paper opted by minimum of 30 students.

From pool of Professional elective papers one to be selected. Regular classes will be arranged for each paper opted by minimum of 30 students. At most two papers can be taught in every respective semester.

SEMESTER I 7 Papers

Total 100 x 7 = 700 Marks

I. COMPULSORY FOUNDATION COURSE [FCMCA101]:

(Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100	**Pass Marks (SIA:17 + ESE:28)=45**

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):

*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

EFFECTIVE ORGANIZATIONAL COMMUNICATION

Theory: 45 Lectures; Tutorial: 15 Hours

Unit - I Basics of communication : Definition, Objectives, Process and Elements, Flow of communication, Types of Communication, Principles of Effective communications, Barriers to Communication.

Unit - II Verbal & Non-verbal communication: Methods of verbal & non- Verbal communication and their difference.

Unit - III Listening Skills : Definition & importance of listening, Principles, Process, Types of listening, Barriers to effective listening.

Unit - IV Essay writing

Unit - V Presentation Principles, Slide Preparation, Report writing.

Unit - VI Business/ Official correspondence.

Unit - VII Preparation of Curriculum Vitae, Job Application and Interview Techniques.

Reference Books:

- Meenakshi Raman & Prakash Singh" Business communication".
- R. and Panton F "The essence of effective communication"
- Munter. M "Business communication: Strategy and skill".

II. CORE COURSE [CCMCA102]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (SIA:17 + ESE:28)=45

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):

*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

PROGRAMMING CONCEPTS & IMPLIMENTATION (C)

Theory: 45 Lectures; Tutorial: 15 Hours

Unit - I : Problem Solving in Everyday Life, Types of Problem, Problem Solving with Computers, Constants and Variables, Data Types, Functions, Operators, Expressions and Equations, Data Storage and Communication with Computer, Organizing the Problem, Computer Software and Software Development Method.

Unit -II : Basics of C: C Language Elements, Variable Declaration, Data Types, Expressions, Data Files. Top-Down Design and Structure Charts, Functions without Arguments, Functions with Input Arguments.

Unit - III: Problem Solving with Decisions, Control Structures, Conditions, All kinds of if statements, Switch statement.

Problem Solving using Loops, Repetition in Programs, while Statement, for Statement, Conditional Loops, Loop Design, Nested Loops, do-while Statement and Flag Controlled Loops.

Unit – IV : Functions with Simple Output Parameters, Multiple Calls to a Function with Input/ Output Parameters, Scope of Names, Formal Output Parameters as Actual Arguments.

Unit – V : Declaring and Referencing Arrays, Array Subscripts, Using for Loops for Sequential Access, Using Array Elements as Function Arguments, Array Arguments, Multidimensional Arrays.

Unit – VI : String Basics, String Comparison, Arrays of Pointer, Character Operations, String-to-Number and Number-to-String Conversions.

Recursion Basics**,** The Nature of Recursion, Tracing a Recursive Function, Recursive Mathematical Functions, Recursive Functions with Array and String Parameters, Problem Solving with Recursion.

Unit – VII: User-Defined Structure types, Structure Type Data as Input and Output Parameters, Functions Whose Result Values are Structured, Problem Solving with Structure Types, Union types.

File Processing and Programming in the Large: Input and Output Files, Binary Files, Using Abstraction to Manage Complexity, Header Files, Implementation Files, Storage Classes, Macros.

Text Books:

- M. Sprankle- Problem Solving and Programming Concepts, 7thEdn, Pearson Education, New Delhi-2006
- J.R. Hanly & E.B. Koffman- Problem Solving and Program Design in C, 4thEdn, Pearson Education, New Delhi-2004.

Reference Books:

- E. Balagurusamy- Programs in ANSI C, 3rdEdn, TMH, New Delhi-2004
- B.A. Forouzan & R.F. Gilberg- Computer Science: A structured Programming Approach Using C, 2ndEdn, Brooks/Cole- Thomson Learning, Indian Reprint, 2003.

III. CORE COURSE [CCMCA103]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (SIA:17 + ESE:28)=45

Instruction to Question Setter for
Mid Semester Examination (MSE):
*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):
*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*
The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.
(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

OPERATING SYSTEM **Theory: 45 Lectures; Tutorial: 15 Hours**

Unit – I **Operating Systems Introduction:** OS and the Computer System, Efficiency, System Performance and User Convenience, Classes of Operating Systems, Batch Processing Systems, Multiprogramming Systems, Time Sharing Systems, Real Time Operating Systems, Distributed Operating Systems, Modern Operating Systems.

Unit - II **Processes and Threads:** Processes and Programs, Programmer view of Processes, OS view of Processes, Threads, Case studies of Processes and Threads.

Unit - III **Scheduling Concepts:** Preliminaries, Non-preemptive Scheduling Policies, Preemptive Scheduling Policies, Scheduling in Practice, Real Time Scheduling, Scheduling in Unix, Scheduling in Linux, Scheduling in Windows, Performance Analysis of Scheduling Policies.

Unit -IV **Memory Management :** Managing the Memory Hierarchy, Static and Dynamic Memory Allocation, Memory Allocation to a Process, Reuse of Memory, Contiguous Memory Allocation, Noncontiguous Memory Allocation, Paging, Segmentation, Segmentation with Paging, Kernel Memory Allocation, A Review of Relocation, Linking and Program Forms.

Unit -V **Virtual Memory:** Virtual Memory Basics, Demand Paging, Page Replacement Policies, Memory Allocation to a Process, Shared Pages, Memory Mapped Files, Unix Virtual Memory, Linux Virtual Memory, Virtual Memory using Segmentation.

Unit -VI **File Systems:** File System and IOCS, Files and File Operations, Fundamental File Organizations, Directory Structures, File Protection, Interface between File System and IOCS, Allocation of Disk Space, Implementing File Access, File Sharing Semantics, File System Reliability, Virtual File System, Unix File System, Linux File System, Windows File System, Performance of File Systems.

Unit -VII **Security and Protection:** Overview of Security and Protection, Goals of Security and Protection, Security Attacks, Formal and Practical aspects of Security, Encryption, Authentication and Password Security, Access Descriptors and the Access Control Matrix, Protection Structures, Capabilities, Unix Security, Linux Security, Windows Security.

Reference Books:

- D.M. Dhamdhere- Operating Systems: A Concept-Based Approach, TMH,
- A. Silberschatz et.al-Operating System Concepts, 6thEdn, John Wiley, Indian Reprint, 2003.
- C. Cronsley-Operating Systems: A Design-Oriented Approach, TMH, New Delhi, 2002.
- H.M. Deitel-Operating Systems, 2ndEdn, Pearson Education, 2003.
- A.S. Tanenbaum-Operating System: Design and Implementation, PHI, New Delhi, 2002.m,.

IV. CORE COURSE [CCMCA104]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (SIA:17 + ESE:28)=45

Instruction to Question Setter for
Mid Semester Examination (MSE):
*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):
*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*
The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.
(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

DISCRETE MATHEMATICS WITH GRAPH THEORY

Theory: 45 Lectures; Tutorial: 15 Hours

Unit I: Mathematical Preliminaries: Euclid's Algorithm, Fundamental Theorem of Arithmetic, Euclid's theorem, Congurence Modulo m, Fermat's & Euler's Theorems, Exponents & Logrithms.

Unit II: Sets Concepts: Definition, Elements, Notations & construction of sets, Types of sets, set operations& properties, venn diagram, De-Morgan's laws.

Unit III: Combinatorics : Basic counting Principles, Factorial, permutation & combination, pigeonhole & extended pigeonhole principle, binomial theorem, mathematical induction, recurrence relation.

Unit IV: Mathematical logic: propositions, connectives, equivalence of formula, well formed formula, tautulogies, principle of duality, logic gates & Units, Normal form, rule of inference, the predicate calculus.

Unit V: Relation & Function: product sets, partition, binary relation in a set, domain & range, the matrix of relation & digraph, path in relation & digraph, Boolean matrices, Adjacency matrix of a relation, properties of relation, equivalence relation, warshall's algorithm. Sum & product of function, types of functions, compositions of function, inverse of functions, hashing function, characteristic function of a set, permutation function.

Unit VI: Lattice theory: Partial order set- Hasse diagram, isomorphism, duality, product of two sets, Lattice as poset- lattices as algebraic system, complete lattice, bounded lattice, sub lattice.

Fuzzy Algebra: Introduction, crisp sets & fuzzy sets, operation of fuzzy sets, union & intersection of two interval- valued fuzzy sets, fuzzy relation.

Unit VII: Graph Theory: Introduction, graph basics, digraph, sub graph, circuit & cycle, multiple path, connected Graph, eulerian graph, Hamiltonian graph, biconnected graph, Algebric terms & operations used in graph theory. The Konigsberg Bridge problem, Four color problem, three utilities problem.

Unit VIII: Planar & Directed Graph: Bipertite Graph, Homeomorphic Graph, Dual Graph, Euler's formula, outerplana graph. Directed Paths, Directed Cycles, Acyclic Graph, job sequencing problem, network flow, max-flow min-cut theorem.

Unit IX: Trees: Definitions, Forest, Rooted Graph, Properties of tree, Binary tree, spanning tree, BFS & DFS, Minimal spanning trees- Kruskal's Algorithm, Prim's Algorithm, Directed tree.

Reference:

- Discrete Mathematics with Graph theory, S.K. Yadav, Ane's Books Pvt. Ltd.
- Graph Theory with Application, Bondy, J.A & U.S.R. Murty [1976], MacMillan
- Kolman, Busby, Ross, Rehmann: *Discrete Matheamatical Structures*, 5/e, Pearson Education, 2006.
- Discrete Mathematics, Swapan Kumar Chakraborty, bikash kantisarkar, Oxford University Press

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V. CORE COURSE [CCMCA105]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 **Pass Marks (SIA:17 + ESE:28)=45**

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):

*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

COMPUTER ARCHITECTURE **Theory: 45 Lectures; Tutorial: 15 Hours**

Unit - I **Parts Of A Computer :** Processor (CPU), memory subsystem, peripheral subsystem. The memory interface: memory subsystem. Parts of these interfaces integrated with the processor, and the remainder contained in the chip – set that supplements the processor. Two main parts of the processor apart from these interfaces: data path and control (which supervises the data path)

Unit - II **Instruction Set Formats :** Three – address and one address instructions and the corresponding data – path architectures, namely, general – purpose register architecture (the classic RISC) and accumulator architecture. Zero – address instructions and the stack architecture. Two – address instructions.

Unit - III **Introductory Machine :** Modern computer design, Machines dating back to the 1980's, reduced instruction set computers (RISC), complex instruction set computers (CISC). The MIPS R2000,the classic RISC machine.

Unit - IV **Electronics fundamentals :** Combinational functions and their implementation with gates and with ROM's, edge – triggered D-flip flops and sequential circuits. Implementation of data – path and control.

Unit - V **Hierarchy of Memory**: Performance trade offs : fast, small, expensive memories (static RAM); slower, larger, inexpensive memories (DRAM); very slow, very large and very cheap memories (magnetic and optical disks). Ideal memory: fast, inexpensive, unbounded size. Ways of creating illusions or approximations of ideal memory. On – chip and off – chip cache memories, redundant arrays of independent disks (RAID).

Unit - VI **Pipelining & Peripherals :**Improving the performance of a computer and increasing the usage of its subsystems by executing several instructions simultaneously. Analogy to assembly line . Influence of instruction set design on ease of pipelining. Difficulties with pipelining: structural, data and branch hazards. Branch prediction. Interconnecting peripherals with memory and processor.

Reference Books:

- Computer System and Architecture Morishmano
- Computer Fundamentals-Architecture and Organisation-B. Ram
- Modern Computer Architecture-Galgotia
- Computer Systems Organisation and Architecture-John D. Carpinelli, Pearson
- Computer System Architecture-P.V.S. Rao, PHI
- Advanced Computer Architecture-A system design approach, Richard Y.Kain, Pearson

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VI. CORE COURSE [CPMCA106]: (Credits: Practical-04)

Marks: 30 (SIA: 20 Exp. + 10 Viva) + 70 (ESE Pr: 6Hrs)=100	Pass Marks (SIA:17 + ESE:28)=45

Instruction to Question Setter for
Semester Internal Assessment (SIA):
*There will be **two** questions in Practical Examination of 3Hrs.out of which **any one** is to be answered. The questions in practical examination will be of equal to 20 marks and will be so framed that the students are able to answer them within the stipulated time. 10 marks will be awarded on the performance in viva voce.*

End Semester Practical Examination (ESE Pr):
***Lab**: There will be **four** questions in Practical Examination of 3Hrs.out of which **any two** are to be answered. Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.*

The questions in practical examination will be of equal to 50 marks and will be so framed that the students are able to answer them within the stipulated time. 10 marks will be awarded on the performance in viva voce whereas 10 marks will be awarded on cumulative assessment which is further subdivided as 5 marks for Practical record and 5 marks for Attendance.

***Assignment**: The Assignment should be hand written (preferred)/ typed in A4 size paper. First three pages (i.e. front page + acknowledgment + index) & Bibliography may be printout. No Xerox copy is allowed.*

***Marks Distribution**:*

LAB(Experiment + Answer script)	*= 50 marks*
Assignment/ Project + Attendance	*=10 marks*
Viva-voce	*=10 marks*

Note:
(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

PROGRAMMING CONCEPTS & IMPLIMENTATION (C) LAB

Practical: 60 Hours

In this paper students are supposed to do programming for followings:
1. Using keyword, identifiers, blank spaces etc
2. Problem solution by recursion and iteration
3. Creation of arrays of all types
4. Matrix Addition, multiplication
5. Uses of function calls
6. Uses of loops
7. Arithmetic problem solutions
8. Pattern finding
9. Coordinate geometry problem solutions
10. Use of structure
11. Use of structure and union
12. Use of Micro & Macro
13. File Handling, etc.

Reference Books:

- E.Balagurusamy- Programs in ANSI C, 3rdEdn, TMH, New Delhi-2004
- B.A.Forouzan & R.F. Gilberg- Computer Science: A structured Programming Approach Using C, 2ndEdn, Brooks/Cole- Thomson Learning, Indian Reprint, 2003.

VII. CORE COURSE [CPMCA107]: (Credits: Practical -04)

Marks: 30 (SIA: 20 Exp. + 10 Viva) + 70 (ESE Pr: 6Hrs)=100	Pass Marks (SIA:17 + ESE:28)=45

Instruction to Question Setter for
Semester Internal Assessment (SIA):
*There will be **two** questions in Practical Examination of 3Hrs.out of which **any one** is to be answered. The questions in practical examination will be of equal to 20 marks and will be so framed that the students are able to answer them within the stipulated time. 10 marks will be awarded on the performance in viva voce.*

End Semester Practical Examination (ESE Pr):
***Lab**: There will be **four** questions in Practical Examination of 3Hrs.out of which **any two** are to be answered. Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.*

The questions in practical examination will be of equal to 50 marks and will be so framed that the students are able to answer them within the stipulated time. 10 marks will be awarded on the performance in viva voce whereas 10 marks will be awarded on cumulative assessment which is further subdivided as 5 marks for Practical record and 5 marks for Attendance.

***Assignment**: The Assignment should be hand written (preferred)/ typed in A4 size paper. First three pages (i.e. front page + acknowledgment + index) & Bibliography may be printout. No Xerox copy is allowed.*

***Marks Distribution**:*

LAB(Experiment + Answer script)	*= 50 marks*
Assignment/ Project + Attendance	*=10 marks*
Viva-voce	*=10 marks*

Note:
(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

UNIX LAB **Practical: 60 Hours**

Unit – I **UNIX Architecture and Command Usage :** UNIX Architecture, Features, POSIX and single UNIX Specification, Locating Commands, Internal and External Commands, Command Structure, Flexibility of Command Usage, Man browsing and Documentation, **man-k**, **apropos**, **whatis.**

Unit - II **General Purpose Utilities : cal, date, echo, printf, bc, script,** Email Basics, **mailx, passwd, who, uname, tty, sty.**

Unit - III **The File System :** The File, The Parent-child Relationship, The HOME Variable, **pwd, cd, mkdir, rmdir,** Absolute and Relative Pathname, **ls,** The UNIX File System.

Unit - IV **Handling Ordinary Files : Cat, cp, rm, mv, more,** The Ip Subsystem, **file, wc, od, cmp, comm, diff, dos2unix, unix2dos,** Compressing and Archiving Files, **gzip, gunzip, tar, zip, unzip.**

Unit - V **Basic Files Attributes : ls –l, ls –d,** File Ownership and Permissions, **chmod**, Directory Permissions, Changing File Ownership.

Unit - VI **The vi Editor : vi**Basics, Input Mode, Saving Text and Quitting, Navigation, Editing Text, Undoing Last Editing Instruction (**U** and **U**), Repeating Last Command(**.**), Searching for Pattern(/ and **?**), Substitution- Search and Replace(**:s**).

Unit - VII **The Shell :** Shell's Interpretive Cycle, Shell Offerings, Pattern Matching, Escaping and Quoting, Redirection- The 3 standard files, **/dev/null** and **/dev/tty,** Pipes, **tee,** Command Substitution, Shell Variables.

Unit - VIII **The Process:** Process Basics, **ps,** System processes(-e or –a), Mechanism of Process Creation, Internal and External Commands, Process States and Zombies, Running Jobs in Backgrounds, **nice,** Killing Processes with Signals, Job Controls, **cut, paste, sort, uniq, tr.**

Unit - IX **Essential Shell Programming :**Shell Scripts, **read,** Command Line Arguments, **exit** and Exit Status of Commands, Logical Operation **&&**and **||,** The **if** Conditional, Using **test** and **[ ]** to evaluate Expressions, The **case** conditional, **expr, $0, while, for, set** and **shift,** The Here Document, **trap,** Debugging Shell Script with **set –x,** Sample Validation and Data Entry Scripts.

