University of Rajasthan
Jaipur

SYLLABUS

M.Sc. (IT)

(Semester Scheme)

I & II Semester Examination 2023-24

III & IV Semester Examination 2024-25

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(Academic)
University of Rajasthan
JAIPUR

UNIVERSITY OF RAJASTHAN, JAIPUR

M.Sc.(IT) Two years (Four Semesters) course 2022-23 Onwards

Eligibility:
(a) M.Sc.(IT) Semester I :

All the graduate (with 10+2+3) from recognized university situated in Rajasthan having 50% marks or CGPA of 3.0 in the UGC Seven Point Scale for general category && for SC/ST/Non-Creamy Layer OBC/MBC candidates having only pass marks and minimum 60% marks for non-Rajasthan candidate. Reservation as per the University Rules.

(b) In addition to above qualification, a candidates has to qualify the URATPG (University of Rajasthan Admission To Post-Graduate) Examination for admission to M.Sc.(IT) Course I semester in the University campus. In the affiliated colleges, admissions shall made on the basis of merit of graduation.

Scheme of Examination:

M.Sc.(IT) (Master of Science (Information Technology)) Syllabus as per new scheme : credit based semester system (Four Semesters in two years) with Continuous Assessment (30% with non-inclusion in cumulative Grade point average(CGPA)) for the course running in the University Campus and non-grading percentage scheme (as per Master of Science norms) for affiliated colleges of the University.

Part-I (Course and Internal Assessment)

- To obtain a Professional Master's Degree M.Sc.(IT), a candidate is required to earn 120 credits in FOUR semesters (Two Years), out of total 144 credit points (36 credits per semester), with grade E or higher. Each student has to earn minimum 30 credit per semester (i.e. 120 credits in four semesters for M.Sc.(IT) course) .
- Each semester of M.Sc.(IT) courses shall have 36 credits. There will be three core papers and three elective papers (4 credits each) and two core laboratory and one elective laboratory (4 credits each).
- To earn credits for a paper (Theory and Practical), a candidate shall be required to obtain grade E or higher (or equivalent marks percentage) in the theory/practical examination (EoSE)
- Core papers (Theory and Practical) are compulsory papers for the students of M.Sc(IT).
- Each semester will have continuous assessment (CA). The continuous assessment (CA) consists of two parts, namely (i) Internal Assessment and (ii) Sessional Test(s) in the ratio 30:70. The Internal Assessment component comprises of assessment of student's performance on the basis of factors like Attendance, Class Room Participation, Quiz, Home Assignment etc.
- To earn the credits for a paper (Theory and Practical) a candidate has to qualify in the Continuous Assessment (internal) Exam along with EoSE of that paper separately.
- However, the grade point/marks obtained in the continuous assessment will not be included in Semester Grade Point Average(SGPA). In Continuous Assessment and

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End of Semester Examination (EoSE) separate grades will be awarded. The candidate will not be permitted to appear in EoSE of a particular credit (i) if he/she does not meet out 75% attendance requirement, or (ii) he/she fails to secure a Semester Grade Point Average (SGPA) of 1.5 in the continuous assessment.

- A course is identified by a course code designated by a string of six alphanumeric characters and a course title. In a course code the first three characters of the string indicate the degree/course name in short and the later three alphanumeric characters designate a particular course. In the case of compulsory core course (CCC) the fourth character identifies the semester numeric digit and in case of the elective core courses (ECC) the fourth character indicates the cluster of specialization. For compulsory or elective theory core courses the fifth is '0', for laboratory core course it is '1' and for project/seminar course it is 2 and the sixth digit indicates number of the course in that category.
  - Compulsory Core Courses (CCC)
  - Elective Core Courses(ECC)

Part II (Examination Paper Scheme):

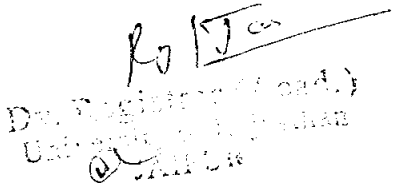
1. Each Theory paper (CCC & ECC) of EoSE shall carry 100 marks The EoSE will be of 3 hours duration.
2. Candidate has to attempt five questions in all. All questions carry equal marks.
3. **Question No. 1 (Compulsory)** covering whole syllabus will consists of 10 short answer questions carrying 2 marks each, based on Knowledge, Understanding and Applications of the topics/ texts covered in the syllabus.
4. **Question No. 2 to 5**, each of 20 marks, will be framed by taking one question from each unit (may have sub-parts) with internal choice within the unit.
5. Each **Practical paper** (CCC & ECC) shall be of 3 hours duration on one day and carry 100 marks for the practical examination. The practical examination will involve 3 exercises, each of 20 marks, practical record of 15 marks and viva-voce examination of 25 marks.

Abbreviations Used

Course Category
CCC: Compulsory Core Course
ECC: Elective Core Course
OEC: Open Elective Course
SC: Supportive Course
SSC: Self Study Core Course
SEM: Seminar
PRJ: Project Work
RP: Research Publication

Contact Hours
L: Lecture
T: Tutorial
P: Practical or Other
S: Self Study

Relative Weights
IA: Internal Assessment (Attendance/ Classroom Participation/Quiz/Home Assignment etc.)
ST: Sessional Test
EoSE: End of Semester Examination



MASTER OF SCIENCE (INFORMATION TECHNOLOGY)
SYLLABUS

For the

Session 2022-23 Onwards

M.Sc.(IT)-First Semester 2022-23 Onwards

S. No.	Subject Code	Subject Title	Course category	Credit	Contact Hours per Week			EoSE * Duration(Hrs)	
					L	T	P	Thy	P
1	MIT 101	Programming in C	CCC	4	3	1	0	3	0
2	MIT 102	Operating Systems	CCC	4	3	1	0	3	0
3	MIT 103	Database Management Systems	CCC	4	3	1	0	3	0
4	MIT 104	Computer Architecture	CCC	4	3	1	0	3	0
5	MIT 105	Computer Fundamentals & Office Management Tools	ECC	4	3	1	0	3	0
6	MIT 106	E-Commerce	ECC	4	3	1	0	3	0
7	MIT 111	Programming in C Lab	CCC	4	0	0	6	0	3
8	MIT 112	DBMS Lab	CCC	4	0	0	6	0	3
9	MIT 113	Office Management Tools Lab	ECC	4	0	0	6	0	3
		Total Credit		36					