Reference Books:

- Sumitabha Das- Unix Concepts & Applications, Tata McGraw Hills.
- Lowell Jay Arthur & Ted Burns-Unix Shell Programming, Galgotia Publication

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SEMESTER II 7 Papers

Total 100 x 7 = 700 Marks

I. CORE COURSE [CCMCA201]: (Credits:Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100	**Pass Marks (SIA:17 + ESE:28)=45**

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):

*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

E-COMMERCE **Theory: 45 Lectures; Tutorial: 15 Hours**

Unit - I Introduction to e-commerce: Electronic commerce, scope of Electronic commerce, key factors of e-commerce, benefits and limitations of e-commerce, e-business, difference between e-commerce and e-business.

Unit - II Business strategy in an electronic age: Value chain, supply chain, Porter's value chain model, inter organizational value chains, Competitive advantage, competitive strategy. Porter's model, First mover advantage, competitive advantage using e-Commerce.

Unit - III Applications of e-commerce: Direct marketing and selling, value Chain integration, supply chain integration, corporate Purchasing, home shopping, recruitment, travel, on-line payment, Impact of e-commerce, security issues in e-commerce and Payment settlement system.

Unit - IV Classification of e-commerce: Framework for e-commerce, Classifications, barriers to e-commerce,

Unit - V Electronic market: Markets, electronic markets, usage of Electronic markets, advantages and disadvantages of Electronic market.

Unit - VI Electronic data interchange (EDI): definition, benefits, EDI Technology, EDI communications, EDI implementations, EDI security, Internet: internet, TCP/IP Internet components.

Reference Books:

- David Whitley, E-Commerce: Strategy, Technologies and Applications, TMH
- Ravi Kalakota & Andre Whinston, Electronic Commerce: A Manager's Guide, Pearson Education
- P.T. Joseph, E-Commerce: A Managerial Perspective, PHI

II. CORE COURSE [CCMCA202]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 **Pass Marks (SIA:17 + ESE:28)=45**

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):

*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

DATABASE MANAGEMENT SYSTEM **Theory: 45 Lectures; Tutorial: 15 Hours**

Unit-I **Data models:** Conceptual model, ER model, object oriented model, UML logical data model, relational, object oriented. **Physical data models:** Clustered, un clustered files, dices(spares and denser) , B+tree, join indices, hash and inverted files, grid files, bulk loading, external sort, time complexities and file selection crieteria .

Unit-II **Relational database design**: Schema design, normalization theory, functional dependencies, higher normal forms, integrity rules, relational operators

Unit-III **Object oriented database design**: Objects, methods, query languages, implementations, comparisons with relational systems, object orientation in relational Database systems, object support in current relational database systems, complex object model, implementation techniques. Mapping mechanism: Conceptual to logical schema, key issues related to for physical schema mapping.

Unit –IV **DBMS concepts**: Acid property, concurrency control , recovery mechanisms, case study integrity, views & security, integrity constraints ,views management, data security.

Unit –V **Query processing** : query optimization-Heuristic and rule based optimizers ,cost estimates, transaction management.

Unit –VI **Case study**: Oracle/ posters DBMS packages : understanding the transaction processing concurrency and recovery protocols, query processing and optimization mechanisms through appropriate queries in sql and plsql.

Unit –VII **Advanced topics :** Other databases systems, distributed, parallel and memory resident, temporal and spatial databases ,introduction to data warehousing ,on-line analytical processing ,data mining, bench marking related to Dbms packages ,database administration.

Reference Books:

- Database System Concept, Silberschtz, Korth and Sudershan.
- An Introduction to Database System, C.J. Date, A. Kannan, S. Swamynathan, Pearson
- Database Modelling and Design, Tobyteorey, Samlightstone, Tomnodeau, Elsevier
- Fundamental of Database System Fourth edition, Pearson, Elmasri & Navathe
- Principal of Database Management, PHI, James Martin
- Database Management System, Mc Grawhill, Ramkrishnan, gohrke
- An Introduction to Database System-Desai, Galgotia

III. CORE COURSE [CCMCA203]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (SIA:17 + ESE:28)=45

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):

*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

DATA STRUCTURE THROUGH C++ Theory: 45 Lectures; Tutorial: 15 Hours

Introduction: Pseudocode, The Abstract Data Type, A Model for an Abstract Data, Algorithm Efficiency.

Unit - I **Linked Lists:** Linear List Concepts, Linked List Concepts, Linked List Algorithms, Processing a Linked List, List Applications, Complex Linked List Structures, List Abstract Data Type-Linked List Implementation.

Unit – II **Stacks:** Basic Stack Operations, Stack Linked List Implementation, Stack Applications, Stack Abstract Data Type Implementation, Stack ADT- Array Implementation.

Unit – III **Queues:** Queue Operations, Queue Linked List Design, Queuing Theory, Queue Applications, Queue ADT-Linked List Implementation, Array Implementation.

Unit - IV **Recursion:** Factorial – A Case Study, How Recursion Works, Designing Recursive Algorithms, Another Case Study- Fibonacci Numbers, The Towers of Hanoi.

Unit – V **Trees Concepts:** Basic Tree Concepts, Binary Trees, Binary Tree Traversals, Expression Trees, General Trees, Huffman Code. Binary Search Trees, AVL Trees, AVL Tree Implementation, AVL Abstract Data Type.

Unit – VI **Heaps & Multiway Trees:** Heap Definition, Heap Structure, Basic Heap Algorithms, Heap Data Structure, Heap Algorithms, Heap Applications. M-Way Search Trees, B-Trees, Simplified B-Trees.

Unit – VII **Searching & Sorting Concepts:** List Searches, Hashed List Searches, Collision Resolution. General Sort Concepts, Insertion Sorts, Selection Sorts, Exchange Sorts, External Sorts.

Text Book:

- R.F.Gilberg & B.A. Forouzan- Data Structures: A Pseudocode Approach with C++, 2nd Edn, Brooks/Cole-Thomson Learning, Indian Reprint.

Reference Books:

- E.Horowitz et.al-Fundamentals of Data Structures in C++, Galgotia Publication, New Delhi
- A.M.Berman- Data Structures vie C++, Oxford Univ. Press, Inc. Indian Reprint
- M.T.Goodrich et.al- Data Structures and Algorithms in C++, John Wiley, Inc.
- Indian Reprint

IV. CORE COURSE [CCMCA204]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (SIA:17 + ESE:28)=45

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):

*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

AUTOMATA THEORY **Theory: 45 Lectures; Tutorial: 15 Hours**

Unit - I **Finite Automata** : Finite Automata, capability & limitations of FSM, Deterministic Finite Automata , Non-Deterministic Finite Automata, NFA with e-moves, regular sets & regular expressions, Equivalence of DFA and NDFA, NFA from regular expressions, regular expressions from DFA, Moore versus Mealy m/c , Kleen's Theorem.

Unit - II **Regular languages & Regular Grammars :** Regular Expressions- Formal Definition & Language associated with It. Criterion for Regularity, Relation between Regular expression & Regular Language , Closure properties of regular grammer. Identifying Nonregular Language-using pigeonhole principle, Pumping Lemma.

Unit - III **Context Free Grammars :** Introduction, definition, Regular Grammar, Derivation trees, Ambiguity, Simplified forms and Normal Forms, Applications.

Unit - IV **Pushdown Automata :** Definition, Moves, Instantaneous Descriptions, Language recognised by PDA, Deterministic PDA, Acceptance by final state & empty stack, Equivalence of PDA , Pumping lemma for CFL, Interaction and Complements of CFL,Decision algorithms.

Unit - V **Turing Machines:** Definition and examples, Computing Partial Functions with Turing Machine(TM), Combining TMs, Variations of TMs, Multi-tape TMs, Non-deterministic TM, Universal TM, Church Thesis.

Unit - VI **Recursively Enumerable Languages:** Recursively Enumerable and Recursive, Enumerating Language, Context Sensitive and Chomosky Hierarchy.

Unit – VII **Unsolvable Problems and Computable Functions:** Non-recursive Language and unsolvable Problems, Halting Problem, Rice Theorem, Post Correspondence Problem.

Text Books :

- J.E. Hopcroft and J.D. Ullman -"Introduction to Automata Theory, Languages & Computation", Narosa..

Reference Books:

- K.L.P Mishra & N. Chandrasekharan -"Theory of Computer Science", PHI
- Peter Linz – " An Introduction to Formal Language and Automata", Narosa
- C.K. NAGPAL- Formal Language & Automata Theory, Oxford University Press
- Vivek Kulkarni- Theory of Computation, Oxford University Press
- Dasradh Ramaiah K. – Introduction to Automata Theory & Compiler Design, PHI

V. CORE COURSE [CCMCA205]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (SIA:17 + ESE:28)=45

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):

*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

DATA COMMUNICATION AND NETWORKING

Theory: 45 Lectures; Tutorial: 15 Hours

Unit - I Data Communications and Networking Basics: Fundamental concept of Communications Model, Data Communications & Networking.

Protocol Architecture: A Basic Protocol Architecture, OSI, The TCP/IP Protocol Architecture

Unit - II Transmission of Data : Concepts and Terminology, Analog and Digital Data Transmission, Transmission Impairments, Channel Capacity.

Guided and Wireless Transmission: Guided Transmission Media, Wireless Transmission, Wireless Propagation, Line-of-Sight Transmission.

Unit - III Signal Encoding Techniques: Digital Data Digital Signals, Digital Data Analog Signals, Analog Data Digital Signals, Analog Data Analog Signals.

Digital Data Communication Techniques: Asynchronous and Synchronous Transmission, Types of Errors, Error Detection, Error Correction, Line Configurations, Interfacing.

Unit –IV Data Link Control: Flow Control, Error Control, High-Level Data Link Control (HDLC).

Multiplexing: Frequency Division Multiplexing, Synchronous Time Division Multiplexing, Statistical Time Division Multiplexing.

Unit – V Circuit Switching and Packet Switching: Switching Networks, Circuit-Switching Networks, Circuit-Switching Concepts, Control Signaling, Softswitch Architecture, Packet-Switching Principles, X.25, Frame Relay.

Unit –VI Asynchronous Transfer Model: Protocol Architecture, ATM Logical Connections, ATM Cells, Transmission of ATM Cells, ATM Service Categories, ATM Adaptation Layer.

Unit –VI Routing in Switched Networks: Routing in Circuit-Switching Networks, Routing in Packet-Switching Networks, Least-Cost Algorithms

Text Book :

- W. Stallings - Data and Computer Communications, 7thEdn., Pearson Edn./ PHI, New Delhi, 2006

Reference Books :

- B. A. Forouzan - Data Communications and Networking, 4thEdn. TMH, New Delhi 2006
- P.C. Gupta – Data Communications and Computer Networks, PHI, New Delhi 2006.

VI. CORE COURSE [CPMCA206]: (Credits: Practical-04)

Marks: 30 (SIA: 20 Exp. + 10 Viva) + 70 (ESE Pr: 6Hrs)=100	Pass Marks (SIA:17 + ESE:28)=45

Instruction to Question Setter for
Semester Internal Assessment (SIA):
*There will be **two** questions in Practical Examination of 3Hrs.out of which **any one** is to be answered. The questions in practical examination will be of equal to 20 marks and will be so framed that the students are able to answer them within the stipulated time. 10 marks will be awarded on the performance in viva voce.*

End Semester Practical Examination (ESE Pr):
***Lab**: There will be **four** questions in Practical Examination of 3Hrs.out of which **any two** are to be answered. Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.*

The questions in practical examination will be of equal to 50 marks and will be so framed that the students are able to answer them within the stipulated time. 10 marks will be awarded on the performance in viva voce whereas 10 marks will be awarded on cumulative assessment which is further subdivided as 5 marks for Practical record and 5 marks for Attendance.

***Assignment**: The Assignment should be hand written (preferred)/ typed in A4 size paper. First three pages (i.e. front page + acknowledgment + index) & Bibliography may be printout. No Xerox copy is allowed.*

***Marks Distribution**:*

LAB(Experiment + Answer script)	*= 50 marks*
Assignment/ Project + Attendance	*=10 marks*
Viva-voce	*=10 marks*

Note:
(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

DBMS LAB **Practical: 60 Hours**

SINGLE TABLE RETRIEVED /UPDATION

1. Select all information froM emp.
2. List all employees having salary within 1000 to 2000.
3. Display different job types.
4. List the employees in certain dept in alphabetical order.
5. Display all employees with DR or LL in their names.
6. List an employee who has a job title of CLERK and earns more than $1100.
7. Update the Emp table and sets the department number for employees 7782 to 10.
8. Delete the development department from department table.
9. To retrieve name, salary and commission of employees where salary is less than or equal to their commission amount.
10. Display name &job title of all employees whose title is not CLERK, MANAGER or ANALYST.

Function & Concatenation

1. Display name, salary and commission of all employees whose monthly salary is greater than their commission.
2. Select SMITH HAS WORKED IN POSITION OF CLERK IN DEPT 20

3. Produce the following

Employee	and	job
SMITH		CLERK
ALLEN		SALESMAN

4. Produce the following
    a. SMITH (CLERK)
    b. ALLEAN (SLAESMAN)
5. Find the maximum, minimum and average salaries of all employees.
6. Find how many managers are there without listing them.
7. Find out difference between highest and lowest salaries.
8. Find all departments which have more than 3 employees.
9. Calculate remainder of the ratio of salary to commission for all employees whose job title is a salesman.
10. List all the employees name and salaries increased by 15% and expressed as a whole number of dollars.

JOIN/ HAVING /GROUP BY /ORDER BY

1. List all the maximum and minimum salary of each job type.
2. Show only employees on grade 3.
3. Show all employees in DALLAS.
4. Display all employees name and department names in department name order.
5. List the following details of employees who earn & 36000 a year or who are clerks.
6. To display kings employee number, department number and department location.
7. Display the department that has no employees.
8. Display the employees who earn less than their managers.
9. Display the name, location and departments of employees whose salary is more than 1500 a month.
10. Find all employees who joined before their manager.
11. Find the average salary and average total remuneration of each job type.

Queries using Data Functions

1. Display each employee name & hire date of Dept 20 hire date should be like June, Thirteenth 1983.
2. Display each employee name & hire date and salary review date, Assume salary review date is 1 year from hire date .output should be in ascending review date.
3. Compare the hire date for all employees who started in 1987.display the employee no, hire date and month started using the ROUND and TRUNC function.

Nested queries

1. Display the employee name, job, salary of all employees whose salary is equal to minimum salary.
2. Display the five highest salary in the company. Display the name and salary.
3. Find the employees .who earn the highest salary in each job type, sort in descending order of salary.

4. Find the employees .who earn the minimum salary for their job. Display the result descending order of salary.
5. Find the most recently hired employees in the department order by hire date.
6. Display details of employees who earn greater than the average of their department. Display the average salary also.
7. Display the employee name, job, salary of all employees whose salary is equal to minimum salary.
8. Display all the departments that have a minimum salary greater than that of department 20.
9. Display the employees whose salary is less than any clerk and who are not clerks.
10. Write a query to display a ' * ' against the row of the most recently hired employee
11. Display **ENAME, HIRE DATE and Column (MAXDATE)** showing

ENAME	HIREDATE	MAXDATE
SMITH	13-JUN-83	
JAMES	23-JUL-84 *	

USING THE & SUBSTITUTION VARIABLE

NOTE – 1. Use a variable prefixed with an ampersand (&) to prompt the user for a value.
2. Use single quotation marks for date and character value.

1. Create SQL statements to prompt the user for an employee number at runtime and displays employees s number ,name, salary and department number for that employee .
2. Do a case sensitive search for a list of employee with a job that a job that the user enters.
3. Display the employee number and any other column and any conditions of employees specified by the user at a runtime from EMP Table.

Reference Books:

- Database System Concept, Silberschtz, Korth and Sudershan.
- An Introduction to Database System, C.J. Date, A. Kannan, S. Swamynathan, Pearson

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VII. CORE COURSE [CPMCA207]: (Credits: Practical-04)

Marks: 30 (SIA: 20 Exp. + 10 Viva) + 70 (ESE Pr: 6Hrs)=100	Pass Marks (SIA:17 + ESE:28)=45

Instruction to Question Setter for
Semester Internal Assessment (SIA):
*There will be **two** questions in Practical Examination of 3Hrs.out of which **any one** is to be answered. The questions in practical examination will be of equal to 20 marks and will be so framed that the students are able to answer them within the stipulated time. 10 marks will be awarded on the performance in viva voce.*

End Semester Practical Examination (ESE Pr):
***Lab**: There will be **four** questions in Practical Examination of 3Hrs.out of which **any two** are to be answered. Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.*

The questions in practical examination will be of equal to 50 marks and will be so framed that the students are able to answer them within the stipulated time. 10 marks will be awarded on the performance in viva voce whereas 10 marks will be awarded on cumulative assessment which is further subdivided as 5 marks for Practical record and 5 marks for Attendance.

***Assignment**: The Assignment should be hand written (preferred)/ typed in A4 size paper. First three pages (i.e. front page + acknowledgment + index) & Bibliography may be printout. No Xerox copy is allowed.*

***Marks Distribution**:*

LAB(Experiment + Answer script)	*= 50 marks*
Assignment/ Project + Attendance	*=10 marks*
Viva-voce	*=10 marks*

Note:
(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

DATA STRUCTURE THROUGH (C++) LAB **Practical: 60 Hours**

Students are expected to do programming for followings:

1. Array implementation.
2. Stack Implementation
3. Queue Implementation
4. Link List Implementation
5. Various Trees Implantation
6. Sortings Implementation
7. Searching implementation
8. Collision Resolution techniques implementation.

Reference Books:

- S.K. Srivastava, Deepali Srivastava- Data Structure through C, BPB Publication.

SEMESTER III 7 Papers

Total 100 x 7 = 700 Marks

I. GENERIC/ DISCIPLINE CENTRIC ELECTIVE-I LANGUAGE ELECTIVE-I [ECMCA301A]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100	**Pass Marks (SIA:17 + ESE:28)=45**

Instruction to Question Setter for
Mid Semester Examination (MSE):
*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):
*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*
The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.
(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

A. JAVA PROGRAMMING **Theory: 45 Lectures; Tutorial: 15 Hours**

Unit I **Fundamentals of Java programming:** Introduction to Object Oriented Programming Language, Difference with C and C++. Introduction to Java, Basic features of Java, Java Architecture, JDK Tools, Java standard Library (JSL).

Unit II Keywords, Identifiers Data Types, Operators, Precedence Summary, Punctuation Symbols Unicode Characters. Condition and looping control statements for, for each, break continue.

Unit III Class and Object: Declaring a Class, Creating an Object, Methods, Exploring New Operator, constructor its types, Finalizes, this Keyword, Access Specifies, Recursion, Inheritance, Polymorphism, Overriding Methods, Runtime Polymorphism, Implementing Abstract classes, packages and interfaces.

Unit IV String: Concatenation and Changing Case, Sub strings Data Conversion String Buffer, Types of Array, Array of Objects, Wrapper Class, Vector Class.

Unit V Exception Handling and Threads: Syntax for Exception Handling Mechanism, User Defined Introduction to Threads, Multi - tasking and Multi – threading, Exception handling.

Unit VI File input and Output: File Class, Byte Stream Classes Reading from and Writing to a File, Character Stream Classes, Random Access File, Sequence Input Stream, Binary files. Data Base Connectivity: ODBC API, JDBC Application Architecture, Java. SQL, Obtaining a connection, step connecting Object, Working with Result, statement, Set Meta Data Interface.

Unit VII **Graphical User Interfaces**: Creating User Interfaces, Overview of a Java GUI, Developing a Java GUI, Adding Functionality to a GUI, Improving GUI Layout.

Reference Books:

- "An Introduction to Java Programming and Object Oriented Application Development" –Richard A. Jhonson.

- Detail-Java How to Program, Pearson Education, New Delhi.
- E. Balagurusamy-Java Programming, TMH, New Delhi, 2005.
- James M. Sleek- Programming and Problem Solving with Java, Thomson Learning, Indian Edition, .
- Herbert Schildt- The Complete Reference, TMH

OR

LANGUAGE ELECTIVE-I [ECMCA301B]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100	**Pass Marks (SIA:17 + ESE:28)=45**

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):

*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

B. DOT NET PROGRAMMING **Theory: 45 Lectures; Tutorial: 15 Hours**

Unit I **NET Introduction**: Introduction of Language, Introduction of Web Application, Platform Dependence, Independence & Portability, Introduction of .NET Framework, Introduction of Compiler & MSIL, CLR, CLS, CTS, CLI.

Unit II **OOPs Implementation:** Encapsulation, Abstraction, Class & object, Relation b/w objects and reference variables, Method Overloading &Types of Methods. Description of Memory blocks: Stacks, Heap & Class Area. Constructors and Destructor & Garbage Collection. Using Scope & Dispose Method , Usage of this keyword , Static Data members, Constructors & methods , Relation & Implementing Has-A relation , Implementing Is-A relation using Inheritance , Method Overriding & Hiding, Static & Dynamic binding, Runtime polymorphism and generalization, Abstract classes & methods, Interfaces and Role based Inheritance, Usage of sealed, partial, out, ref, pram keyword , Namespace , Assembly & GAC , Property & Indexer , Windows Application, Delegates & Event , Event Handling, Windows App. Component. Object class and its role.

Unit III **String Handling & Exception Handling:** String class & concept of Immutability, Pool of String Constants & its use , Common String operations , Use of String Builder. Difference b/w exception and error, Exception Handling & Robustness, Common Exceptions and Errors , Try and catch block , Exception handlers , throw keyword and its usage , Role of finally , Exception Class Methods & properties , Creating User defined Exceptions.

Unit IV **Multithreading in .NET:** Multitasking and Multithreadin G, Process & thread , States of Thread , Thread based execution model of .NET Applications , Implementing User threads , Thread synchronization, Inter Thread communication , Thread Interrupting , Daemon Threads and their use.

Unit V **Input Output Streams:** Streams & their advantages over conventional input output , Reading & writing data byte by byte, line by line, and in one go. Redirecting Standard input & output streams, Serialization & Deserialization, Serialization Formatter, Xml Formatter, Binary Formatter, Soap Formatter, Json Formatter, File class and File System Interaction, Zip & Unzip Files.

Unit VI **Reflection:** Understanding object representation of classes, Loading classes dynamically, Instantiating classes indirectly, Obtaining information of classes dynamically, Invoking methods indirectly, Referencing data members indirectly, Overriding access policy and referencing private members.

Unit VII **Collection Framework:** Role and Importance of Collection Framework, Index Based Collection Array List, Stack, Queue , Use Define Collection, Map Based Collection Use of Key & Value pair (Entry), Hash Table, Sorted List , Searching elements in List, Hash and Tree based collections , Role of equals and hashCode() methods, Role of Comparable interfaces, Type safety and Generics , Generic Collection . List, Stack, Queue, Dictionary, Linked List, Sorted List.

Reference Books:

- Essential of .Net programming-C. Komalavalli, S.K. Sahu, Ane books
- .Net 4.5 programming black book
- Beginning .Net 3.5 in c# and VB, Wrox
- Programming in VB.net, Julia case Bradley, Anitac. Mellspaugh, McGraw hill

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II. CORE COURSE [CCMCA302]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 **Pass Marks (SIA:17 + ESE:28)=45**

Instruction to Question Setter for
Mid Semester Examination (MSE):
*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):
*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*
The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.
(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

NETWORK SECURITY AND CRYPTOGRAPHY

Theory: 45 Lectures; Tutorial: 15 Hours

Unit-I **Attacks on Computers and Computer Security:** Introduction, The Need for Security, Security Approaches, Principles of Security, Types of Attacks.

Unit-II **Cryptography: Concepts and Techniques:** Introduction, Plain Text and Cipher Text, Substitution Techniques, Transposition Techniques, Encryption and Decryption, Symmetric and Asymmetric Key Cryptography, Steganography, Key range and Key Size, Possible Types of Attacks.

Unit-III Symmetric Key Algorithms and AES: Introduction, Algorithm Types and Modes, An Overview of Symmetric Key Cryptography, Data Encryption Standard (DES), International Data Encryption Algorithm (IDEA), RC4, RC5, Blowfish, Advanced Encryption Standard (AES).

Unit-IV **Asymmetric Key Algorithms, Digital Signatures and RSA:** Introduction, Brief History of Asymmetric Key Cryptography, An Overview of Asymmetric Key Cryptography, The RSA Algorithm, Symmetric and Asymmetric Key Cryptography Together, Digital Signatures, Knapsack Algorithm, Some Other Algorithms.

Unit-V **Digital Certificates and Public Key Infrastructure(PKI):** Introduction, Digital Certificates, Private Key Management, The PKIX Model, Public Key Cryptography Standards (PKCS), XML, PKI and Security, Creating Digital Certificates Using Java.

Unit-VI **Internet Security Protocols:** Introduction, Basic Concepts, Secure Socket Layer (SSL), Transport Layer Security (TLS), Secure Hyper Text Transfer Protocol (SHTTP) , Time Stamping Protocol (TSP) , Secure Electronic Transaction (SET), SSL versus SET, 3-D Secure Protocol, Electronic Money, Email Security, Wireless Application Protocol (WAP) Security, Security in GSM, Security in 3G.

Unit-VII **User Authentication and Kerberos:** Introduction, Authentication Basics, Passwords, Authentication Tokens, Certificate-based Authentication, Kerberos, Key Distribution Center (KDC), Security Handshake Pitfalls, Single Sign on (SSO) Approaches.

Network Security, Firewalls and Virtual Private Networks (VPN): Introduction, Brief Introduction to TCP/IP, Firewalls, IP Security, Virtual Private Networks (VPN), Intrusion.

Text Book:

- A.Kahate- Cryptography and Network Security , 2nd Edn., Tata McGraw Hill Publication, New Delhi, 2007

Reference Books:

- B.A. Foronzan – Cryptography & Network Security, TMH, New Delhi, 2007
- S. Stalling – Cryptography and Network Security, Pearson Edn., New Delhi, 2006

III. CORE COURSE [CCMCA303]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 **Pass Marks (SIA:17 + ESE:28)=45**

Instruction to Question Setter for
Mid Semester Examination (MSE):
*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):
*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*
The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.
(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

COMPILER DESIGN **Theory: 45 Lectures; Tutorial: 15 Hours**

Unit-I **Introduction to compilers:** introduction, theory of computer language, design of language, evolution of compilers, stages of compilation.

Unit-II **Lexical analysis:** Introduction, Alphabets and token in computer language, representation of tokens and regular expression, Token recognition and finite state automata, implementation, Error recovery

Unit-III **Syntax Analysis:** Introduction, context free grammar and structure of language, parser and its type, top down parser, bottom up parser, implementation, parser generator tool (yacc), error handling.

Unit-IV **Run time storage organization:** Introduction, scope and lifetime of variables, symbol table, storage allocation , heap allocation, garbage collection,

Unit-V **Intermediate code generation**: need for intermediate code, types of intermediate code, representation by three address code, grammar symbols and attribute, semantic analysis, semantic routine for intermediate code generation,

Unit-VI **Optimization:** introduction, hints on writing optimization code at user level,, construction of basic block and processing, data flow analysis using flow graph, data flow equation for blocks, principle sources of optimization and transformation, procedural optimization , alias , loops in flow graph, loop optimization.

Unit-VII **Code generation**: introduction, issues in code generation, target machine architecture, subsequent use information , simple code generation, register allocation, directed acyclic graph representation, code generation from intermediate code, code scheduling,

References

- Compiler Design , K Muneeswaran , Oxford.
- Compiler Principle , Technique and Tools, Aho, Sethi, Ullman, Pearson.
- Introduction to Automata and Compiler Design, Dasarthramaiya K. , PHI.

IV. CORE COURSE [CCMCA304]: (Credits: Practical-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 **Pass Marks (SIA:17 + ESE:28)=45**

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):

*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

ANALYSIS & DESIGN OF ALGORITHM Theory: 45 Lectures; Tutorial: 15 Hours

Unit – I **Elementary Algorithmic & Asymptotic Notation**: Problems and instances, The efficiency of algorithms, Average and worst-case analyses, Elementary operations.

A notation for "the order of", Other asymptotic notation, Conditional asymptotic notation, Asymptotic notation with several parameters, Asymptotic notation Operations.

Unit – II **Algorithm Analysis** : Control structures analysis, Using a barometer, Supplementary examples, Average-case analysis, Amortized analysis, Solving recurrences

Unit – III **Greedy Algorithms**: Greedy algorithm's characteristics, Graphs: Minimum spanning trees, Shortest paths, The knapsack problem, scheduling concepts.

Unit – IV **Divide-and-conquer**: Multiplying large integers, The general template, Binary search, Sorting, Finding the median, Matrix Multiplication, Exponentiation

Unit – V **Dynamic Programming**: Calculation of binomial coefficient, The World Series, Making change, The principle of optimality, The knapsack problem, Shortest paths, Chained matrix multiplication

Unit – VI **Exploring Graphs** : Graphs and games: An introduction, Traversing trees, Depth-first search: Undirected graphs, Depth-first search: directed graphs, Breadth-first search, Backtracking, Branch-and-bound, the minimax principle.

Unit – VII **Probabilistic Algorithms**: Introduction, Probabilistic does not imply uncertain, Expected versus average time, Pseudorandom generation, Numerical probabilistic algorithms, Monte Carlo algorithms, Las Vegas algorithms.

Text Book:

- G Brassard & P Bratley - Fundamentals of Algorithmics PHI, New Delhi, 2005

Reference Books:

- E.Horowitz. et.al.- Fundamentals of Computer Algorithms, Galgotia Publication Pvt. Ltd., New Delhi, 2004
- J.Kleinberg & E. Tardos – Algorithm Design, Pearson Education, New Delhi, 2006
- T.H. Cormen et.al. – Introduction to Algorithms – PHI, New Delhi, 2005
- S. Dasgupta et.al. – Algorithm, TMH, New Delhi – 2007
- S. Sahani – Data Structures, Algorithms and Applications in C++ 2nd Edition, Universities Press (India) Pvt. Ltd., 2005

V. CORE COURSE [CCMCA305]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100	Pass Marks (SIA:17 + ESE:28)=45

Instruction to Question Setter for
Mid Semester Examination (MSE):
*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):
*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*
The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.
(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

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IT INDUSTRIES MANAGEMENT **Theory: 45 Lectures; Tutorial: 15 Hours**

Unit – I Introduction : Nature & Concept of Management; Evolution of management thought; Concept of functional management; Management styles, Productivity measurement, productivity index, types of production system. Basic Concepts of Accounting: Accounting Principles Concepts conventions, Double Entry System

Unit – II Human Resource Management: Definition and theories of Managing People for IT Industry, Human Resource Planning, responsibility assignment matrix, resource management, developing and managing the project team, Case Studies

Unit – III IT Industry Supply Chain Management: Types, Business processes, Strategic, tactical, and operational decisions in supply chains, performance measures, inventory management, bullwhip effect, e-marketplaces, e-procurement, e-logistics, e-fulfillment, customer relationship management, web services, ERP and supply chains, Case Studies

Unit – IV IT Project Quality Management: Tools and techniques for quality control (Pareto Analysis, Statistical sampling, testing), process control, SQC control charts, single, double and sequential sampling, TQM. ,CMM, ISO, Six Sigma ,Case Studies

Unit – V Environmental Issues, Pollution Control Acts, Green IT Practices, Establishing a Green IT Action Plan, techniques and technologies available to enable Green IT Case Studies

Reference Books

- Managemenet :Global Perspectives, by Koontz and Weihrich
- Principles of Management by Prasad, L.M.,
- Environmental and Pollution Awareness by Sharma B.R.

VI. CORE COURSE [CPMCA306]: (Credits: Practical -04)

Marks: 30 (SIA: 20 Exp. + 10 Viva) + 70 (ESE Pr: 6Hrs)=100	Pass Marks (SIA:17 + ESE:28)=45

Instruction to Question Setter for
Semester Internal Assessment (SIA):
*There will be **two** questions in Practical Examination of 3Hrs.out of which **any one** is to be answered. The questions in practical examination will be of equal to 20 marks and will be so framed that the students are able to answer them within the stipulated time. 10 marks will be awarded on the performance in viva voce.*

End Semester Practical Examination (ESE Pr):
***Lab**: There will be **four** questions in Practical Examination of 3Hrs.out of which **any two** are to be answered. Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.*

The questions in practical examination will be of equal to 50 marks and will be so framed that the students are able to answer them within the stipulated time. 10 marks will be awarded on the performance in viva voce whereas 10 marks will be awarded on cumulative assessment which is further subdivided as 5 marks for Practical record and 5 marks for Attendance.

***Assignment**: The Assignment should be hand written (preferred)/ typed in A4 size paper. First three pages (i.e. front page + acknowledgment + index) & Bibliography may be printout. No Xerox copy is allowed.*

***Marks Distribution**:*

LAB(Experiment + Answer script)	*= 50 marks*
Assignment/ Project + Attendance	*=10 marks*
Viva-voce	*=10 marks*

Note:
(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

CYBER SECURITY LAB **Practical: 60 Hours**

Overview of TCP/IP Protocol:
Distinction between Transmission Control Protocols and User Data gram Protocol, Well-Known and Empirical Port, Connection Oriented and Connectionless Services.

Socket Interface:
Distinction between Socket and Connection, Socket Address Structure, Socket System Calls.

Client Server Interaction:
Connection-oriented Client-server Interaction, Connection-less Client-server Interaction, Interactive and Concurrent Server, Multiprocessor Server and Multi-threaded Server Design Concepts.

Application Development:
Design of File Transfer Protocol, Remote Log-in Protocol etc., using socket interface.
User threat mangemnet (UTM), Fire Wall, Defining rules for firewall, Digital certificate management, Dhcp setup. MLPS.

Reference Books:

- W. Richard Stevens, **UNIX networking Programming,** Prentice-Hall of India, 1990.
- Bill Rieken and Lyle Wieman, **Adventure in UNIX Network Applications Programming,** John Wiley & Sons, 1992.

VII. GENERIC/ DISCIPLINE CENTRIC ELECTIVE-I LANGUAGE ELECTIVE-I LAB [EPMCA307A]: (Credits: Practical -04)

Marks: 30 (SIA: 20 Exp. + 10 Viva) + 70 (ESE Pr: 6Hrs)=100	**Pass Marks (SIA:17 + ESE:28)=45**

Instruction to Question Setter for

Semester Internal Assessment (SIA):

*There will be **two** questions in Practical Examination of 3Hrs.out of which **any one** is to be answered. The questions in practical examination will be of equal to 20 marks and will be so framed that the students are able to answer them within the stipulated time. 10 marks will be awarded on the performance in viva voce.*

End Semester Practical Examination (ESE Pr):

***Lab**: There will be **four** questions in Practical Examination of 3Hrs.out of which **any two** are to be answered. Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.*

The questions in practical examination will be of equal to 50 marks and will be so framed that the students are able to answer them within the stipulated time. 10 marks will be awarded on the performance in viva voce whereas 10 marks will be awarded on cumulative assessment which is further subdivided as 5 marks for Practical record and 5 marks for Attendance.