*EoSE- End of Semester Examination

M.Sc.(IT)-Second Semester 2022-23 Onwards

S.No.	Subject Code	Subject Title	Course category	Credit	Contact Hours per Week			EoSE * Duration(Hrs)	
					L	T	P	Thy	P
1	MIT 201	Java Programming	CCC	4	3	1	0	3	0
2	MIT 202	Software Engineering	CCC	4	3	1	0	3	0
3	MIT 203	Data Communication and Computer Networks	CCC	4	3	1	0	3	0
4	MIT 204	Web Application Development	CCC	4	3	1	0	3	0
5	MIT 205	Algorithms and Data Structures	ECC	4	3	1	0	3	0
6	MIT 206	Data Warehousing & Data Mining	ECC	4	3	1	0	3	0
7	MIT 211	Java Lab	CCC	4	0	0	6	0	3
8	MIT 212	Web Application Development Lab	CCC	4	0	0	6	0	3
9	MIT 213	Data Structures Lab	ECC	4	0	0	6	0	3
			Total Credit	36					

*EoSE- End of Semester Examination .

M.Sc.(IT)-Third Semester 2023-24 Onwards

S.No.	Subject Code	Subject Title	Course Category	Credit	Contact Hours per Week			EoSE * Duration(Hr	
					L	T	P	Thy	P
1	MIT 301	Cloud Computing	CCC	4	3	1	0	3	0
2	MIT 302	.NET Frame Work and ASP.NET	CCC	4	3	1	0	3	0
3	MIT 303	Python Programming	CCC	4	3	1	0	3	0
4	MIT 304	Artificial Intelligence	ECC	4	3	1	0	3	0
5	MIT ***	Elective - I(Any One in Elective Group –I)	ECC	4	3	1	0	3	0
6	MIT ***	Elective - II(Any One in Elective Group –II)	ECC	4	3	1	0	3	0
7	MIT 311	.NET Lab	CCC	4	0	0	6	0	3
8	MIT 312	Python Lab	CCC	4	0	0	6	0	3
9	MIT 313	Communication and Soft Skill Lab	ECC	4	0	0	6	0	3
			Total Credit	**36**					

***EoSE- End of Semester Examination.**

/*: Please see the List of Elective papers (Elective-I andElective-II corresponding)

M.Sc.(IT)-Fourth Semester 2023-24(Exam May. 2024 Onwards)

S. No.	Subject Code	Subject Title	Course Category	Credit	Contact Hours per Week			EoSE* Duration (Hrs)	
					L	T	P	Thy	P
1	MIT 401	Digital Marketing	CCC	4	3	0	0	3	0
2	MIT***	Elective -III(Any One in Elective Group –III)	ECC	4	3	0	0	3	0
3	MIT 411	Digital Marketing Lab	CCC	4	0	0	6	0	3
4	MIT ***	Elective - IV(Any One in Elective Group –IV)	ECC	4	0	0	6	0	3
5	MIT 413	Industrial Project : Minimum Three Months in an Organization approved by the Director/Head of the Centre/Department	CCC	20	0	0	18	0	3
			Total Credit	36					

*EoSE- End of Semester Examination

/*: Please see the List of Elective papers (Elective-III and Elective-IV corresponding.)

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Elective Papers:

Elective Course Code	Course Category	Subject Title	Prerequisite	Semester
Elective Group-I (Any one)				
MIT A01	ECC	Big Data Analytics	-	III
MIT A02	ECC	Advanced Java Programming	-	III
MIT A03	ECC	Computer Graphics	-	III
MIT A04	ECC	Cyber Security	-	III
Elective Group-II (Any one)				
MIT B01	ECC	Theory of Computation	-	III
MIT B02	ECC	Soft Computing	-	III
MIT B03	ECC	Computer Based Optimization Techniques	-	III
MIT B04	ECC	Network Security &Cryptography	-	III
Elective Group-III (Any one)				
MIT C01	ECC	Data Science with R	-	IV
MIT C02	ECC	Machine Learning	-	IV
MIT C03	ECC	Analysis and Design of Algorithms	-	IV
MIT C04	ECC	Open Source Operating System	-	IV
Elective Group-IV (Any one)				
MIT D01	ECC	Data Science with R Lab	-	IV
MIT D02	ECC	Machine Learning Lab	-	IV
MIT D03	ECC	ADA Lab	-	IV
MIT D04	ECC	Open Source Operating System Lab	-	IV

Note: Student have to take any one subject in Elective Group-III and also have to take one elective lab of same subject from the Elective Group-IV.

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Course Contents in Detail – M.Sc.(IT) I Semester-2022 -23

Note :

- Papers MIT101, MIT 102, MIT 103, MIT 111 and MIT 112 are compulsory(CCC) and Papers MIT 104, MIT 105, MIT 106 and MIT 113 are elective(ECC).
- Continuous assessment(Internal) will be done by the concerned teacher on the basis of test papers, regularity in the class and performance of the student. Maximum marks in continuous assessment of each paper is 100.

MIT 101:Programming Through C

Theory & Tutorial: 4 hours per week
Examination: Theory Paper – 3 hours; Max. Marks – 100, Passing Marks - 40
Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question(may have sub parts) from each unit. There will be an internal choice within the unit.

UNIT- I

Computer Program: Introduction, developing a program, algorithm, flowchart, pseudo code.

Basics of C: C Character set, variables and constants, keywords, Type checking, Scope and lifetime data types. Operators, Instructions, comment statements, simple input and output.

Unit-II

Control and Looping Structures :Control structures, decision control structure, loop control structure, case control structure. String and character handling, arrays and string processing.

Unit- III

Functions :Functions, function prototype, subroutines, scope and lifetime of identifiers parameter passing mechanism, recursion.

User defined data types :Define #,enumerated data types, unions, structures, array of structures.

Unit- IV

Pre processors, header files and standard lib, Functions. **Pointer** : Definition and uses of pointers, arithmetic , pointers and arrays, pointers and function.