***Assignment**: The Assignment should be hand written (preferred)/ typed in A4 size paper. First three pages (i.e. front page + acknowledgment + index) & Bibliography may be printout. No Xerox copy is allowed.*

***Marks Distribution**:*

LAB(Experiment + Answer script)	*= 50 marks*
Assignment/ Project + Attendance	*=10 marks*
Viva-voce	*=10 marks*

Note:

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

JAVA PROGRAMMING LAB **Practical: 60 Hours**

Write a programme in java for followings:

1. To illustrate Arithmetic, Relational, Boolean, Bitwise, Shift Operators.
2. To illustrate Precedence Rule.
3. To use “If-else” & “Switch Cases”
4. To use “For Loop” , “While Loop” & “Do- While loop”.
5. To use “Break” & “Labeled Break” .
6. For class declaration & object initialization.
7. For calculating “simple interest” using class, object & methods.
8. For method overloading.
9. For finding volume of cuboid by using Construstor & Parameterized Constructors.
10. For Static initialization block, Instance initialization block & Constructor.
11. For creation, initialization, setting values and then sorting in 1 dimension array
12. For matrix multiplication.
13. For Nested classes.
14. For method of overriding.
15. For Inheritance.

16. For Encapsulation.
17. For Abstract Class & Abstract Methods.
18. For class implementing interface.
19. For using inbuilt packages. E.g. Fact, Static, Import etc.
20. For Wrapper classes.
21. For Declaration, Creation, Finding Length, Comparison, Region Matching, Index of Character, occurrence of particular string, character at particular position, Test for Equality related to string.
22. For Try-Catch, Multiple Catch, Throw & Rethrow Exception, Finally, User Defined Exception, Exception Encapsulation.
23. For creating Thread.
24. File Handelling
25. Database Connectivity

Reference Books:

- Deitel-Java How to Program, Pearson Education, New Delhi.
- E. Balagurusamy-Java Programming, TMH, New Delhi, 2005.

OR

LANGUAGE ELECTIVE-I LAB [EPMCA307B]: (Credits: Practical -04)

Marks: 30 (SIA: 20 Exp. + 10 Viva) + 70 (ESE Pr: 6Hrs)=100	**Pass Marks (SIA:17 + ESE:28)=45**

Instruction to Question Setter for

Semester Internal Assessment (SIA):

*There will be **two** questions in Practical Examination of 3Hrs.out of which **any one** is to be answered. The questions in practical examination will be of equal to 20 marks and will be so framed that the students are able to answer them within the stipulated time. 10 marks will be awarded on the performance in viva voce.*

End Semester Practical Examination (ESE Pr):

***Lab**: There will be **four** questions in Practical Examination of 3Hrs.out of which **any two** are to be answered. Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.*

The questions in practical examination will be of equal to 50 marks and will be so framed that the students are able to answer them within the stipulated time. 10 marks will be awarded on the performance in viva voce whereas 10 marks will be awarded on cumulative assessment which is further subdivided as 5 marks for Practical record and 5 marks for Attendance.

***Assignment**: The Assignment should be hand written (preferred)/ typed in A4 size paper. First three pages (i.e. front page + acknowledgment + index) & Bibliography may be printout. No Xerox copy is allowed.*

***Marks Distribution**:*

LAB(Experiment + Answer script)	*= 50 marks*
Assignment/ Project + Attendance	*=10 marks*
Viva-voce	*=10 marks*

Note:

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

DOT NET LAB **Practical: 60 Hours**

1. Introduction to .NET Framework, Introduction to Compiler & MSIL, CLR, CLS, CTS, CLI. Encapsulation, Abstraction, Class & object, variables. Stacks, Heap & Class Area.

2. Constructors and Destructor & Garbage Collection. Using Scope & Dispose Method, Usage of this keyword, Static Data members, Constructors & methods,

3. Inheritance, Method Overriding & Hiding, Static & Dynamic binding, Runtime polymorphism and generalization,

4. Abstract classes & methods, Interfaces and Role based Inheritance, Usage of sealed, partial, out, ref, pram keyword, Namespace, Assembly & GAC, Property & Indexer,

5. Windows Application, Delegates & Event, Event Handling, Windows App. Component. String class & concept of Immutability, Pool of String Constants & its use, Common String operations, Use of String Builder.

6. Exception Handling: try and catch block, throw keyword and its usage, finally, Exception Class Methods & properties, Creating User defined Exceptions.

7. Multitasking and Multithreading, Process & thread , States of Thread , Thread based execution model of .NET Applications , Implementing User threads , Thread synchronization, Inter Thread communication , Thread Interrupting , Daemon Threads and their use.

8. Streams & their advantages over conventional input output, Reading & writing data byte by byte, line by line, and in one go. Redirecting Standard input & output streams, Serialization & Deserialization, Serialization Formatter, Xml Formatter, Binary Formatter, Soap Formatter, Json Formatter, File class and File System Interaction, Zip & Unzip Files.

9. Object representation of classes, Loading classes dynamically, Instantiating classes indirectly, Obtaining information of classes dynamically, Invoking methods indirectly, Referencing data members indirectly, Overriding access policy and referencing private members.

10. Collection Framework, Index Based Collection Array List, Stack, Queue , Use Define Collection, Map Based Collection Use of Key & Value pair (Entry), Hash Table, Sorted List, Searching elements in List, Hash and Tree based collections, Role of equals and hash code() methods, Role of Comparable interfaces, Type safety and Generics, Generic Collection. List, Stack, Queue, Dictionary, Linked List, Sorted List.

Reference Books:

- Beginning .Net 3.5 in C# and VB, Wrox
- Programming in VB.Net, Julia case Bradley, Anitac. Mellspaugh, Mc Graw hill

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SEMESTER IV 8 Papers

Total (100 x 7 = 700 Marks + 50 Marks) = 750 Marks

I. GENERIC/ DISCIPLINE CENTRIC ELECTIVE-II LANGUAGE ELECTIVE-II [ECMCA401A]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100	**Pass Marks (SIA:17 + ESE:28)=45**

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):

*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

A. ADVANCE JAVA PROGRAMMING

Theory: 45 Lectures; Tutorial: 15 Hours

Unit I **Components and Facilities or Rich Graphical User Interface:** Programming with the JFC, Swing API Components, Jcomponents Class, Dialog boxes, Panels, Labels, Checkboxes, Menus, Toolbars and Actions, Sliders, Spinners, Progress bars, Scrollbars, List and Combo boxes, Text-entry Components, Colour and File Choosers, Tables and Trees, Printing with 2D API, Java Print Service API.

Unit II **Using Relational Database:** Introduction, Best Practices for Programming for Databases, JDBC Drivers for RDBM Systems, SQL to Java type Mapping, Understanding the Database used in this chapter, Using the **java.sql** API, Coding Transactions, Using the **javax.sql** API, Connection Pooling.

Unit III **XML:** Introduction, XML structure, XML example document with SAX, Parsing an XML Document with DOM, Generating an XML document with DOM, Validating XML Documents using DTD and XML schema, Transforming XML using XSLT.

Unit IV **Network Programming:** Introduction, Working with URLs, Working with Sockets, Remote Method Invocation.

Unit V **Building Web Applications:** Introduction, The technology of Web, J2EE Web Application Packaging, Servlets, The Servlet API, The User Experience, Building a Web App with Continuity, Framework for Building Web Applications, Building Robust Web Apps.

Unit VI **Enterprise JavaBeans:** Introduction, Enterprise Programming, What are EJBs? Session EJBs, EJB Clients, Entity EJBs, Message Driven Beans, EJB Transactional Characteristics, EJB Security, Best Practices for Designing EJB-Based Application.

Reference Books:

- Wigglesworth & McMillan – JavaTM Programming Advanced Topics, 3rdEdn., India Edition, Thomson Education, New Delhi, 2007
- Uttam K. Roy- Advanced Java Programming, Oxford University Press, 2015

OR

LANGUAGE ELECTIVE-II [ECMCA401B]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100	**Pass Marks (SIA:17 + ESE:28)=45**

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):

*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

B. ADVANCE DOT NET PROGRAMMING

Theory: 45 Lectures; Tutorial: 15 Hours

Unit I Windows application programming: Introduction, Controls, Menus and Context Menus, Dialog, Form Inheritance, Other Misc. Topics.

Unit II Database Connectivity Using ADO.NET: Overview of Database & Database Server, Introduction of SQL Server 2008, DML & DDL Query. Join, Trigger, Procedure & function. Ado.NET API. Connected Layer. Connection, Command & Data Reader. Disconnected Layer. Adaptor, Data Set, Table, Row & Column. ODBC, OLEDB, Oracle Client. Connectivity with Oracle, Access, Excel & MySql. Connection Pooling.

Unit III **Web Application Programming Using Asp.NET :** Web application architecture, Static Web Page, Application Life Cycle ,Dynamic Page, Page Life Cycle & Event Method, Html & Server Control ,Server Control Event Life Cycle, State Management, Url Rewriting, Hidden Form Field, View State, Session, Cookies & Application. Global class & Event Method.

Uploading & Downloading, Page Directives, Data Source, Sql Data Source, Xml Data Source, Site Map Data Source & Object Data Source. Data Control, Data List, Details View, Form View, Grid

View, List View& Repeater. Validation Control, Compare Validator, Custom Validator, Range Validator, Regular Expression Validator & Validation Summary. Navigation, Menu, Site Map Path & Tree View.

Login Control & Membership, Login, Login Name, Login Status, Login View, Password Recovery, Change Password, Create User Wizard. Ajax Extensions, Script Manager, Update Panel, Update Progress & Timer.

Globalization & localization. Master Page & Style them. Mail, SMTP, POP3

Unit IV **MVC3:** Introduction to MVC3, The Model-View-Controller Pattern, Differences Between, MVC and Web Forms Applications, Building a Simple MVC Application with Visual Studio Working with Controllers and Actions.
Introduction to Controllers: Using a Controller to Manage the Application, Controller Actions, Returning Action Results.

Creating MVC Models: Data and Business Rules in MVC Applications, Creating a Custom Data Model.

Data Validation and Data Annotations, Using MVC Views, Views in ASP.NET MVC, Creating Views, Adding Content to a View, HTML Helpers and Action Filters ,Using HTML Helpers in MVC ,Creating a Custom Helper Using Action Filters, Creating a Custom Filter , Routing and URLs , Customizing Application URLs , Creating Route Constraints , Routinand Web Forms Using MVC and AJAX and JQuery ,Integrating Client-Side Script with MVC Using the MVC AJAX Helpers, Working with JSON Data.

Unit V **Networking:** Introduction of Networking, Understanding socket and port, Tcp Client & Tcp Listener, TCP/IP based networking, HTTP based networking, Http Request, Http Response

Unit VI **Remoting:** Application Domain, Remotable & Non Remotable, Object, Marshal-By-Reference, Server Activated Object (SAO), Single Call, Singleton, Client Activated Object , Channels, Tcp Channal, Service Configuration & Hosting

Unit VII **LINQ:** Introduction to LINQ, LINQ expressions, Using via extension methods, Filtering, Sorting, Aggregation, Skip and Take operators, Joins, Extension methods , Object initialization syntax ,Anonymous types , Lambda expressions, Deferred Execution, Benefits and drawbacks , IEnumerable vs IQueryable , Using acrosstiers, Data Projection , Single result value , Existing types, Anonymous types , Grouping, LINQ to XML, New XML classes , Generating XML, Querying XML, Using data projection, Combining with XPath , LINQ to SQL, Attributes and mapping, Creating a Data Context, Deferred loading, Saving changes, Inserts and deletes , Transactions.

Reference Books:

- Pro ASP.NET MVC5, 5th edition, Adam Freeman, Apress publication
- .NET 4.5 programming (6-in-1) Black book, Dreamtech Press.

II. CORE COURSE [CCMCA402]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (SIA:17 + ESE:28)=45

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):

*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

SOFT COMPUTING & NEURAL NETWORK Theory: 45 Lectures; Tutorial: 15 Hrs

Unit I Introduction to Artificial Intelligence System, Neural Network, Fuzzy Logic & Genetic Algorithm. Fuzzy Set Theory: Fuzzy versus Crisp, Crisp Set, Fuzzy Set, Crisp Relation, Fuzzy Relations.

Unit II **Fuzzy System:** Crisp Logic, Predicate Logic, Fuzzy Logic, Fuzzy Rule Based System, Defuzzification Methods, Applications.

Unit III Genetic Algorithms, Basic Concepts, Creation of offspring, Working Principle, Encoding, Fitness Function, Reproduction.

Unit IV Genetic Modelling, Inheritance Operations, Cross Over, Inversion and Deletion, Mutation Operator, Bit Wise Operators, Generation Cycle, Convergence Of Genetic Algorithm, Application, Multi-Level Optimization, Real Life Problems, Difference And Similarities Between GA And Other Traditional Methods, Advanced in GA.

Unit V Fundamentals Of Neural Networks, Basic Concepts Of Neural Networks, Human Brain, Model Of An Artificial Neuron, Neural Network Architectures, Characteristics Of Neural Networks, Learning Method, Taxonomy Of Neural Network Architectures, History Of Neural Network Research, Early Neural Network Architectures, Some Application Domains.

Unit VI Back Propagation Network Architecture Of Back Propagation Network, Back Propagation Learning, Illustration, Applications, Effects Of Tuning Parameters Of The Back Propagation Neural Network, Selection Of Various Parameters In BPN, Variations Of Standard Back Propagation Algorithm.

Unit VII Associative Memory And Adaptive Resonance Theory, Autocorrelators, Hetrocorrelators, Multiple Training Encoding Strategy, Exponential BAM, Associative Memory For Real For Coded Pattern Pairs, Applications, Introduction To Adaptive Resonance Theory, ARTI Character Recognition Using ARTI.

Reference Books:

- Neural network, Fuzzy logic and genetic algorithm, Synthesis and application, S.Rajasekarn, G.A. VijyalakshmiPai (PHI)
- Neuro-Fuzzy and Soft computing, J.S.R.JANG,C.-t.Sun, E.MIZUTANI(PHI)

III. CORE COURSE [CCMCA403]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 **Pass Marks (SIA:17 + ESE:28)=45**

Instruction to Question Setter for
Mid Semester Examination (MSE):
*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):
*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*
The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

ENTERPRISE RESOURCE PLANNING **Theory: 45 Lectures; Tutorial: 15 Hours**

Unit-I **Introduction to ERP:** Evolution of ERP, What is ERP, Reasons for the growth of the ERP market, Advantages of ERP, Reasons of Failure.

Unit-II **Enterprise- An Overview:** Integrated Management information, Business Modeling, Integrated Data Model.

Unit-III **ERP and Related Technologies:** BRP (Business Process Reengineering), MIS (Management Information System), DSS (Decision Support System), EIS (Executive Information system), OLAP, Supply Chain Management.

Unit-IV **A Manufacturing Perspective:** ERP, CAD/CAM, MRP (Material Requirement Planning), Bill of Material, Closed loop MRP, MRP-II, DRP (Distributed Requirement Planning), Product Data Management, Data Management,

Unit-V **Benefits of PDM:** ERP Units, Finance, Plant Maintenance, Quality Management, Material Management.

Unit-VI **Benefits of ERP & ERP Market:** SAP, BAAN, Oracle Corporation, People Soft.

Unit-VII **Vendors, Consultants &Users's:** In – house Implementation – pros & cons, Vendors, Consultants, End-users. ERP Implementation Life Cycle, ERP Case Studies.

Text Book:
- Enterprise Resource Planning by Alexis Leon TMH Fourth Reprint 2001.

IV. CORE COURSE [CCMCA404]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 **Pass Marks (SIA:17 + ESE:28)=45**

Instruction to Question Setter for
Mid Semester Examination (MSE):
*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):
*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*
The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

SOFTWARE ENGINEERING **Theory: 45 Lectures; Tutorial: 15 Hours**

Unit –I **Software Engineering Basics :** Evolving Role of Software, Changing Nature of Software, Legacy Software, Software Engineering – A layered Technology.

Unit -II Process Frame work, Process Patterns, Process Models, Waterfall Model, Incremental Process Models, Evolutionary Process Models, Specialized Process Models, Unified Process Model, Agile Process Model.

Unit –III **Requirement Engineering:** An approach to design and construction, Requirement specification, Initiating the Requirement Engineering Process, Functional and Non Functional Requirements, Developing Use case, Building the Analysis Model, Negotiating Requirements, Validating Requirements.

Unit –IV **Design Engineering:** Design Process Approaches, Design Concepts, Quality, Design Models, Pattern Based Software Design. Cohesion and Coupling, Software Design Object oriented vs Function Oriented designs. User Interface Design –Input and Output Interfaces, Component –Based GUI Development, a User Interface design Methodology

Unit –V **Tasting Strategies and Testing Tactics:** Strategic Approach to software Testing, Test Strategies for conventional and Object Oriented Software, Validation Testing System Testing, White Box Testing, Basis Path Testing Control Structure Testing, Black Box Testing, Object Oriented Testing Methods. Test coverages, Test plan

Unit –VI **Metric for process and Estimation Techniques:** Process metrics, Software Measurement, Software Project Estimation, Decomposition Techniques, Empirical Estimation Models, Estimation for Object Oriented Projects Specialized Estimation Techniques, COCOMO models.

Unit –VII Software Quality and Configuration Management: Quality Concepts, Software Quality Assurance, Software Reliability, Software Configuration Management, SCM Repository, SCM Process.

Computer Aided Software Engineering (CASE) Tools, Types of CASE tools.

Current trends in Software Engineering – Software engineering for projects and products.

Introduction to web engineering and Agile process.

Text Book:

- Roger S. Pressman – "Software Engineering – A Practitioner's Approach", TMH, 7th Ed.

Reference Books:

- R. Fairley – " Software Engineering – Concepts –TMH, 2nd Ed.
- Rajib Mall, "Software Engineering" PHI.
- P. Jalote " An Integrated Approach to Software Engineering", Narosa.
- R.Khurana, "Software Engineering", Vikas Publishing House.
- Ian Sommerville – "Software Engineering", 7thEdn., Pearson Education.

V. CORE COURSE [CPMCA405]: (Credits: Practical -04)

Marks: 30 (SIA: 20 Exp. + 10 Viva) + 70 (ESE Pr: 6Hrs)=100	**Pass Marks (SIA:17 + ESE:28)=45**

Instruction to Question Setter for
Semester Internal Assessment (SIA):
*There will be **two** questions in Practical Examination of 3Hrs.out of which **any one** is to be answered. The questions in practical examination will be of equal to 20 marks and will be so framed that the students are able to answer them within the stipulated time. 10 marks will be awarded on the performance in viva voce.*

End Semester Practical Examination (ESE Pr):
***Lab**: There will be **four** questions in Practical Examination of 3Hrs.out of which **any two** are to be answered. Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.*

The questions in practical examination will be of equal to 50 marks and will be so framed that the students are able to answer them within the stipulated time. 10 marks will be awarded on the performance in viva voce whereas 10 marks will be awarded on cumulative assessment which is further subdivided as 5 marks for Practical record and 5 marks for Attendance.

***Assignment**: The Assignment should be hand written (preferred)/ typed in A4 size paper. First three pages (i.e. front page + acknowledgment + index) & Bibliography may be printout. No Xerox copy is allowed.*

***Marks Distribution**:*

LAB(Experiment + Answer script)	*= 50 marks*
Assignment/ Project + Attendance	*=10 marks*
Viva-voce	*=10 marks*

Note:
(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks)..

HTML5, CSS, CASE TOOLS LAB **Practical: 60 Hours**

Unit I: Introduction: HTML tags, pairs, singular tags, commands lists, graphics, tables, linking documents, images as hyperlinks, frames.
Unit II: Introduction to HTML5: The canvas, Geolocation, Audio and video, Forms, Location storage, Web workers, Web applications, Microdata, Creating and accessing a canvas, Writing text to canvas, Using paths, Filling areas, Clip method, The is Point In Path method, Working with curves, Manipulating images, Editing at pixel level, Advanced graphical Effects, Transformations.
Unit III: HTML5 audio and video: About codecs, The <audio> elements, Supporting non-HTML5 browsers, The <video> element.
Unit IV: Other HTML5 features: Geolocation and the GPS service, Local storage, Web workers, Offline web application, Drag and Drop, Cross document Messaging, Microdata, HTML5 tags.
Unit V: Introduction to CSS: Importing style sheet, Using semicolons, CSS rules, Style types, CSS selectors, CSS cascade, Measurements, Fonts and typography, Managing text styles, CSS colours, Pseudo classes, Shorthand rules, Box model and layout.
Unit VI: Advanced CSS with CSS3: Attributes Selectors, Box sizing property, CSS3 background, Multiple backgrounds, CSS3 borders, Box shadows, Element overflows, Multicolumn layout, Colours and opacity, Text Effects, Web fonts, Google web fonts, Transformations, 3D transformations, Transitions.
Unit VII: CASE tools: UML DIAGRAM, ACTIVITY, SEQUENCE, COLLABORATION, DEPLOYMENT, STATE MACHINE, CLASS, OBJECT, DFD. ETC.

Reference Books:

- David karlins, Dreamweaver CSS.5 Mobile and Web Development with HTML5, CSS3, and JQuery, SPD
- Richard C.LEE, William M. tepfenhart, UML and C++, PHI

VI. GENERIC/ DISCIPLINE CENTRIC ELECTIVE-II LANGUAGE ELECTIVE-II LAB [EPMCA406A]: (Credits: Practical-04)

Marks: 30 (SIA: 20 Exp. + 10 Viva) + 70 (ESE Pr: 6Hrs)=100 **Pass Marks (SIA:17 + ESE:28)=45**

Instruction to Question Setter for
Semester Internal Assessment (SIA):
*There will be **two** questions in Practical Examination of 3Hrs.out of which **any one** is to be answered. The questions in practical examination will be of equal to 20 marks and will be so framed that the students are able to answer them within the stipulated time. 10 marks will be awarded on the performance in viva voce.*

End Semester Practical Examination (ESE Pr):
***Lab**: There will be **four** questions in Practical Examination of 3Hrs.out of which **any two** are to be answered. Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.*

The questions in practical examination will be of equal to 50 marks and will be so framed that the students are able to answer them within the stipulated time. 10 marks will be awarded on the performance in viva voce whereas 10 marks will be awarded on cumulative assessment which is further subdivided as 5 marks for Practical record and 5 marks for Attendance.

***Assignment**: The Assignment should be hand written (preferred)/ typed in A4 size paper. First three pages (i.e. front page + acknowledgment + index) & Bibliography may be printout. No Xerox copy is allowed.*

***Marks Distribution**:*

LAB(Experiment + Answer script)	*= 50 marks*
Assignment/ Project + Attendance	*=10 marks*
Viva-voce	*=10 marks*

Note:
(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

A. ADVANCE JAVA PROGRAMMING LAB **Practical: 60 Hours**

1. Programming with the Java Tools Javaap, Jcmd, Jhat, Jdb, Jar
2. Java API Components AWT to create Components, Containers- window, frame, dialog, panel.
3. Swing J components Class, Dialog boxes, Panels, Labels, Checkboxes, Menus, Toolbars and Actions, Sliders, Spinners, Progress bars, Scrollbars, List and Combo boxes,
4. Text-entry Components,
5. Colour and File Choosers,
6. Tables and Trees, Printing with 2D API, Java Print Service API.
7. JDBC Drivers for RDBMS, SQL to Java type Mapping, Use of **java.sql**
8. XML structure, XML example document, Node interface, Document Node Methods, Element Node properties, Text Nodes. Parsing an XML Document with DOM tree, Generating an XML document with DOM, Validating XML Documents using DTD and XML schema, Transforming XML using XSLT.
9. Introduction, Working with URL connections, URL encoders and decoders.
10. Application Packaging, Servlets, The Servlet API, The User Experience, Building a Web App with Continuity, Framework for Building Web Applications, Building Robust Web Apps.
11. Developing a simple Bean, create a source file for the new Bean, Create an instance of the colour Bean, Bean interfaces, Message Driven Beans, EJB-Based Application.

Reference Books:

- Wigglesworth & McMillan – JavaTM Programming Advanced Topics, 3rdEdn., India Edition, Thomson Education, New Delhi, 2007
- Uttam K. Roy- Advanced Java Programming, Oxford University Press, 2015
- Herbert Schildt The Complete Reference Java 2, 4thEdn, TMH.

OR

LANGUAGE ELECTIVE-II LAB [EPMCA406B]: (Credits: Practical-04)

Marks: 30 (SIA: 20 Exp. + 10 Viva) + 70 (ESE Pr: 6Hrs)=100	**Pass Marks (SIA:17 + ESE:28)=45**

Instruction to Question Setter for
Semester Internal Assessment (SIA):
*There will be **two** questions in Practical Examination of 3Hrs.out of which **any one** is to be answered. The questions in practical examination will be of equal to 20 marks and will be so framed that the students are able to answer them within the stipulated time. 10 marks will be awarded on the performance in viva voce.*

End Semester Practical Examination (ESE Pr):
***Lab**: There will be **four** questions in Practical Examination of 3Hrs.out of which **any two** are to be answered. Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.*

The questions in practical examination will be of equal to 50 marks and will be so framed that the students are able to answer them within the stipulated time. 10 marks will be awarded on the performance in viva voce whereas 10 marks will be awarded on cumulative assessment which is further subdivided as 5 marks for Practical record and 5 marks for Attendance.

***Assignment**: The Assignment should be hand written (preferred)/ typed in A4 size paper. First three pages (i.e. front page + acknowledgment + index) & Bibliography may be printout. No Xerox copy is allowed.*

***Marks Distribution**:*

LAB(Experiment + Answer script)	*= 50 marks*
Assignment/ Project + Attendance	*=10 marks*
Viva-voce	*=10 marks*

Note:
(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

B. ADVANCE DOT NET PROGRAMMING LAB **Practical: 60 Hours**

1. Controls, Menus and Context Menus, Dialog, Form Inheritance, Other Misc. Topics.

2. SQL Server 2008, DML & DDL Query. Join, Trigger, Procedure & function

3. Ado.NET API. Connected Layer Connection, Command & Data Reader.

4. Disconnected Layer Adaptor, Data Set, Table, Row & Column. ODBC, OLEDB, Oracle Client. Connectivity with Oracle, Access, Excel & My Sql.

5. Static Web Page, Application Life Cycle, Dynamic Page, Page Life Cycle & Event Method, Html & Server Control ,Server Control Event Life Cycle, State Management, URL Rewriting, Hidden Form Field, View State, Session, Cookies & Application. Global class & Event Method.

6. Data Source, Sql Data Source, Xml Data Source, Site Map Data Source & Object Data Source. Data Control, Data List, Details View, Form View, Grid View, List View& Repeater.

7. Login, Login Name, Login Staus, Login View, Password Recovery, Change Password, Create User Wizard. Ajax Extensions, Script Manager, Update Panel, Update Progress & Timer Globalization & localization. Mail, SMTP, POP3

8. Forms Applications , Building a Simple MVC Application with Visual Studio , Working with Controllers and Actions, Introduction to Controllers Using a Controller to Manage the Application , Controller Actions , Returning Action Results , Creating MVC Models, Views, Views in ASP.NET MVC, Creating Views, Adding Content to a View

9. Creating a Custom Helper, Using Action Filters, Creating a Custom Filter, Routing and URLs.

10. Using MVC and AJAX and JQuery, Integrating Client-Side Script with MVC , Using the MVC AJAX Helpers Working with JSON Data

11. Networking port TCP Client & TCP Listener TCP/IP based networking HTTP based networking Http Request Http Response

References:

- Pro ASP.NET MVC5, 5th edition, Adam Freeman, A press publication.
- .NET 4.5 programming (6-in-1) Black Book, Dreamtech Press.

VII. PROFESSIONAL ELECTIVE-I [PRMCA407A]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 **Pass Marks (SIA:17 + ESE:28)=45**

Instruction to Question Setter for
Mid Semester Examination (MSE):
*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):
*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*
The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

A. CLOUD COMPUTING **Theory: 45 Lectures; Tutorial: 15 Hours**

Unit I **Introduction**: Essentials, Benefits and need for Cloud Computing - Business and IT Perspective - Cloud and Virtualization - Cloud Services Requirements - Cloud and Dynamic Infrastructure - Cloud Computing Characteristics Cloud Adoption.
Unit II **Cloud Models**: Cloud Characteristics - Measured Service - Cloud Models - Security in a Public Cloud Public versus Private Clouds - Cloud Infrastructure Self Service.
Cloud as a Service: Gamut of Cloud Solutions - Principal Technologies - Cloud Strategy Cloud Design and Implementation using SOA - Conceptual Cloud Model - Cloud Service Defined.
Unit III **Cloud Solutions**: Cloud Ecosystem - Cloud Business Process Management - Cloud Service Management - Cloud Stack - Computing on Demand (CoD) – Cloud sourcing.
Unit IV **Cloud Offerings & Management** : Information Storage, Retrieval, Archive and Protection - Cloud Analytics Testing under Cloud - Information Security - Virtual Desktop Infrastructure - Storage Cloud. Resiliency – Provisioning - Asset Management - Cloud Governance - High Availability and Disaster Recovery - Charging Models, Usage Reporting, Billing and Metering.
Unit V **Cloud Virtualization Technology**: Virtualization Defined - Virtualization Benefits - Server Virtualization - Virtualization for x86 Architecture - Hypervisor Management Software - Logical Partitioning (LPAR) - VIO Server - Virtual Infrastructure Requirements.
Cloud Virtualization: Storage virtualization - Storage Area Networks - Network-Attached storage - Cloud Server Virtualization - Virtualized Data Center.
Unit VI **Cloud and SOA**: SOA Journey to Infrastructure - SOA and Cloud - SOA Defined - SOA and IaaS - SOA-based Cloud Infrastructure Steps - SOA Business and IT Services.
Unit VII **Cloud Infrastructure Benchmarking**: OLTP Benchmark - Business Intelligence Benchmark - e-Business Benchmark - ISV Benchmarks - Cloud Performance Data Collection and Performance Monitoring Commands - Benchmark Tools.

Text Book:

- K. Saurabh– Cloud Computing, 2nd Edn, Wiley India, 2014.

Reference Books:

- T. Velte, A. Velte and R. Elsenpeter-Cloud Computing: A Practical Approach, McGraw Hill, India.
- R. Buyya, J. Broberg-Cloud Computing: Principles and Paradigms, Wiley.
- Derrick Rountree , LLeanacastrillo – The Basicsof Cloud Computing, Syngress
- ArshdeepBahga, Vijay Madisetti – Cloud Computing: A Hands onn Approach, Universities press

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OR

PROFESSIONAL ELECTIVE-I [PRMCA407B]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (SIA:17 + ESE:28)=45

Instruction to Question Setter for
Mid Semester Examination (MSE):
*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):
*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*
The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

B. DATA WAREHOUSING AND DATA MINING

Theory: 45 Lectures; Tutorial: 15 Hours

Unit –I Introduction, Motivation behind Data mining, Why is it important, Data warehousing: Introduction, Data Warehousing Definition, Multidimensional Data Model, OLAP Operation, warehouse Scheme, Data Warehousing Architecture, Metadata, OLAP ENGINE, Data warehouse Backend Process.
Unit –II Data Mining: Introduction, Data Mining Definition, KDD Vs, Data Mining, DBMS Vs DM, other related area, DM Technique, Other Mining Problem, Issue and challenges are in DM, DM Application area, DM Application, Case Study.
Unit –III Mining Association Rule in Large Database: Introduction, What is an Association Rule, Method to discover association Rule, A Priori Algorithm, Partition Algorithm, Pinear-Search algorithm, Dynamic item set Counting Algorithm, FP Tree Growth.
Unit –IV Algorithm, Discussion and Different Algorithm, Generalized, Association Rules with Item.
Unit –V Constraints. Clustering Techniques: Introduction, Clustering Paradigram, Partition Algorithm, K-Medoid Algorithm, CLARA, CLARANS, Heirer Chial Clustering, DBSCAN, BIRCH, CURE, Categorical Clustering Algorithms, STIRR, ROCK, CACTUS.
Unit –VI Decision Trees: Introductions, Tree Construction Principle, Best split splitting Indices, Splitting criteria, Decision Tree Construction with Presenting, Prunesing Technique, Integration of Pruning Technique and Construction.
Unit –VII Data Warehousing: Overview, Definition, Delivery Process, Multi-Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Mining.

Text Book

A.K. Pujari, A Data Mining Technique, University Press (India) Limited, 2001

Reference Book

- A Hand and M. Kamber, ?Data Mining Concept and Technique? , Morgan Kauffman Publishers, Else River India, New Delhi, 2003.
- RecherdJ, Roiger and Michance W. Creatz, Data Mining: A tutorial Based Primer, Addision Wesley, 2003.
- M.H. Dienham, Data Mining: Introductory and Advanced Topics, Pentice Hall 2003.

OR

PROFESSIONAL ELECTIVE-I [PRMCA407C]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (SIA:17 + ESE:28)=45

Instruction to Question Setter for
Mid Semester Examination (MSE):
*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):
*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*
The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

C. PARALLEL & DISTRIBUTED ALGORITHM

Theory: 45 Lectures; Tutorial: 15 Hours

Unit – I Introduction, architectures and languages for parallel and distributed processing.

Unit – II Abstract models of parallel computing, PRAM (Parallel Random Access Machine), Distributed and parallel algorithms and their complexity. Interaction between processes, communication, synchronization.

Unit – III Topologies, synchronous and asynchronous algorithms. Algorithms for parallel sorting. Algorithms for parallel searching.

Unit – IV Parallel matrix operations. All prefix sums and their applications. Graphs and list algorithms. Synchronization algorithms and tasks.

Unit – V Mechanisms and language constructs for synchronization. Recently published algorithms.

Reference Books:

- Parallel and Distributed Computing Architecture and Algorithm, S.K. Basu, PHI

OR

PROFESSIONAL ELECTIVE-I [PRMCA407D]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100	Pass Marks (SIA:17 + ESE:28)=45

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):

*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

D. NUMERICAL AND STATISTICAL METHODS

Theory: 45 Lectures; Tutorial: 15 Hours

NUMERICAL METHODS

Unit-I **Errors in Numerical calculations**: Errors & their computation-absolute, relative & percentage.

Solution of algebraic & transcendental equations: Introduction, Bisection method, Iterative method, False position method, Newton's Raphson method, Lin Bairstows method. Error analysis & convergence study.

Unit-II **Interpolation with equal & unequal intervals:** Introduction, finite differences-forward, backward & central, difference tables, differences of polynomials, Newton's formula for interpolation, Gauss's central difference interpolation formula, divided difference & their properties-Newton's divided differences formula, Lagrange's interpolation formula, Inverse interpolation.

Unit-III **Numerical differential & integration**: Introduction, derivatives using forward & backward difference formula, Numerical Integration-Trapezoidal rule, Simpson's 1/3 & 3/8 rules Weddle's rule.

Unit-IV **Numerical solution of linear system of equations**: Direct method-Gauss elimination, Guass-Jordan, LU decomposition methods. Iterative methods-Gauss-Jacobi & gauss Seidel methods.

Unit-V **Numerical solution ordinary differential equations:** Taylor series method, Euler's method, Modified Euler's method, Runga-Kutta methods of 2^{nd}& 4^{th} order, Predictor-corrector methods (Milne's method and Adam's methods).