Input/Output: Console Input and Output functions, data files, operations on data files, text and binary files.

Recommended Books:

Balagurusamy E; Programming in ANSI C;Fifth Edn; Mc Graw Hill.
Kanetkar Y.; LET US C; X Edition, BPB.
Gottfried B; Programming with C: Schaum Qutlines; Mc Graw Hill Edition.
Deitel HM & Deitel JP; C/C++ How to program; 5th Edn; Pearson Pub.

MIT 102 : Operating Systems

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

- Candidate has to attempt five questions in all. All questions carry equal marks.
- Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
- Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Basic Concepts : Necessity of an Operating System, Evolution of Operating System(multiprogramming systems, batch systems, timesharing system, distributed systems and Real Time system), Operating system structure, Operating system components and functions of an operating system, system calls, system programs, Virtual machines.

Unit-II

Process management: process concept, process scheduling, cooperating processes, Threads, Inter-process communication, CPU scheduling criteria, Scheduling algorithms, Multiple-processor scheduling.

Process Synchronization and Deadlocks: The Critical section problem, synchronization hardware semaphores, Classical problems of synchronization, Critical regions, Monitors, **Deadlocks**-System model, Characterization, Deadlock prevention, Avoidance and Detection, Recovery from deadlock, Combined approach to deadlock handling.

Unit-III

Storage management: Memory management- Logical and Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation with paging, Virtual Memory, Demand paging and its performance, page replacement algorithms, File systems, secondary storage Structure, File concept access methods.

Unit-IV

Disk Structure and Scheduling : Disk structure, Disk scheduling methods, Disk management , Recovery Disk structure, disk scheduling methods, disk management, Swap-Space management.

Protection and Security :Goals of Protection, Domain of protection, The Security problem, Program threats, Authentication, One Time passwords, program threats, System threats, Threat Monitoring, Encryptions.

Recommended books:

- Galvin P.B, Silberschatz; Operating System Principles; (Seventh Edition),J Wiley 2018
- Tanenbaum A.S, Modern Operating Systems, 2nd Edn. PHI Publ,2006
- William Stalling: Operating Systems, Internal & Design Principles, Sixth Edn; Pearson, 2009.
- GaryNutt: Operating Systems-A Modern Perspective (Second Edition) , Pearson Education, 2008.
- D.M.Dhamdhere: Systems Programming and Operating Systems (Second Edition), Tata McGraw Hill Publishing company Limited.
- HarveyM.Deitel, Operating Systems, Pearson Education.

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MIT 103: Database Management Systems

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note: 1.

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Overview of DBMS:Basic concepts, Database system architecture, Schemas, Instances, Components, Database users, Three-tier architecture, and Client/Server architecture, Data independence, Database models.

Data modeling using the Entity Relationship Model:Data Modeling using ER Model, ER diagram, mapping constraints, Keys, Generalization, aggregation, reduction of ER diagrams to tables, Types of Keys, Integrity Rules, Data Dictionary, Normalization (1NF, 2 NF, 3NF, BCNF), inclusion dependencies, loss less join decompositions.

Unit-II

Transaction Management : Transactions: Concepts, ACID Properties, States Of Transaction, Serializaibility, Isolation, onflict & View Serializable Schedule, Checkpoints, Deadlock Handling.

Database Querying: Relational Algebra, Set Operations, Relational Calculus, Steps In Query Processing, Algorithms for Selection, Sorting And Join Operations, Query Optimization, Transformation Of Relational Expressions.

Unit-III

Concurrency Control: Locks Based Protocols, Time Stamp Based Protocols, Validation Based Protocol, Multiple Granularity, Multi-version Schemes.

Recovery System & Security : Failure Classifications, Recovery & Atomicity, Log Base Recovery, Recovery with Concurrent Transactions, Shadow Paging, Failure with Loss of Non-Volatile Storage, Recovery From Catastrophic Failure.

Unit-IV

SQL and PL/SQL : Introduction to SQL: Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands, SQL operators, Tables, views and indexes, Constraints, Group By and Having Clause, Order By Clause, Queries and sub queries, Functions, **PL/SQL** basics, blocks, architecture, variables, constants, attributes, character set, PL/SQL control structure, data types, conditional and sequential control statements, cursors, exceptions, triggers, functions, procedures and packages.

Recommended Books:

1. Korth H F and Silberschataz A, System Concepts, Sixth Edition; McGraw Hill,2010
2. Leon, and Leon, SQL Tata McGraw Hill Pub. Co. Ltd.
3. IvanBayross; SQL/PL 4th Edn: BPB,2009

4. Navathe S.B. Elmasri R.; Fundamentals of Database Systems, Fifth Edition, Pearson 2011.
6. Ramakrishan and Gharke, Database Management Systems, 3rd Ed, Tata McGraw Hill, 2007.
7. Data C J Database Management Systems, 8th Edn,Pearson Education Asia.
Singh S.K.; Database Systems; I Edition; Pearson, 2006.
8. Thomas Connolly and Carolyn Begg, "Database Systems: A Practical Approach to Design, Implementation, and Management, Addison Wesley, 6th Edition, 2014.

MIT-104: Computer Architecture

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Basic Building Blocks: Logic gates, basic combinational logic, Boolean functions & Expressions, multiplexer, decoders, encoders, comparators, adder and substructures, BCD to 7 segment decoder, sequential circuits, RS, JK, D and T flip flops, counter and shift register, Clock and Timing events.

Unit-II

Basic of Computer organization: System buses and instruction cycles, memory subsystem organization and interfacing, I/O subsystem organization and interfacing, Register transfer languages.

Instruction and Addressing : Addressing methods, encoding of information, instructions types, Instruction format and instructions sequencing addressing modes, paging, relative, indirect and indexed addressing.

Unit-III

CPU design: Specifying a CPU, design and implementation of a simple CPU, design of ALU, Number representation, Arithmetic operations, floating point arithmetic. Design of the control unit and design verification,design and implementation of a simple micro-sequencer.

Microprocessor Concepts: Pin Diagram of 8085, Architecture of 8085, Addressing Mode of 8085, functional block diagram of 8085 assembly language, instruction set of 8085.

Unit-IV

Memory Organization : Auxiliary memory, Associative memory, virtual memory & paging and cache memory organization.