STATISTICAL METHOD

Unit-VI **Concept of Probability:** Experiment and Sample Space, Events and Operations with Events, Probability of an Event, Basic probability Rules, Application of Probability Rules, Conditional Probability.

Random Variables: How Random Variable Arise, Probability Distribution of a Random Variable, Mean or Expected Value of a Random Variable, Probability Histogram value of a Random Variable, Variance and Standard Deviation of a random Variable.

Unit-VII **Binomial Experiments:** Structure of a Binomial Experiment, Binomial Probability Distribution, Use of Binomial Probability Table.

Normal Curve and Normal Distribution: Motivation behind a Normal Curve, properties of a Normal curve, Normal probability Distribution, Areas under a Normal Curve.

Application of the Normal Distribution: Approximating a Binomial Probability, the normal Theorem and the Central Limit Theorem.

Reference:-

- Introductory methods of numerical analysis, S.S Sastry (PHI)
- An introduction to numerical analysis, Kendall E.Atkinson (Wiley)
- Numerical analysis, Dr.B.S Goyel, Dr.S.K.Mittal,(Pragati Prakashan)
- Numericals and statistical Techniques, Quazishoebahmed et.al., Ane Books Pvt. Ltd.

OR

PROFESSIONAL ELECTIVE-I [PRMCA407E]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100	**Pass Marks (SIA:17 + ESE:28)=45**

Instruction to Question Setter for
Mid Semester Examination (MSE):
*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):
*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*
The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

E. DISTRIBUTED DATABASE ALGORITHM

Theory: 45 Lectures; Tutorial: 15 Hours

Unit – I **Introduction to Distributed Data Processing:** Advantages of DDB's, Problem areas.

Unit – II **Distribute Database Management System Architecture:** DBMS Standardization, Architectural models for DDBMS Distribute DBMS Architecture.

Unit – III **Distributed Database Design:** Design Strategies, Distribution design issues, Fragmentation, Allocation.

Unit – IV **Semantic Data Control :** view management, data security, Integrity control.

Unit – V **Query processing and Optimization:** Quarry Processing Problem, Characterization of Query Processors, Layers of query Processing, Query decomposition, Query Optimization, Centralized query optimization, Join ordering in fragment queries, Distributed Query Optimization Algorithms.

Unit –VI **Transaction Management and Concurrency Control:** Introduction, Properties, Serializability Theory, Locking Based Concurrency control Algorithm Time Stamp based concurrency control Algorithms, Dead Lock management.

Unit – VII **Recovery and Reliability:** Failures and fault tolerance in distributed system, Distributed & local reliability protocol, Sits failures, network partitioning.

Text Book:

- M. Tamer Ozsee, Patric Valduriez - Principle of Distributed Database Systems 2nd Edn., Pearson Education Asia,2001.
- Distributed Database principles & system, Stefano Ceri, Gluseppe Pelagatti(McGraw Hill)

OR

PROFESSIONAL ELECTIVE-I [PRMCA407F]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100	**Pass Marks (SIA:17 + ESE:28)=45**

Instruction to Question Setter for
Mid Semester Examination (MSE):
*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):
*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*
The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

F. INTERNET OF THINGS **Theory: 45 Lectures; Tutorial: 15 Hours**

Unit I **Introduction and Concepts :** Definition and Characteristic, Physical Design- Things in IoT, IoT Protocols; Logical Design- IoT Functional Blocks, IoT Communication Models and APIs; IoT Enabling Technologies- Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems; IoT Levels & Deployment Templates.

Unit II Introduction, Home Automation- Smart Lighting & Appliances, Intrusion Detection, Smoke/Gas Detectors; Cities- Smart Parking, Smart Lighting & Roads, Structural Health Monitoring, Surveillance, Emergency Response; Environment- Weather Monitoring, Air Pollution Monitoring, Noise Pollution Monitoring, Forest Fire Detection, River Floods Detection; Energy- Smart Grids, Renewable energy Systems, Prognostics;

Retail- Inventory Management, Smart Payments, Smart Vending Machines; Logistics- Route Generation & Scheduling, Fleet Tracking, Shipment Monitoring, Remote Vehicle Diagnostics; Agriculture- Smart Irrigation, Green House Control; Industry- Machine Diagnosis & Prognosis, Indoor Air Quality Monitoring; Health & Lifestyle- Health & Fitness Monitoring, Wearable Electronics;

Unit III **IoT & M2M:** Introduction, M2M, Differences between Iot and M2M, SDN (Software Defined Networking) and NFV (Network Function Virtualization) for Iot

Unit IV **IoT System Management with NETCONF-YANG:** Need for Iot Systems Management, Simple Network Management Protocol (SNMP)- Limitations; Network Operator Requirements, NETCONF, YANG, NETOPEER.

IoT Platforms Design Methodology: Introduction, IoT Design Methodology, IoT System for Weather Monitoring

Unit V **IoT Physical Devices & Endpoints:** Basic Building Block of IoT Device, Exemplary Device, Linux on Raspberry Pi, Raspberry Pi Interfaces- Serial, SPI, I2C; Programming Raspberry Pi

with Python- Controlling LED with Raspberry Pi, Interfacing LED & Light Sensor(LDR) and Switch with Raspberry Pi; Other IoT Devices- pc Duino, Beagle Bone Black, Cubie board

Unit VI IoT Physical Servers and Cloud Offerings: Cloud Storage Models & Communication APIs, WAMP Auto Bahn for IoT, Xively Cloud for IoT, Python Web Application Framework- Django Architecture, Starting Development with Django; Designing a RESTful Wen API, Amazon Web Services for IoT- EC2, Auto Scaling, S3, RDS, Dynamo DB, Kinesis, SQS, EMR; Sky Net IoT Messaging Platform.

Unit VII Illustrating IoT Design : Introduction, Home Automation- Smart Lighting, Home Intrusion Detection; Cities- Smart Parking; Environment- Weather Monitoring System, Weather Reporting Bot, Air Pollution Monitoring, Forest Fire Detection; Agriculture- Smart Irrigation; Productivity Application- Iot Printer.

Reference Books:

- Arshdeep Bahga & Vijay Madisetti- Internet of Things: A hands-on Approach, 2015, Universities press.

VIII. PROFESSIONAL ELECTIVE-I [PRMCA408]: (Credits: 02)

Total Marks = 50	**Pass Marks =23**

Guidelines to Examiners for
End Semester Examination (ESE):

Overall project dissertation may be evaluated under the following heads:

- *Motivation for the choice of topic*
- *Project dissertation design*
- *Methodology and Content depth*
- *Results and Discussion*
- *Future Scope & References*
- *Participation in Field Training Programme*
- *Application of Research technique in Data collection*
- *Report Presentation*
- *Presentation style*
- *Viva-voce*

Distribution of Marks:

Project Report	(Total = 30 marks)
1. Formulation of Project Design	= 10
2. Implementation of the Design	= 10
3. Presentation of Report	= 10
G.D. and Viva Voce Examination	(Total = 20 marks)
1. Presentation & Viva	= 10
2. Marks given by Internal Supervisor (based on cumulative assessment)	= 10

Note: There will be only one internal examination of 50 mark for this paper.

EVALUATION OF MINI PROJECT-I (SRS & DESIGN):

This paper is meant for realising the basic principle of software engineering and become confident enough to implement principle and techniques of software engineering. Here it is expected from the students that, while studying software engineering in detail and having hands on programming related to software engineering in Semester-IV, they are now ready to implement Software Requirement Specification (SRS) and Designing part over the topic of their choice.

Every student will have to do Mini Project by selecting any topic of his choice under the supervision of internal guide/teacher and to present a report for evaluation prior to the End Semester University Examination. The distribution of marks will be as given above:

Selection of Internal Guide:
The student has to approach to faculty members for his/her consent for internal guide.

Instruction to the guide:

Each faculty member will give consent for internal guide to a maximum no. of candidates as per following condition:

Maximum No. of candidates/Faculty member = Total No. of Students/ Total No. of Faculty members.

SEMESTER V 8 Papers

I. GENERIC/ DISCIPLINE CENTRIC ELECTIVE-III LANGUAGE ELECTIVE-III [ECMCA501A]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 **Pass Marks (SIA:17 + ESE:28)=45**

Instruction to Question Setter for
Mid Semester Examination (MSE):
*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):
*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*
The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

A. PHP, JAVA SCRIPT & JQUERRY PROGRAMMING

Theory: 45 Lectures; Tutorial: 15 Hours

Unit I **PHP:** Comments, Syntax, Variables, Constants, Commands, Scope of variable. Expressions, Operators, Conditional statement, Looping constructs, Casting, Dynamic linking. PHP functions, Including and Requiring files, PHP version compatibility, PHP objects. Numerically indexed and Associative arrays, Foreach loop, Array functions.

Using printf –precision setting, string padding, using sprint;, Date and Time functions, File handling.

Unit II **Introduction to MySQL:** MySQL basics, Database design and terms, Data types, Functions, Accessing MySQL via command line, Indexes, Accessing MySQL via php My Admin, Normalization, Relationship, Transactions, Backing up and restoring.

Accessing MySQL using PHP: Process, Connecting to MySQL database, Deleting a record, Displaying form, Querying database, Running program, Table operation-creation, description, drop; Operations on data- addition, retrieving, updating, deletion; Preventing hacking attempts, Using mysqli procedurally.

Unit III **Form handling:** Building form, Retrieving submitted data, Various attributes in HTML5- autocomplete, autofocus, placeholder, required, override, width and height, form, list, min and max, step; Colour input type, Number and range input types.

Cookies, Sessions and Authentication: Using cookies in PHP, HTTP authentication, Using sessions.

Unit IV **Exploring JavaScript:** JavaScript and HTML text, Using comments, Semicolon, Variables, Operators, Variable typing, Functions, Global variables, Using DOM, Using console.log, Using alert, Writing into elements, Using documents. write, Expressions, Literals, Variables, Operators, The with statement, Using onerror, Using try…catch, Conditional statements, Looping constructs, Explicit casting, Functions, Objects, Arrays.

Unit V **JAVASCRIPT and PHP validation:** Validating user input, Regular Expressions, Meta characters and Fuzzy character matching, Parentheses grouping, Character class, Negation, General modifiers, Redisplaying form after validation.

Unit VI **Accessing CSS from JAVASCRIPT:** Revisiting the get Element By Id function, Accessing CSS properties from JavaScript, Inline JavaScript, Adding new element, Using interrupts.

Unit VII **Introduction to JQUERY:** JQuery, Syntax, Selectors, Handling events, Event functions and properties, Special effects, Manipulating DOM, Dynamically applying classes, Modifying dimensions, DOM traversal, Using Ajax, Plug-ins.

Reference Book:

- Learning Php, Mysql & Java Script, Robin Nixon, O'reilly

OR

LANGUAGE ELECTIVE-III [ECMCA501B]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (SIA:17 + ESE:28)=45

Instruction to Question Setter for
Mid Semester Examination (MSE):
*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):
*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*
The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.
(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

B. PYTHON PROGRAMMING Theory: 45 Lectures; Tutorial: 15 Hours

Unit I **Introduction to Python:** The Python Language, The Python Standard Library and Extension Units, Python Implementations, Python Development and Versions, Python Resources.
The Python Language: Lexical Structure, Data types, Variables and Other References, Expression and Operators, Numeric Operations, Sequence Operations, Set Operations, Dictionary Operations, The print Statement, Control Flow Statements, Functions.
Object-Oriented Python: Classes and Instances, Special Methods, Decorators, Metaclasses.

Unit II **Exceptions:** The TRY Statement, Exception Propagation, The Raise Statement, Exception Objects, Custom Exception Classes, Error-Checking Strategies.
Units: Unit Objects, Unit Loading, Packages, The Distribution Utilities (distutils).
Core Built-ins: Built-in types, Built-in Functions, The sys Unit, The copy Unit, The Collections Unit, The Functional Unit, The Bisect Unit, The Heapq Unit, The User Dict Unit, The Optparse Unit, The Itertools Unit.
Strings and Regular Expressions: Methods of String Objects, The String Unit, String Formatting, The Pprint Unit, The Repr Unit, Unicode, Regular Expressions and the Re Units.

Unit III **File and Text Operations:** Other chapters that also deal with Files, Organization of this Chapter, File Objects, Auxiliary Unit for File I/O, The StringIO and cStringIO Units, Compressed Files, The OS Unit, File System Operations, Text Input and Output, Richer-Text I/O, Interactive Command Sessions, Internationalization.
Persistence and Databases: Serialization, DBM Unit, Berkeley DB Interfacing, The Python Database API (DBAPI) 2.0

Unit IV **Time Operation:** The Time Unit, The Date Time Unit, The Pytz Unit, The dateutil Unit, The sched Unit, Thecalender Unit, Themx.DateTime Unit.

Controlling Execution: Dynamic Execution and the exec Statement, Internal Types, Garbage Collection, Termination Functions, Site and User Customization.

Unit V **Thread and Processes:** Thread in Python, The thread Unit, The Queue Unit, The Threading Unit, Threaded Program Architecture, Process Environment, Running Other Programs, The map Unit.

Unit VI **Numeric Processing:** The Math and cMath Unit, The Operator Unit, Random and Pseudorandom numbers, The Decimal Unit, The gmpy Unit.

Array Processing: The Array Unit, Extensions for Numeric Array Computation, The Numeric Package, Array Objects, Universal Functions (ufuncs), Auxiliary Numeric Units.

Reference Books:

- 1.Alex Martelli- PYTHON IN A NUTSHELL,2ND Edition, O'REILLY, 2012
- 2.Mark Lutz-Python reference,5thedition,O'Reilly

II. CORE COURSE [CCMCA502]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 **Pass Marks (SIA:17 + ESE:28)=45**

Instruction to Question Setter for
Mid Semester Examination (MSE):
*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):
*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*
The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

ARTIFICIAL INTELLIGENCE **Theory: 45 Lectures; Tutorial: 15 Hours**

Unit – I **Introduction and Problem Solving**: Various definitions of AI, Introduction to AI applications and AI techniques, Production systems, control strategies, reasoning-forward and backward chaining.

Unit –II **Intelligent Agents**: Definition of a rational agent, reflex, model-based, goal-based and utility-based agents, the environment in which a particular agent operates.

Unit–III **Search and Game Playing**: Breadth first search, depth first search, iterative deepening, uniform cost search, hill climbing, simulated annealing, genetic algorithm search, heuristic search, Best first search, A* algorithm, AO* algorithm, Minmax & game trees, refining minmax, Alpha-Beta pruning, constraint satisfaction.

Unit–IV **Knowledge Representation**: First order predicate calculus, resolution, unification, natural deduction system, refutation, logic programming, PROLOG, semantic networks, frame system, value inheritance, conceptual dependency, Ontologies.

Unit – V **Planning**: basic representation for planning, symbolic-centralized vs reactive-distributed, partial order planning algorithm.

Unit – VI **Uncertainty**: different types of uncertainty – degree of belief and degree of truth, various probability constructs- prior probability, conditional probability, probability axioms, probability distributions, and joint probability distributions, Bayes' rule, other approaches to modelling uncertainty such as Dempster-Shafer theory and fuzzy sets/logic.

Unit –VII **Natural Language Processing**: Component steps of communication, contrast between formal and natural languages in the context of grammar, parsing and semantics.

Reference books:

- S. Russel and P.Norvig, Artificial Intelligence: A modern Approach.
- Elain Rich and Kelvin Knight, Artificial Intelligence.
- Nils J Nilson, Artificial intelligence: A new Synthesis.
- R. Akerkar, Introduction to Artificial intelligence.

III. CORE COURSE [CCMCA503]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100	Pass Marks (SIA:17 + ESE:28)=45

Instruction to Question Setter for
Mid Semester Examination (MSE):
*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):
*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*
The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

BUSINESS INTELLIGENCE **Theory: 45 Lectures; Tutorial: 15 Hours**

Unit – I Introduction, Overview of Business Intelligence, deduction, induction, machine learning and neural networks

Unit – II Introduction to analysis: quantitative methods for data analysis and knowledge extraction: classification and regression, Bayesian approaches, belief networks.

Unit – III Introduction to DSS development: Traditional system development life cycle, Alternate development methodologies, Prototyping: DSS Methodology, Tools for DSS development, DSS Technology levels and tools

Unit – IV Enterprise system : Concept and definition, Enterprise Decision Support System, Evolution of executive and enterprise information system (EIS), Characteristics and capabilities of EDSS, Comparing and integrating EIS and DSS

Unit – V BI applications: Knowledge management, Decision analysis, Investment Strategies, Marketing Campaigns

Reference Books

- Decision Support Systems and Intelligent Systems by Efrain Turbon.
- Adaptive Business Intelligence by Michalewicz Z., Schmidt M., Michalewicz M. and Chiriac
- Business Intelligence: A Managerial Approach by Turban E., Sharda R., Aronson J.E. and King, D.
- Advanced Management Information Systems by W.S. Jawadeka

IV. CORE COURSE [CCMCA504]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 **Pass Marks (SIA:17 + ESE:28)=45**

Instruction to Question Setter for
Mid Semester Examination (MSE):
*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):
*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*
The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

COMPUTER GRAPHICS **Theory: 45 Lectures; Tutorial: 15 Hours**

Unit I: Basic raster graphics Algorithms for Dawing 2D primitives: Scan converting Lines, Circles, Elipses, Filling Rectangles, Polygons, Ellipse, Pattern filling, Clipping in Raster world-(Lines, Circles, Elipses, Polygons) , Antialiasing.
Unit II: Graphics hardware and input devices: Hardcopy and display technologies, raster scan display systems, the video controller, random scan processor, input devices for operator interaction, image scanners.
Unit III: Input devices, interaction techniques and interaction tasks: interaction hardware, basic interaction tasks, composite interaction tasks.
Unit IV: Geometrical transformation;2D transformations, homogeneous coordinates and matrix representation of 2D transformation, composition of 2D transformation, the windows-to-view port transformation, efficiency.
Unit V: Matrix representation of 3D transformation, composition of 3D transformation, transformation as a change in coordinate system.
Unit VI: **Viewing in 3D:** Projections, specifying an arbitrary 3D view, examples of 3d viewing ,the mathematics of planar geometric projections ,implementing planar geometric projection and coordinate systems.
Unit VII: Achromatic and coloured light: Achromatic light chromatic colour, colour models for raster graphics, reproducing colour, using colour in computer graphics.
Unit VIII: **Visible-Surface Determination:** Functions of Two Variables, Techniques for Efficient Visible-Surface Algorithms, Algorithms for Scan-Line Determination, The z-Buffer Algorithms, List-Priority Algorithms, Area-Subdivision Algorithms, Algorithms for Octress.

Text Books

- D.Hearn and M.P.Baker, Computergraphics, Pretice-hall of india 2004
- J.D.Foley,A vann Dam, S.K. Feiner and J.F. Hughes, computer graphics: principals and practices
- D.F.Rogerrs and A.J. Admas, mathematical elements in computer graphics.

V. CORE COURSE [CPMCA505]: (Credits: Theory-04)

Marks: 30 (SIA: 20 Exp. + 10 Viva) + 70 (ESE Pr: 6Hrs)=100	Pass Marks (SIA:17 + ESE:28)=45

Instruction to Question Setter for
Semester Internal Assessment (SIA):
*There will be **two** questions in Practical Examination of 3Hrs.out of which **any one** is to be answered. The questions in practical examination will be of equal to 20 marks and will be so framed that the students are able to answer them within the stipulated time. 10 marks will be awarded on the performance in viva voce.*

End Semester Practical Examination (ESE Pr):
***Lab**: There will be **four** questions in Practical Examination of 3Hrs.out of which **any two** are to be answered. Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.*

The questions in practical examination will be of equal to 50 marks and will be so framed that the students are able to answer them within the stipulated time. 10 marks will be awarded on the performance in viva voce whereas 10 marks will be awarded on cumulative assessment which is further subdivided as 5 marks for Practical record and 5 marks for Attendance.

***Assignment**: The Assignment should be hand written (preferred)/ typed in A4 size paper. First three pages (i.e. front page + acknowledgment + index) & Bibliography may be printout. No Xerox copy is allowed.*

***Marks Distribution**:*

LAB(Experiment + Answer script)	*= 50 marks*
Assignment/ Project + Attendance	*=10 marks*
Viva-voce	*=10 marks*

Note:
(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

COMPUTER GRAPHICS LAB **Practical: 60 Hours**

Write a programme for the following in (C/C++/ JAVA)

1. For locating point
2. For drawing line
3. Implement breshnham algorithm for line drawing.
4. Implement dda algorithm for line drawing.
5. Circle drawing.
6. Elipse drawing
7. Parabola drawing.
8. Boundary fill algorithm.
9. Tranformation in 2d etc.

Reference:

- V.K. Pachghare, Comprhensive Computer Graphics, Laxmi Publication.

VI. GENERIC/ DISCIPLINE CENTRIC ELECTIVE-III LANGUAGE ELECTIVE-III LAB [EPMCA506A]: (Credits: Practical-04)

Marks: 30 (SIA: 20 Exp. + 10 Viva) + 70 (ESE Pr: 6Hrs)=100	**Pass Marks (SIA:17 + ESE:28)=45**

Instruction to Question Setter for

Semester Internal Assessment (SIA):

*There will be **two** questions in Practical Examination of 3Hrs.out of which **any one** is to be answered. The questions in practical examination will be of equal to 20 marks and will be so framed that the students are able to answer them within the stipulated time. 10 marks will be awarded on the performance in viva voce.*

End Semester Practical Examination (ESE Pr):

***Lab**: There will be **four** questions in Practical Examination of 3Hrs.out of which **any two** are to be answered. Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.*

The questions in practical examination will be of equal to 50 marks and will be so framed that the students are able to answer them within the stipulated time. 10 marks will be awarded on the performance in viva voce whereas 10 marks will be awarded on cumulative assessment which is further subdivided as 5 marks for Practical record and 5 marks for Attendance.

***Assignment**: The Assignment should be hand written (preferred)/ typed in A4 size paper. First three pages (i.e. front page + acknowledgment + index) & Bibliography may be printout. No Xerox copy is allowed.*

***Marks Distribution**:*

LAB(Experiment + Answer script)	*= 50 marks*
Assignment/ Project + Attendance	*=10 marks*
Viva-voce	*=10 marks*

Note:

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks)..

A. PHP, JAVA SCRIPT & JQUERY PROGRAMMING LAB

Practical: 60 Hours

Programs to develop to do the following:-

PHP: 1. Syntax to declare Variables, Constants, Scope of variables.
2. Expressions, Operators, Conditional statement, Looping constructs, Casting,
3. Dynamic linking.
4. PHP functions, Including and Requiring files, Date and Time functions
5. PHP objects.
6. Numerically indexed and Associative arrays, Foreach loop, Array functions.
7. File handling.

MySQL:

1. Data types, Functions,
2. Accessing MySQL via command line,
3. Indexes,
4. Accessing MySQL via php My Admin,
5. Connecting to MySQL database: Displaying form, Querying database, Table operation-creation, drop.

6. Operations on data- addition, retrieving, updating, deletion;

FORM HANDLING:

1. Building form, retrieving submitted data,
2. Various attributes in HTML5- autocomplete, autofocus, placeholder, required, override, Width and height, form, list, min and max, step;
3. Colour input type, Number and range input types.

COOKIES, SESSIONS AND AUTHENTICATION:

Using cookies in PHP, HTTP authentication, Using sessions.

EXPLORING JAVASCRIPT:

1. JavaScript and HTML text,
2. Declaring Variables, Operators, Variable typing,
3. Functions, Global variables, Using DOM, Using console.log, Using alert,
4. Writing into elements, Using documents. write,
5. Expressions, Literals, Variables, Operators,
6. The with statement,
7. Exception handling Using onerror, Using try…catch,
8. Conditional statements, Looping constructs, Explicit casting, Functions, Objects, Arrays.

JAVASCRIPT AND PHP VALIDATION:

Validating user input, Regular Expressions, character matching, Parentheses grouping, Character class, Negation, General modifiers, Redisplaying form after validation.

ACCESSING CSS FROM JAVASCRIPT:

Revisiting the get Element By Id function, Accessing CSS properties from JavaScript, Inline JavaScript, Adding new element, Using interrupts.

JQUERY:

JQuery, Syntax, Selectors, Handling events, Event functions and properties, Special effects, Manipulating DOM, Dynamically applying classes, Modifying dimensions, DOM traversal, Using Ajax, Plug-ins.

Reference Books:

- Learning Php,Mysql & Java Script, Robin Nixon, O'reilly

OR

LANGUAGE ELECTIVE-III LAB [EPMCA506B]: (Credits: Practical -04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (SIA:17 + ESE:28)=45

Instruction to Question Setter for
Mid Semester Examination (MSE):
*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):
*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*
The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

B. PYTHON PROGRAMMING LAB Practical: 60 Hours

Programming based on the following:-

1. Data types, Variables and Other References, Expression and Operators,
2. Numeric Operations, Sequence Operations, Strings, Tuples, List, Set Operations, Dictionary Operations,
3. The print, Control Flow Statements, while, for, break, continue for, pass try, raise, with
4. Functions, lambda expressions, generators, attributes.
5. Classes and Instances, bound, unbound, overriding, superclass Methods, Decorators, Metaclasses.
6. Try, raise, with exceptions, Exceptions objects, Standard and custom Exception classes.
7. Units, Import, from, import*, statements, Python built-in Units sys, copy, Collections Unit, Functional Unit, Bisect Unit, Heapq Unit, User Dict Unit, Optparse Unit, Itertools Unit.
8. Methods of String Objects, String Unit, String Formatting, Pprint Unit, Repr Unit, Unicode, Regular Expressions and the Re Units.
9. File and Text Operations: Creating aFiles object with open, Auxiliary Unit for File I/O, The String IO and cString IO Units, Text Input and Output, Richer-Text I/O, Interactive Command Sessions, Internationalization.
10. Persistence and Databases**:** marshal, pickle, any dbm Unit, The Python Database API
11. Time Operation**:** time, datetime, pytz, dateutil, sched, calender, mx. Date Time Unit.
12. Controlling Execution**:** exec Statement, co, _code, co_filename, code_object, gc Unit, weakref, proxy, register.
13. Thread and Processes**:** thread, Queue, Threading, map Unit.
14. Numeric Processing**:** The math and cmath Unit, operator Unit, Random and Pseudorandom numbers, Decimal, gmpy Unit.
15. Array Processing**:** array Unit, extensions for Numeric Array Computation, Numeric Package, Array Objects, Universal Functions (ufuncs), Auxiliary Numeric Units.

Reference Books:

- Alex Martelli- PYTHON IN A NUTSHELL,2ND Edition, O'REILLY, 2012

VII. PROFESSIONAL ELECTIVE-II [PRMCA507A]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 **Pass Marks (SIA:17 + ESE:28)=45**

Instruction to Question Setter for
Mid Semester Examination (MSE):
*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):
*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*
The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

A. PATTERN RECOGNITION Theory: 45 Lectures; Tutorial: 15 Hours

Unit I **Introduction:** Definition, Data Sets For Pattern Recognition, Paradigms

Unit II **Representation:** Data Structure for Pattern Recognition, Representation of Clusters, Proximity Measures, Size of Pattern, Abstraction of Data set, Feature Extraction and Selection, Evaluation of Classifiers and Clustering.

Unit III **Nearest Neighbour Based Classifiers:** Nearest Neighbour(NN) Algorithm, Variants of NN Algorithm, Use of the NN algorithm for Transaction Databases, Efficient Algorithm, Data Reduction, Prototype Selection.

Unit IV **Bayes Classifiers:** Bayes Theorem, Minimum Error Rate Classifiers, Estimation of Probabilities, Comparison with NNC, Naïve Bayes Classifiers, Bayesian Belief Network.

Unit V **Hidden Markov Models (HMM) & Decision Trees:** HMM for Classification, HMM, Classification using HMMs, Decision Tree for Pattern Classification, Construction of Decision Tree, Splitting at the Nodes, Overfitting and Pruning.

Unit VI **Support Vector Machines:** Introduction, Linear Discriminant Function, Neural Networks, SVM for Classification.
Combination of Classifiers: Introduction, Methods for Constructing Ensembles of Classifiers, Methods for Combining Classifiers.

Unit VII **Clustering:** Importance of Clustering, Hierarchical Algorithms, Partitional Clustering, Clustering Large Data Sets.

Reference Books:

- Pattern classification by Richard o. Duda, Peter E.Hart and Dvid G. Stork
- Pattern Recognition and Machine Learning by C.M. Bishop
- Pattern recognition by S. Theodoridis and Koutroumbas.

OR

PROFESSIONAL ELECTIVE-II [PRMCA507B]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (SIA:17 + ESE:28)=45

Instruction to Question Setter for
Mid Semester Examination (MSE):
*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):
*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*
The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

B. NATURAL LANGUAGE PROCESSING

Theory: 45 Lectures; Tutorial: 15 Hours

Unit-I **Introduction to NLP :** Definition, issues and strategies, application domain, tools for NLP, Linguistic organisation of NLP, NLP vs PLP.

Unit-II **Word Classes** Review of Regular Expressions, CFG and different parsing techniques
Morphology: Inflectional, derivational, parsing and parsing with FST, Combinational Rules
Phonology: Speech sounds, phonetic transcription, phoneme and phonological rules, optimality theory, machine learning of phonological rules, phonological aspects of prosody and speech synthesis.

Unit-III **Pronunciation, Spelling and N-grams:** Spelling errors, detection and elimination using probabilistic models, pronunciation variation (lexical, allophonic, dialect), decision tree model, counting words in Corpora, simple N-grams, smoothing (Add One, Written-Bell, Good-Turing), N-grams for spelling and pronunciation.

Unit-IV **Syntax :** POS Tagging: Tagsets, concept of HMM tagger, rule based and stochastic POST, algorithm for HMM tagging, transformation based tagging

Unit-V **Sentence level construction & unification:** Noun phrase, co-ordination, sub-categorization, concept of feature structure and unification.
Representing Meaning: Unambiguous representation, canonical form, expressiveness, meaning structure of language, basics of FOPC
Semantic Analysis: Syntax driven, attachment & integration, robustness

Unit-VI **Lexical Semantics:** Lexemes (homonymy, polysemy, synonymy, hyponymy), Word Net, internal structure of words, metaphor and metonymy and their computational approaches

Word Sense Disambiguation: Selectional restriction based, machine learning based and dictionary based approaches.

Unit-VII **Pragmatics:** Discourse: Reference resolution and phenomena, syntactic and semantic constraints on Co-reference, pronoun resolution algorithm, text coherence, discourse structure.
Dialogues: Turns and utterances, grounding, dialogue acts and structures
Natural Language Generation: Introduction to language generation, architecture, dicourse planning (text schemata, rhetorical relations.

Text Book:

- D. Jurafsky& J. H. Martin – "Speech and Language Processing – An introduction to Language processing, Computational Linguistics, and Speech Recognition", Pearson Education

Reference Books:

- Allen, James – "Natural Language Understanding". Benjamin/Cummings, 2nd Edn.,1995
- Bharathi, A., Vineet Chaitanya and Rajeev Sangal., Natural Language Processing- "A Pananian Perspective", Eastern Economy Edition,PHI, 1995
- Eugene Cherniak: "Statistical Language Learning", MIT Press, 1993

OR

PROFESSIONAL ELECTIVE-II [PRMCA507C]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (SIA:17 + ESE:28)=45

Instruction to Question Setter for
Mid Semester Examination (MSE):
*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):
*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*
The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

C. OPTIMIZATION TECHNIQUES Theory: 45 Lectures; Tutorial: 15 Hours

Unit I **Introduction & Linear Programming Formulation:** Operation Research Definition and Decision Making, Scope and Application. Meaning and Definition of LPF, Basic Assumption, Application, Limitation, Linear Programming Model, Formulation of Linear Programming

Unit II **Linear Programming:**

The Graphical Method : Definition, Graph of Linear Inequality, The Graphic Method of Solution of Linear Programming Problems

The Simplex Method : Definition, Fundamental Theorem, General Formulation, Matrix Form, Standard Form, Computational Aspect of Simplex Method, Simplex Method- Minimization Problem, Problems Based on Mixed Constraints, The Breaking in Simplex Method, Special Cases in Simplex Methods.

Unit III **Duality and Sensitivity Analysis :** Formulation of Dual from Primal, Economic Interpretation of Dual Problem, Sensitivity(Post-Optimality) Analysis.

Unit IV **Transportation Problem:** Transportation Model, Definition, Transportation Algorithm, Methods for Finding Initial Solution, Test for Optimality, Trans-shipment Problem

Unit V **Assignment Problem:** Introduction, Mathematical Model, Solution Methods of Assignment Problem, Cases in Assignment Problems, Travelling Salesman Problem.

Unit VI **Decision Theory:** Introduction, Structure of Decision Making Problem, Optimism Criterian (Maximax/Minimin Criterion), Pessimism Criterion or Wald Criterion, Minimax Regret Criterion, Laplace Criterion, Hurwicz Criterion, Expected Monetary Value, Expected Opportunity Loss, Expected Value of Perfect Information, Decision Trees.

Game Theory : Game Theory Concept, Pure Strategy Games(With Saddle Point), Mixed Strategy Games(without Saddle Point)

Unit VII **Project Management CPM and PERT:** Network Analysis Concept, Critical Path Analysis, Programme Evaluation and Review Technique(PERT), Network Crashing(Time-Cost Trade-off), Updating Network.

NLPP: Introduction, Formulality a NLPP, General NLPP, Constrained Optimization with Equality Constraints and Inequality constraints, Saddle Points. Kuhn – Tucker Conditions with Non Negative Constraints, Quadratic Programming, Wolfe's Modified Simplex Method.

Reference Books:

- J.P. Singh, N.P. Singh- Operations Research, Ane's Books Pvt. Ltd.
- Kanti Swarup, P.K. Gupta, Man Mohan – "Opeations Reaearch, Sultan Chand & Sons, New Delhi
- Ronald L. Rardin "Optimization in Operations Research", pearson Education, New Delhi.
- S.S. Rao, "Optimization Theory & Application", Wiley Eastern Ltd.

OR

PROFESSIONAL ELECTIVE-II [PRMCA507D]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100	**Pass Marks (SIA:17 + ESE:28)=45**

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):

*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

D. INFORMATION RETRIEVAL Theory: 45 Lectures; Tutorial: 15 Hours

Unit I Introduction to IR models and methods, Text analysis/Web spidering, Text properties.

Unit II Vector- based model, Boolean model, Probabilistic model, IR model: IR evaluation and IR test collections; Relevance feedback, query expansion.

Unit III Web search: link based and content based; Query-based and content sensitive link analysis

Unit IV Search engine technologies. Question answering on offline and online collections.