Input and Output organization: Asynchronous data transfer, programmed I/O Interrupts, Direct memory access, I/O processors, serial communication.

Recommended Books:

1. Computer Fundamentals by P.K. Sinha, BPB Publication.

2. John D. Carpinelli: Computer Systems Organization & Architecture; 3rd Edition; Person Education Asia,2008
3. M, Morris Mano; Computer System Architectures; III Edition, Prentice Hall of India,2017
4. MalvinoB ; Digital Computer Electronics III Edition; TMHL
5. JohnP.Hayes, Computer Architecture and Organization, McGraw Hill, International Edition.
6. VincentJPHeuring and Harry f Jordan: Computer Systems Design & Architecture , AddisonWesley, Person Education Asia.
7. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fifth Edition, Morgan Kaufmann / Elsevier, 2014.
8. William Stallings, Computer Organization and Architecture – Designing for Performance, 8thEdition, Pearson Education, 2010.

MIT 105 : Computer Fundamentals & Office Management Tools

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

UNIT- I

Introduction to Computers: Characteristics of computers, Evolution of computers, generation of computers, classification of computers, applications of computers.classification of computers, Input and Output devices, Central processing unit (CPU).

Primary and Secondary Memory: Memory hierarchy, Random access memory (RAM), types of RAM, Read only memory (ROM), types of ROM. Classification of secondary storage devices, magnetic tape, magnetic disk, optical disk.

UNIT- II

Number Systems: Introduction to number system, Binary, Octal, Hexadecimal, conversion between number bases, Arithmetic operations on binary numbers, Alphanumeric- BCD, EBCDIC, ASCII.

Computer Software: Software categories, system software, application software, utility software.

Computer Languages: Introduction, classification of programming languages, generations of programming languages, features of a good programming language.

UNIT- III

MS Word: Word processing, MS-Word features, creating saving and opening documents in Word, interface, toolbars, ruler, menus, keyboard shortcut, editing, previewing, printing & formatting a document, advance features of MS Word, find & replace, using thesaurus, mail merge, handling graphics, tables, converting a Word document into various formats like-text, rich text format. Word perfect, etc.

MS Excel: Worksheet basics, creating worksheet, entering data into worksheet, data, text, dates, alphanumeric values saving & quitting worksheet, opening and moving around in an existing worksheet, Toolbars and menus, Keyboard shortcuts, working with single and multiple workbook, working with formula & cell referencing, Auto sum, coping formulas, absolute and relative

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addressing, formatting of worksheet, previewing & printing worksheet, Graphs and Charts. Database, macros, multiple worksheets-concepts.

UNIT- IV

Power Point: Creating and viewing a presentation, managing Slide Shows, navigating through a presentation, using hyperlinks, advanced navigation with action setting and action buttons. organizing formats with Master Slides, applying and modifying designs, adding graphics, multimedia and special effects.

Microsoft Access: Planning a database (tables, queries, forms, reports), creating and editing database, customizing tables, linking tables, designing and using forms, modifying database structure. Sorting and Indexing database, querying a database and generating reports.

Reference Books:

1. Microsoft; 2007/2010 Microsoft Office System; PHI.
2. Microsoft; Microsoft Office 2007/2010: Plain & Simple; PHI.
3. Sanjay Saxena; A First Course in Computers 2003 Edition; Vikas Pub.
4. Computer Fundamentals by P.K. Sinha, BPB Publication.
5. Computer Fundamentals and Programming in C,Reema Thareja,OXFORD University Press.
6. Introduction to Computer,Peter Norton's, Tata McGraw Hill Publication.
7. MS-Office , Dr. S.S. Shrivastava, Published by Laxmi Publication.
8. Office 2019:In Easy Steps,Michal Price ,BPB Publication.

MIT 106 : E-Commerce

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

- Candidate has to attempt five questions in all. All questions carry equal marks.
- Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
- Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Business Environment : Organizational Structure and Design, Dependence on Technology, Integrating Technology with Business Environment, IT and Corporate Strategy, Sustaining a Competitive Edge through application of IT in Management Functions.

E-Commerce : Definition, Objectives, Components, Advantages and disadvantages, Scope, E-Commerce Opportunities for Industries, Growth of E-Commerce, e-Commerce Applications- E-Marketing, E-Customer Relationship Management, E-Supply Chain Management, E-Governance, E-Buying, E-Selling, E-Banking, E-Retailing.

Unit-II

E-Commerce Models: Business to consumer, Business to Business, Consumer to Consumer, Government to Citizen, Features and Benefits, Portal Vs. Website.
Other Models: Brokerage Model, Aggregator Model, Info-Mediary Model, Community Model and value chain Model.

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Unit-III

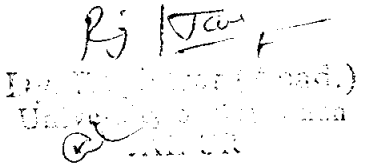
E-Payments : Introductions, Special features, Types of E-Payment Systems (EFT, E-Cash, E-Cheque, Credit/Debit Card, Smart Card, Digital Tokens and Electronic Purses/ Wallets).
Security issues in E-Commerce : Security risk of E-Commerce, Types of threats, Security Tools, Cyber Laws, Business Ethics,EDI Architecture, EDI Standards, EDI Application in business.

Unit-IV

ERP : Introduction, Needs and Evolution of ERP Systems, ERP Domain, ERP Benefits, ERP and Related Technologies, Relevance to Data Warehousing and Data Mining, ERP Drivers, Evaluation Criterion for ERP product, ERP Life Cycle: Adoption decision, Acquisition, Implementation, Use & Maintenance, Evolution and Retirement Phases, ERP Modules, ERP Success & Failure Factors.

Recommended Books :

1. Ravi Kalakota, "Electronic Commerce: A Manager's Guide", Addison-Wesley Professional, Edition 2012.
2. Ian Daniel, "E-Commerce get it Right", Neuro Digital Publication, 2011.
3. Dr. K Abirami Devi & Dr. M Alagammai, "E-Commerce Essentials", Margham Publication, 2012.
4. Kenneth C. Laudon, Karol Traver, "E-Commerce 2014", Prentice Hall Publication, 2013.
5. Lexis Leon; Enterprise Resource Planning;TMH
6. Brady, Manu, Wegner; Enterprise Resource Planning; TMH
7. N. K. Venkitakrishnan, Vinod Kumar Garg; Enterprise Resource Planning : Concepts and Practice; PHI Learning.
8. Dimpi Srivastava, Arti batra; ERP Systems; I K International Publishing House



Practical Examination :

Each practical paper shall be of 3 hours duration on one day and carry 100 marks for the practical examination. The practical examination will involve 3 exercises, each of 20 marks, practical record of 15 marks and viva-voce examination of 25 marks.

MIT 111 : Programming in C Lab
Examination : Practical Examination
Lab Exercise on Theory Paper MIT 101

List of experiments: C Programming :

1. Simple C programs with flow charts
2. Use of Decision control
3. Handling of Arrays
4. Handling of strings
5. Use of functions.
6. Applications of Structures and Union.
7. Use of pointer in Array and function handling
8. File operation

MIT 112: DBMS Lab
Examination : Practical Examination
Lab Exercise on Theory Paper MIT 103

List of experiments:

1. SQL data types, Operators, Literals, Constraints
2. Assignment on Queries: Select / From / Where/ Group By/Having Clause/ Order By Clause/ SQL Operators/ Joins/ Built-in Functions
3. PL/SQL Block Structure
4. Conditional Statements
5. Iterations: Simple Loops, For Loop, While Loop, Nested Loops
6. Exception Handling
7. Database Programming with Record Variables
8. Database Programming with Cursors, Cursor-For Loop
9. Procedures & Functions
10. Triggers
11. Packages

MIT 113 : Office Management Tools Lab
Practical Lab
Examination : Practical Examination
Lab Exercise on Theory Paper MIT 105

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S.No.	Subject Code	Subject Title	Course category	Credit	Contact Hours per Week			EoSE * Duration(Hrs)	
					L	T	P	Thy	P
1	MIT 201	Java Programming	CCC	4	3	1	0	3	0
2	MIT 202	Software Engineering	CCC	4	3	1	0	3	0
3	MIT 203	Data Communication and Computer Networks	CCC	4	3	1	0	3	0
4	MIT 204	Web Application Development	CCC	4	3	1	0	3	0
5	MIT 205	Algorithms and Data Structures	ECC	4	3	1	0	3	0
6	MIT 206	Data Warehousing & Data Mining	ECC	4	3	1	0	3	0
7	MIT 211	Java Lab	CCC	4	0	0	6	0	3
8	MIT 212	Web Application Development Lab	CCC	4	0	0	6	0	3
9	MIT 213	Data Structures Lab	ECC	4	0	0	6	0	3
			Total Credit	36					

*EoSE- End of Semester Examination .

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Syllabus of M.Sc.(IT) II Semester: 2022-23

Note :

1. Papers MIT201, MIT202, MIT203, MIT211 and MIT212 are compulsory(CCC) and Papers MIT204, MIT205, MIT206 and MIT213 are elective(ECC).
2. Continuous assessment(Internal) will be done by the concerned teacher on the basis of test papers, regularity in the class and performance of the student. Maximum marks in continuous assessment of each paper is 100.

MIT 201 : Java Programming

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100
Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question(may have sub parts) from each unit. There will be an internal choice within the unit.

Unit-I

Introduction to OOP : Basic concepts of Object Oriented Programming , Objects and Classes, Data abstraction and Encapsulation, Inheritance, Polymorphism, Dynamic binding, Message communication: Benefits & applications of OOP.

Introduction to Java : History, Java features, Java Environment- JDK, API. Types of Java program, Creating and Executing a Java program; Java tokens: Keywords, Character set, Identifiers, Literals, Separator; Java Virtual Machine (JVM); Command Line Arguments; Comments in Java program.

Elements: Variables, Data types, Scope of variables, Type casting. Operators, Expressions, Evaluation of expressions.

Unit-II

Decision Making and Branching: If statement and its types, switch statement; Decision making and looping -while loop, do While, for loop, break labeled loop, continue statement.

Arrays: One Dimensional Array, Multidimensional Array, Vectors, Wrapper classes; String Array, String Methods, String Buffer Class.

Class and Objects : Defining a class, Methods, Creating objects, Accessing class members, Constructors, Method overloading, Static members, Nesting of Methods, this keyword.

Inheritance : Define a subclass, deriving a sub class, Overriding methods, Final variables and methods, final classes, Finalize methods, Abstract methods and classes, Visibility Control- Public access, Private access, & protected. Defining interface, Extending interface, Implementing Interface, Accessing interface variables.

Unit-III

Packages: Java API Packages-System Packages, Naming Conventions, Creating & Accessing a Packages, Finding Packages and CLASSPATH, Adding Class to a Packages, Hiding Classes.

JAVA Streams : Data Flow with Java Streams, Input Streams, Output Streams.

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Exception Handling: Advantages of Exception Handling, Types of Errors, Basics of Exception Handling, try blocks, throwing an exception, catching an exception, finally statement, declaring and throwing custom Exceptions.

Multithreading: Creating treads, life of a thread, defining & running thread, thread methods, thread priority, synchronization, implementing run-able interface, thread scheduling.

Unit-IV

Collections : The Collection Framework, The Collection Classes, implementation of List, Set and Map interface, Accessing a Collection via an Iterator, object Ordering, The SortedSet and SortedMap Interface, Comparators.

GUI in Java : applet and it uses; Abstract window tool kit, Event Handlers, Event Listeners. AWT Controls and Event Handling- Labels, Text Component, ActionEvent, Buttons, CheckBoxes, ItemEvent, Choice, Scrollbars, Layout Managers, Input Events, Menus; Introduction to Swing

Networking: Java utility for networking, Manipulating URLs, reading a file on a Web server. Establishing simple Client Server.

Recommende Books:

1. Herbert Schildt, "Java: The Complete Reference", 11th Edition, McGraw-Hill, 2019.
2. E. Balagurusamy, "Programming with Java: A Primer", 6th Edition, Tata McGraw-Hill, 2019.
3. H.M.Deitel, P.J.Deitel, "Java: how to program", Fifth edition, Prentice Hall of India.
4. Cay Horstmann, Gary Cornell; Core Java Fundamentals – Volume I and II;; Pearson Education.
5. Khalid A. Mughal, Rolf W. Rasmussen; A Programmer's Guide to Java Certification (2nd Edn.).