Unit V Personalised IR, cross-language IR,web2.0

Reference Books:

- Tanveer Siddiqui, U.S. Tiwari, Natural Language Processing & Information Retrieval, Oxford University Press

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OR

PROFESSIONAL ELECTIVE-II [PRMCA507E]: (Credits: Theory-04)

Marks: 30 (SIA: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100	**Pass Marks (SIA:17 + ESE:28)=45**

Instruction to Question Setter for
Mid Semester Examination (MSE):
*There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*

End Semester Examination (ESE):
*There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*

Note: *There may be subdivisions in each question asked in Theory Examinations*
The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "Best of Two" system will be applicable for marking for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

E. MACHINE LEARNING Theory: 45 Lectures; Tutorial: 15 Hours

Unit-I Overview and Introduction to Bayes Decision Theory: Machine intelligence and applications, pattern recognition concepts classification, regression, feature selection, supervised learning class conditional probability distributions, Examples of classifiers bayes optimal classifier and error, learning classification approaches.
Unit-II Linear machines: General and linear discriminants, decision regions, single layer neural network, linear separability, general gradient descent, perceptron learning algorithm, mean square criterion and widrow-Hoff learning algorithm; multi-Layer perceptrons: two-layers universal approximators, backpropagation learning, on-line, off-line error surface, important parameters.
Unit-III Learning decision trees: Inference model, general domains, symbolic decision trees, consistency, learning trees from training examples entropy, mutual information, ID3 algorithm criterion, C4.5 algorithm continuous test nodes, confidence, pruning, learning with incomplete data .
Unit-IV Instance-based Learning: Nearest neighbor classification, k-nearest neighbor, nearest neighbor error probability.
Unit-V Machine learning concepts and limitations: Learning theory, formal model of the learnable, sample complexity, learning in zero-bayes and realizable case, VC-dimension, fundamental algorithm independent concepts, hypothesis class, target class, inductive bias, occam's razor, empirical risk, limitations of inference machines, approximation and estimation errors, Tradeoff.
Unit-VI Machine learning assessment and Improvement: Statistical model selection, structural risk minimization, bootstrapping, bagging, boosting.
Unit-VII Support Vector Machines: Margin of a classifier, dual perceptron algorithm, learning nonlinear hypotheses with perceptron kernel functions, implicit non-linear feature space, theory, zero-Bayes, realizable infinite hypothesis class, finite covering, margin-based bounds on risk, maximal margin classifier.

Reference Books:

- E. Alpaydin, Introduction to Machine Learning, Prentice Hall of India, 2006.
- T. M. Mitchell, Machine Learning, McGraw-Hill, 1997.
- C. M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006.

VIII. PROFESSIONAL ELECTIVE-II [PRMCA508]: (Credits: 02)

Total Marks = 50	**Pass Marks =23**

Guidelines to Examiners for
End Semester Examination (ESE):

Overall project dissertation may be evaluated under the following heads:

- *Motivation for the choice of topic*
- *Project dissertation design*
- *Methodology and Content depth*
- *Results and Discussion*
- *Future Scope & References*
- *Participation in Field Training Programme*
- *Application of Research technique in Data collection*
- *Report Presentation*
- *Presentation style*
- *Viva-voce*

Distribution of Marks:

Project Report	(Total = 30 marks)
1. Formulation of Project Design	= 10
2. Implementation of the Design	= 10
3. Presentation of Report	= 10
G.D. and Viva Voce Examination	(Total = 20 marks)
1. Presentation & Viva	= 10
2. Marks given by Internal Supervisor (based on cumulative assessment)	= 10

Note: There will be only one internal examination of 50 mark for this paper.

EVALUATION OF MINI PROJECT-II (IMPLEMENTATION & TESTING)

This paper is meant for realising the basic principle of software engineering and become confident enough to implement principle and techniques of software engineering. Here it is expected from the students that, while studying software engineering in detail and having hands on programming related to software engineering in Semester-V, they are now ready to work on Implementation & Testing part over the topic of their choice.

Every student will have to do Mini Project by selecting any topic of his choice under the supervision of internal guide/teacher and to present a report for evaluation prior to the End Semester University Examination. The distribution of marks will be as given above:

Selection of Internal Guide:
The student has to approach to faculty members for his/her consent for internal guide.

Instruction to the guide:

Each faculty member will give consent for internal guide to a maximum no. of candidates as per following condition:

Maximum No. of candidates/Faculty member = Total No. of Students/ Total No. of Faculty members.

SEMESTER VI 2 Papers

I. PROFESSIONAL ELECTIVE-III [PRMCA601]: (Credits: 02)

Total Marks = 50	Pass Marks =23

Guidelines to Examiners for
End Semester Examination (ESE):
Overall project dissertation may be evaluated under the following heads:

- *Motivation for the choice of topic*
- *Project dissertation design*
- *Methodology and Content depth*
- *Results and Discussion*
- *Future Scope & References*
- *Participation in Field Training Programme*
- *Application of Research technique in Data collection*
- *Report Presentation*
- *Presentation style*
- *Viva-voce*

Distribution of Marks:

Project Report	(Total = 30 marks)
1. Formulation of Project Design	= 10
2. Implementation of the Design	= 10
3. Presentation of Report	= 10
G.D. and Viva Voce Examination	(Total = 20 marks)
1. Presentation & Viva	= 10
2. Marks given by Internal Supervisor (based on cumulative assessment)	= 10

Note: There will be only one internal examination of 50 mark for this paper.

EVALUATION OF PRE SUBMISSION SEMINAR

This paper is meant for realising all basic and advanced concepts studied so far by providing software enabled solution on the topic or situation or real problem and become confident enough to overcome challenges of Software industries.

Every student will have to do Mini Project by selecting any topic of his choice under the supervision of internal guide/teacher and to present a report for evaluation prior to the End Semester University Examination. The distribution of marks will be as given above:

Selection of Internal Guide:
The student has to approach to faculty members for his/her consent for internal guide.

Instruction to the guide:
Each faculty member will give consent for internal guide to a maximum no. of candidates as per following condition:

Maximum No. of candidates/Faculty member = Total No. of Students/ Total No. of Faculty members.

II. PROFESSIONAL ELECTIVE-III [PRMCA602]: (Credits:04)

Marks : 70 (OJT) + 30 (Viva) =100	Pass Marks: =45

Guidelines to Examiners for
End Semester Examination (ESE):
Overall project dissertation may be evaluated under the following heads:

- *Motivation for the choice of topic*
- *Project dissertation design*
- *Methodology and Content depth*
- *Results and Discussion*
- *Future Scope & References*
- *Participation in Field Training Programme*
- *Application of Research technique in Data collection*
- *Report Presentation*
- *Presentation style*
- *Viva-voce*

Distribution of Marks:

OJT Project Report (By External)	(Total = 70 marks)
1. Formulation of Project Design	= 25
2. Implementation of the Design	= 25
3. Presentation of Report	= 20
G.D. and Viva Voce Examination (By Internal)	(Total = 30 marks)
1. Presentation & Viva	= 20
2. Marks given by Internal Supervisor (based on cumulative assessment)	= 10

Note: There will be only one internal examination of 100 marks for this paper.

FINAL PROJECT/ INTERNSHIP

A. ON JOB TRAINING (OJT):

1. OJT is **ON JOB TRANING**, Student have to do two months (**OJT Six Month**) industrial Training from IT origination (**Reference letter for OJT of must be issued from Concern Department**). Student has to produce daily report. In this daily report, Attendee sheet, Work culture and working hour list, day by day, must be listed.
2. Student alone or in a group of not more than three, shall undertake **One Project Dissertation** approved by the Subject Teacher/H.O.D. of the Department/College concerned. The progress of the Project Dissertation shall be monitored by the faculty members at regular intervals, and followed by Internal Viva Examination of 30 marks.

Academic Credits for training shall be based on following:

A **Power Point presentation** (based on the report) for duration of **10 minutes** should be make. This will be presented in front of examiners. Marks will be awarded on this presentation and documents submitted to the faculty coordinator at the institute.

Students have to submit the following on completion of training to the concern faculty at the college:

1. Synopsis submission
2. Synopsis Approval will be given within a week from the date of submission.
3. Synopsis will be approved by concerned department faculty member.
4. Faculty members will be the internal guide of particular group of Students.
5. The group size will be maximum of 3 candidates.
6. Group will present power point presentation in front of panel and submit the project

status report within the 15 to 20 days from the date of approval.

7. Final Project Submission contains Hard copy, Soft copy & leave letter.
   Project hard copy contains
   a) Front page
   b) Certificate of Authenticity
   c) Certificate of job Training
   d) Declaration
   e) Acknowledgement
   f) Table of content/index
   g) Project guidelines (These points are mandatory)
      (i). Introduction with Company profile.
      (ii). Vision, mission & objective.
      (iii). SWOT Analysis.
      (iv). Chronology of Achievements.
      (v). Topic introduction & discussion.
      (vi). Its relevance & implication in company.
      (vii). Findings.
      (viii). Conclusion
      (ix). Further enhancement (Suggestion).
      (x). Bibliography
      (xi). Reference Website
      (xii). CD (compact Disc)
   h) The file should be Book Binding .One Project Report for office copy and each candidate must have its own copy.
8. Leave Card.

The Training Report will be submitted in the form specified as under:

a. The typing should be done on both sides of the paper(instead of single side printing)
b. The font size should be12 with Times New Roman font.
c. The Training Report may be typed in 1.5 line spacing.
d. The paper should be A-4size.

Two copies meant for the purpose of evaluation may be bound in paper and submitted to the approved authority.

DISTRIBUTION OF CREDITS FOR P.G. PROGRAMME (SEMESTER-WISE) FOR POSTGRADUATE **'M.C.A.'** PROGRAMME

Table B-1: Semester wise distribution of 150Credits for MCA Papers.

Semester	CC	FC	GE/DC	SE	Total credits
Semester I	24	04			28
Semester II	28				28
Semester III	20		08		28
Semester IV	16	02	12		30
Semester V	16	02	12		30
Semester VI			06		06
	118	**04**	**24**	**04**	**150**

CC=Core Course; FC=Foundation Compulsory/Elective Course; GE=Generic Elective; SE=Skill Enhancement Course; DC=Discipline Centric Elective

SAMPLE CALCULATION FOR SGPA & CGPA FOR **'P.G. M.C.A.'** PROGRAMME

Table B-2: Sample calculation for SGPA for M.C.A. Programme

Course	Credit	Grade Letter	Grade Point	Credit Point (Credit X Grade)	SGPA (Credit Point/Credit)
Semester I					
FCMCA101	04	A	8	32	
CCMCA102	04	B+	7	28	
CCMCA103	04	B+	7	28	
CCMCA104	04	B	6	24	
CCMCA105	04	A	8	32	
CPMCA106	04	B	6	24	
CPMCA107	04	B	6	24	
Total	**28**			**192**	**6.857 (192/28)**
Semester II					
CCMCA201	04	B	6	24	
CCMCA202	04	C	5	20	
CCMCA203	04	A	8	32	
CCMCA204	04	B+	7	28	
CCMCA205	04	B+	7	28	
CPMCA206	04	A+	9	36	
CPMCA207	04	A	8	32	
Total	**28**			**200**	**7.142 (200/28)**
Semester III					
ECMCA301	04	A+	9	36	
CCMCA302	04	A	8	32	
CCMCA303	04	0	10	40	
CCMCA304	04	A	8	32	
CCMCA305	04	A	8	32	
CPMCA306	04	B+	7	28	
EPMCA307	04	A	8	32	
Total	**28**			**232**	**8.285 (232/28)**
Semester IV					
ECMCA401	04	B	6	24	
CCMCA402	04	A	8	32	
CCMCA403	04	A+	9	36	
CCMCA404	04	B+	7	28	
CPMCA405	04	B	6	24	
EPMCA406	04	A	8	32	
PRMCA407	04	A+	9	36	
PRMCA408	02	B	6	12	
Total	**30**			**224**	**7.466 (224/30)**

Semester V					
ECMCA501	04	B	6	24	
CCMCA502	04	B+	7	28	
CCMCA503	04	A+	9	36	
CCMCA503	04	B+	7	28	
CCMCA504	04	O	10	40	
EPMCA506	04	A	8	32	
PRMCA507	04	A+	9	36	
PRMCA508	02	B+	7	14	
Total	**30**			**238**	**7.933 (238/30)**
Semester VI					
PRMCA601	02	A	8	16	
PRMCA602	04	A+	9	36	
Total	**06**			**52**	**8.666 (52/06)**
CGPA					
Grand Total	**80**			**1138**	**7.586 (1138/150)**

Table B-3: Sample calculation for CGPA for P.G. Vocational M.Sc./M.A./M.Com Programme

Semester I	**Semester II**	**Semester III**	**Semester IV**
Credit:28; SGPA:6.86	Credit:28; SGPA: 7.14	Credit:28; SGPA: 8.28	Credit:30; SGPA: 7.47

Semester V	**Semester VI**		
Credit:30; SGPA:7.93	Credit:06; SGPA: 8.67		

Thus CGPA = (28x6.86 + 28x7.14 + 28x8.28 + 30x7.47 + 30x7.93 + 9x8.67) / 150 **= 7.59**

DISTRIBUTION OF MARKS FOR EXAMINATIONS AND FORMAT OF QUESTION PAPERS

Distribution of Marks for Mid Semester Evaluation:

Table No. 15: Distribution of marks of Theory Examinations of Mid Semester

Topic	Code	Full Marks	Pass Marks	Time	Group-A (Very short answer type Compulsory Questions) No. of Questions x Marks = F.M.	Group-B (Descriptive Questions) No. of Questions x Marks = F.M.	Total No. of Questions to Set	
							Group A	Group B
Mid Sem*	T30*	30 (20 +5 +5)	17	1 Hr	5 x1 =5	3 (out of 5) x5 =15	05	5

***There shall be 20 marks theory examination for mid sem, 05 marks for attendance/ regular interactions & 05 marks for seminar/ assignment/ term paper given by faculty concerned in classrooms.**

Distribution of Marks for End Semester Theory Examinations:

Table No. 16: Marks distribution of Theory Examinations of End Semester

Topic	Code	Full Marks	Pass Marks	Time	Group-A# (Very short answer type Compulsory Questions) No. of Questions x Marks = F.M.	Group-B (Descriptive Questions) No. of Questions x Marks = F.M.	Total No. of Questions to Set	
							Group A#	Group B
End Sem	T50	50	--	3 Hrs	2 x5 =10	2 (out of 3) x20 =40	2	3
	T70	70	28	3 Hrs	Q.No.1 (5x1) + 1x5 =10	4 (out of 6) x15 =60	2	6

 # Question No.1 in Group-A carries very short answer type questions of 1 Mark

Note : There may be subdivisions in each question asked in Theory Examinations.

FORMAT OF QUESTION PAPER FOR MID SEM EXAMINATION

20 MARKS

Ranchi University, Ranchi

Mid Sem No. Exam Year

Subject/ Code

F.M. =20 **Time**=1Hr.

General Instructions:
समान्य निर्देश :

i. **Group A** carries very short answer type compulsory questions.
(खंड 'A' में अत्यंत लघु उत्तरीय अनिवार्य प्रश्न हैं।)
ii. **Answer 3 out of 5** subjective/ descriptive questions given in **Group B**.
(खंड 'B' के पाँच में से किन्हीं तीन विषयनिष्ठ/ वर्णनात्मक प्रश्नों के उत्तर दें।)
iii. Answer in your own words as far as practicable.
(यथासंभव अपने शब्दों में उत्तर दें।)
iv. Answer all sub parts of a question at one place.
(एक प्रश्न के सभी भागों के उत्तर एक साथ लिखें।)
v. Numbers in right indicate full marks of the question.
(पूर्णांक दायीं ओर लिखे गये हैं।)

Group A

1. ..... [5x1=5]
2. .....
3. .....
4. .....
5. .....

Group B

6. ..... [5]
7. ..... [5]
8. ..... [5]
9. ..... [5]
10. ..... [5]

Note: There may be subdivisions in each question asked in Theory Examination.

FORMAT OF QUESTION PAPER FOR END SEM EXAMINATION

50 MARKS

Ranchi University, Ranchi

End Sem No. Exam Year

Subject/ Code

F.M. =50

General Instructions:

i. **Group A** carries very short answer type **compulsory** questions.
ii. **Answer 2 out of 3** subjective/ descriptive questions given in **Group B**.
(खंड 'B' के तीन में से किन्हीं दो विषयनिष्ठ / वर्णनात्मक प्रश्नों के उत्तर दें।)
iii. Answer in your own words as far as practicable.
(यथासंभव अपने शब्दों में उत्तर दें।)
iv. Answer all sub parts of a question at one place.
(एक प्रश्न के सभी भागों के उत्तर एक साथ लिखें।)
v. Numbers in right indicate full marks of the question.
(पूर्णांक दायीं ओर लिखे गये हैं।)

Group A

1. ..... [5]
2. ..... [5]

Group B

3. ..... [20]
4. ..... [20]
5. ..... [20]

Note: There may be subdivisions in each question asked in Theory Examination.

FORMAT OF QUESTION PAPER FOR END SEM EXAMINATION

70 MARKS

Ranchi University, Ranchi

End Sem No. Exam Year

Subject/ Code

F.M. =70 **P.M.**=28 **Time**=3Hrs.

General Instructions:

i. **Group A** carries very short answer type **compulsory** questions.
ii. **Answer 4 out of 6** subjective/ descriptive questions given in **Group B**.
(खंड 'B' के छः में से किन्हीं चार विषयनिष्ठ / वर्णनात्मक प्रश्नों के उत्तर दें।)
iii. Answer in your own words as far as practicable.
(यथासंभव अपने शब्दों में उत्तर दें।)
iv. Answer all sub parts of a question at one place.
(एक प्रश्न के सभी भागों के उत्तर एक साथ लिखें।)
v. Numbers in right indicate full marks of the question.
(पूर्णांक दायीं ओर लिखे गये हैं।)

Group A

1. [5x1=5]
   i. .....
   ii. .....
   iii. .....
   iv. .....
   v. .....
2. ..... [5]

Group B

3. ..... [15]
4. ..... [15]
5. ..... [15]
6. ..... [15]
7. ..... [15]
8. ..... [15]

Note: There may be subdivisions in each question asked in Theory Examination.