MIT 202 : Software Engineering

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

- Candidate has to attempt five questions in all. All questions carry equal marks.
- Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
- Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Software Engineering Fundamentals: Software, Problem Domain, Software Engineering Challenges.Software Processes (processes, projects &products, component).
Software Development Process Models: Waterfall Model, Prototyping, Iterative Enhancement Model, Spiral Model. Introduction to Agile Model: Principles, Steps, Various Agile Process Models.
Software Requirement Analysis & Specification: Need, Characteristics & Components. Introduction to Requirements Modeling: Data Flow Diagram and Use Cases.

Unit-II

Introduction to Metrics: Function Point, Line of Code (LOC) and KLOC.
Software Project Planning: Cost Estimation- Uncertainties in Cost Estimation, Building Cost Estimation Models, On Size Estimation, COCOMO Model. **Project Scheduling**: Average Duration

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Estimation, Project Scheduling & Milestones. Quality Assurance Plans: Verification & Validation, Inspection & Reviews.

Unit-III

Design Engineering: Design Process & Design Quality, Design Concepts (abstraction, architecture, patterns, modularity, information hiding, functional independence, refinement, refactoring, and design classes), The Design Model (data design elements, architectural design elements, interface design elements, component-level design elements, deployment-level design elements).

Unit-IV

Testing Strategies & Tactics: A strategic approach to software testing, Strategic issues, Software testing fundamentals, Test characteristics, Test Strategies for conventional software: Unit Testing, Integration testing, Validation Testing, System testing, Black-Box testing, White Box testing.

Software Reliability: Measures of Reliability & Availability, Software Safety.

Maintenance and Reengineering: Introduction to: Software Maintenance, Software Supportability, Reengineering, Reverse Engineering, Restructuring, and Forward Engineering.

Reference /Text Books

1. Pressman, Roger (2001) Software Engineering; A Practitioner's Approach, 8th ed. M Graw-Hill,2014.
2. Sommerville Lan; Software Engineering, 9th Ed. Pearson Education,2014
3. Jalote, Pankaj (7) An integrated Approach to Software Engineering 2nd Ed.
4. James Rumbaugh. MichealBlaha, "Object oriented Modeling and Design with UML", 2nd Edition, 2007.
5. Simon Bennett, Steve McRobb and Ray Farmer, " Object-Oriented Systems Analysis and Design Using UML" 4th Edition,McGraw Hill Education, 2010

MIT203: Data Communication and Computer Networks

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

UNIT-I

Data Communications & Network Models : Data Communications: Components, Data Representation and Data flow; Networks: Distributed Processing, Network Criteria, Network Models, Categories of networks and Internetwork; Internet and Protocols and Standards.

Network Models: Layered tasks, the OSI model, Layers in the OSI Model, TCP/IP protocol SuitTCP/IP (Protocols, architecture, layers, services).

Unit – II

Data and Signals & Digital Transmission : Data and Signals: Analog and Digital Data, Analog and Digital Signals, Periodic and Non periodic Signals, Transmission impairment, Data rate limits and Performance. Transmission modes.

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TransmissionMedia: Guided media (Twisted Pair Cable, Coaxial Cable & Fiber-Optic Cable) and Unguided media :Radio wave, Infrared,Microwave Communication, Satellite, Geosynchronous Satellites Communication and optical fiber communication.

UNIT-III

Multiplexing & Switching : Digital Transmission: Digital to Digital Conversion:- Line coding(Unipolar, Polar & Bipolar), Block Coding, Analog to Digital Conversion: PCM & DM, Digital to analog conversion : ASK,FSK,PSK & QAM, Analog to Analog conversion: Amplitude Modulation, Frequency Modulation & Phase Modulation. Multiplexing: FDM, WDM, Synchronous TDM and Statistical TDM.

Error Detection and Correction : Switching: Circuit switched networks, message switching & packet switching. Datagram networks, Virtual Circuit networks. Error Detection and Correction: Introduction, Block coding: Hamming Distance & Parity bit, linear block codes, cyclic codes: CRC, VRC & LRC, and Checksum.

UNIT-IV

Data Link Control : Data Link control: Framing, Introduction of Flow and Error Control. Elementary Data Link Protocols: - Simplest Protocol, Stop & Wait Protocol and Simplex protocol for a Noisy channels.
Networks Layer Functions and Protocols: Routing, Routing algorithms, Network layer protocol of Internet- IP protocol, Internet control protocols.

Transport Layer Functions and Protocols: Transport services, Berkeley socket interface overview, Transport layer protocol of Internet- UDP and TCP. Overview of Application layer protocol:Overview of DNS protocol, Overview of WWW & HTTP protocol.

Recommended Books :

1. Behrouz A. Forouzan, "Data Communication and Networking", 4th edition, Tata McGraw Hill.
2. A. S. Tanenbaum, "Computer Networks", Pearson Education Asia, 4th Ed., 2003.
3. William Stallings, "Data and computer communications", Pearson education Asia, 7th Ed.
4. M.A. Miller, Data and Netowork Communications, Thomosn Kearning
5. Gilbert Held, Understanding Data Communication, Techmedia.

MIT204: Web Application Development

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

- Candidate has to attempt five questions in all. All questions carry equal marks.
- Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
- Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Introduction to Web Technologies : Explore the history of the Internet, the Web, & HTML , Understanding Page Structure and Forms ,How the Website Works, Client and Server Scripting Languages, Domains and Hosting , Responsive Web Designing , Types of Websites (Static and Dynamic Websites) , Web Standards and W3C recommendations

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Introduction of HTML and XHTML :Introduction HTML , HTML Basics , HTML Elements , HTML5 Semantic ,HTML5 DocType, New Structure Tags , Section , Nav , Article , Aside , Header , Footer , HTML Attributes , HTML Headings , HTML Paragraph , HTML Styles ,HTML Formatting , HTML Quotations ,HTML Computer Code , HTML Comments & Colours , HTML CSS, Links and Images , HTML Lists , HTML Blocks , HTML Classes , HTML Layout , HTML Responsive , HTML iframes , HTML JavaScript , HTML Head , HTML Entities and URI Code , HTML Symbols and XHTML , HTML Charset and Forms,

Unit-II

Advance HTML :Create complex image maps , Create tables and nested tables , Insert a form on a web page , Set, modify form field properties: text field, drop-down, check box, radio button , Validating HTML, POST and GET Method , Fieldset and Legend
CSS :CSS Introduction, CSS Selector, CSS Colors, CSS - Styling the text, Box Model, CSS Positioning, Display properties, **Flexbox** :Creating a flex layout Apply CSS to flex layout CSS flex-direction, **Grids**: Creating a grid Apply CSS to grid Grid gaps and Grid lines, CSS Images, **Media queries**: Designing mobile-first Adding breakpoint according to devices Hiding element using media queries, **Bootstrap 5:** Bootstrap Basics ,Using Bootstrap 5 , Bootstrap Themes ,Using Bootstrap Icons ,Modern Website Design ,Understanding Animation/Transition

Unit-III

Introduction to Client Side Scripting : Introduction to Java Script , Javascript Types , Variables in JS , Operators in JS , Conditions Statements , Java Script Loops , JS Popup Boxes , JS Events , JS Arrays , Working with Arrays , JS Objects , JS Functions , Using Java Script in Realtime , Validation of Forms ,**Using JS in real-world App**: Understanding DOM/BOM ,DOM Objects BOM Objects, Dynamic Content Creation ,Cookies and Localstorage, Javascript Callback Javascript Promise ,Javascript HTTP methods

Unit-IV

Ajax and jQuery: Introduction to Ajax, Cross-Browser DOM, Advantages and Disadvantages, Ajax the jQuery way: using load, post, get functions, jQuery: jQuery Basics, Selecting Element with jQuery, Managing Events, Hiding and Showing Elements, Toggling visibility using jQuery.

Event model : introduction, event ON CLICK, event ON LOAD – error handling with ON ERROR, tracking the mouse with event, more DHTML events.

Recommended Books:

1. Jennifer Robbins , "Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web graphics", O'reilly, 2018
2. Adrian W. West ," Practical Web Design for Absolute Beginners", 2016
3. Harvey M. Dietel, Paul Dietel& Tem R. Nieto, ", Internet& World Wide Web How to Program", Pearson, 2011
4. Ivan Bayross. "Web enabled commercial application development using HTML, DHTML, JavaScript, PERL-CGI", BPB Publications, 2010
5. Thomas A; Powel: Web Design ; C.R. : Second Edition TMH,2009.
6. Thomas A. Powel : HTML & XHTML : C.R. Fourth Edition; TMH, 2008
7. M.L. Young; Complete Reference b: Internet; 2nd Edition; Tata McGraw Hill, 2006
8. PHP and MySQL Web Development (Developer's Library) 5th Edition, Luke Welling Laura Thomson,2016
9. Mike McGrath, "PHP & MySQL in easy Steps", Tata McGraw Hill, 2012.

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MIT 205 : Algorithms and Data Structures

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Introduction : Algorithms, pseudo code, efficiency of algorithms, analyzing algorithms and problems, complexity measures, basic time analysis of an algorithm, space complexity. Data abstraction and basic data structures, data types and abstract data types.

Basic data structures – Arrays, Stack, Queues and their applications, linked and sequential representation of arrays, stacks & queue.

Unit-II

Linked lists : Representation of linked list in memory. insertion, deletion and searching of linked list, two way lists. Arithmetic expressions, Polish notations, dequeue and priority queues.

Trees: Basic concepts, linked representation, representation in continuous memory. Binary and N-ary trees, Searching, insertion and deletion in binary search tree, traversing algorithms using stacks, header nodes threads.

Unit-III

Graphs : Graphs and their representations, sequential representation- Adjacent matrix, linked representation of graphs, operations on graph, traversing a graph. DFS and BFS algorithms. Heap structures, heap sort algorithm .

Unit-IV

Sorting and Searching: Use various data structures for searching and sorting, Internal and external sorting techniques, linear and binary search, Hash tables & Hashed searching, Bubble sort, Insertion sort, Selection sort, Merge sort, Radix sort, quick sort.

Recommended reference books :

1. S. Lipschutz: Data Structures; Mc Graw Hill International Edition,2008.
2. E. Horowitz &Sahni, "Fundamental Data Structure", Galgotia Book Source. 2007
3. A.V.Aho, J.E.Hopcroft, and J.D.Ullman, Data Structures and Algorithms, 3rd Edition; Pearson Education Asia,2008
4. SalariaR.S.: Data Structure and Algorithms Using C/C++; 4th Edition; Khanna.
5. Jean-PaulTremblay and PaulG.Sorenson, An Introduction to Data structures with applications TMH Publishing Co.Ltd.
6. A. MichaelBerman: Data Structures via C++OxfordUniversity Press.
   Jean-Paul Tremblay and Paul G. Sorenson, An Introduction to Data Structures with application, TMH Publishing Co. Ltd.
8. A. Tannenbaum, "Data Structure Using C", Pearson Education, 2019.

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MIT 206 : Data Warehousing & Data Mining

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Introduction to Data Warehousing : Introduction, Data Warehouse importance and functions, Multidimensional Data Model, Data Matting and it's usage, Cost of data marting, Metadata, Data warehouse Architecture, Building a Data warehouse, Implementation, Further Development, Planning and Project Management of Data Warehouse.

Unit-II

Data Mining : Data Warehousing to Data Mining, Evolution Analysis, Classification of Data Mining Systems, Architecture of data mining system, Major Issues in Data Mining. Data preprocessing : Needs preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Dieselization and Concept Hierarchy Generation; Analysis of Attributes Relevance. Discriminating between Different Classes. Data Warehouse and OLAP Technology for Data Mining.

Unit-III

Association Rules : Association Rule Mining, Single- Dimensional Boolean Association Rules from Transactional Databases.Apriori algorithm, Use of sampling for frequent item-set, FP tree algorithm, Multi-Level Association Rules from Transaction Databases. Issues regarding classification & prediction. Different Classification Methods, Prediction.

Unit-IV

Clustering and Applications of Data Mining : Cluster Analysis, Types of Data Categorization of Major Clustering Methods, Kmeans, Partitioning Methods, Hierarchical Methods, Density Based Methods, Grid Based Methods, Model-Based Clustering Methods, Clustering High Dimensional Data, Constraint Based Cluster Analysis, Outlier Analysis, Data Mining Applications.

Recommended Books :

1. Data Warehousing in the Real World – SAMANAHORY&DennisMURRAY. PeasrsonEdnAsia.
2. Data Mining – Concepts and Techniques-JIAWEI HAN & MICHELINE KAMBER Hareourt India.
3. Data Warehousing ; ReemaThareja; Oxford
4. Data Mining Introductory and advanced topics MARGARET H DUNHAM PEARSON EDUCATION.
5. Data Warehousing in Real World Anahory, Pearson Education.
6. Data Mining Techniques-ARUNKPUJARI, University Press.
7. Bulding the Data Warehouse-W.H.Inmon, 3rd Edition, Wiley. 2003.
8. Data Warehousing Fundamentals-PAULRAJPONNAIAH WILLEY STUDENT EDN.

Practical Examination :

Each practical paper shall be of 3 hours duration on one day and carry 100 marks for the practical examination. The practical examination will involve 3 exercises, each of 20 marks, practical record of 15 marks and viva-voce examination of 25 marks.

MIT 111: Java Lab
Practical Lab
Examination : Practical Examination
Lab Exercise on Theory Paper MIT 201
List of experiments:

1. Simple java applications for understanding references to an instant of a class
2. Handling Arrays in JAVA
3. Handling strings in JAVA
4. Implementation polymorphism
5. Package creation
6. Developing user defined packages in java
7. Use of Inheritances
8. Use of Interfaces
9. Threads, Multithreading
10. Collection handling
11. GUI/Swings applications
12. I/O Stream handling
13. Exception Handling

MIT 212: Web Application Development Lab
Practical Lab
Examination : Practical Examination
Lab Exercise on Theory Paper MIT 204

List of experiments:

HTML:

- Basics Elements & Attributes, HTML Formatting tags, Links,
- Images, Tables, Forms Elements
- HTML5 Audio and Video, HTML5 Input Types & Attributes
- CSS Syntax, CSS Attribute Selectors
- CSS properties: Fonts, Background, Colors, Links, Lists,
- CSS Box Model, Display, Opacity, Float, Clear
- CSS Layout, CSS Navigation Bar,
- CSS Rounded Corners, CSS Border Images, CSS Animations

JavaScript:

- Displaying Output, DeclaringVariables, Operators, Arithmetic, Data Types,Assignment,
- JavaScript Functions, Booleans, Comparisons, Conditional ,
- JavaScript Switch, Loops, Break, Type,
- JavaScript Objects, Scope,
- Strings and String Methods
- Numbers and Number Methods, Math, JavaScript Dates: Formats and Methods
- JavaScript Events, JavaScript, JavaScript Forms (API and Validation), Objects,
- JavaScript Functions, JavaScript DOM, JavaScript Validation, Browser BOM
- Exercises on Ajax and jQuery

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MCIT 213: Data Structures Lab
Practical Lab
Examination: Practical Examination-
Exercises based on the Theory paper MIT 205

List of Experiments:

1. Array implementation of Stack and Queue
2. Linked list implementation of List, Stack Queue
3. Array implementation of QUEUE
4. Applications of List, Stack and Queue ADTs
5. Implementation of Binary Trees and operations of Binary Trees
6. Implementation of Binary Search Trees
7. Implementation of AVL Trees
8. Implementation of Heaps using Priority Queues.
9. Graph representation and Traversal algorithms
10. Applications of Graphs
11. Implementation of searching and sorting algorithms

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M.Sc.(IT)-Third Semester 2023-24 Onwards

S.No.	Subject Code	Subject Title	Course Category	Credit	Contact Hours per Week			EoSE * Duration(Hr	
					L	T	P	Thy	P
1	MIT 301	Cloud Computing	CCC	4	3	1	0	3	0
2	MIT 302	.NET Frame Work and ASP.NET	CCC	4	3	1	0	3	0
3	MIT 303	Python Programming	CCC	4	3	1	0	3	0
4	MIT 304	Artificial Intelligence	ECC	4	3	1	0	3	0
5	MIT ***	Elective - I(Any One in Elective Group –I)	ECC	4	3	1	0	3	0
6	MIT ***	Elective - II(Any One in Elective Group –II)	ECC	4	3	1	0	3	0
7	MIT 311	.NET Lab	CCC	4	0	0	6	0	3
8	MIT 312	Python Lab	CCC	4	0	0	6	0	3
9	MIT 313	Communication and Soft Skill Lab	ECC	4	0	0	6	0	3
			Total Credit	**36**					

***EoSE- End of Semester Examination.**

/*: Please see the List of Elective papers (Elective-I and Elective-II corresponding)

Elective Group-I (Any one)				
MIT A01	ECC	Big Data Analytics	-	III
MIT A02	ECC	Advanced Java Programming	-	III
MIT A03	ECC	Computer Graphics	-	III
MIT A04	ECC	Cyber Security	-	III
Elective Group-II (Any one)				
MIT B01	ECC	Theory of Computation	-	III
MIT B02	ECC	Soft Computing	-	III
MIT B03	ECC	Computer Based Optimization Techniques	-	III
MIT B04	ECC	Network Security &Cryptography	-	III

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Syllabus of M.Sc.(IT) III Semester-2023-24

Note :

1. Papers MIT 301, MIT302, MIT 303, MIT311 and MIT312 are compulsory(CCC) and Papers MIT304, MIT305, MIT306 and MIT 313 are elective(ECC).
2. Continuous assessment(Internal) will be done by the concerned teacher on the basis of test papers, regularity in the class and performance of the student. Maximum marks in continuous assessment of each paper is 100.

MIT-301 : Cloud Computing

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Introduction of Cloud Computing: Nutshell of cloud computing, Enabling Technology, Vision, feature Characteristics and components of Cloud Computing. Challenges, Risks and Approaches of Migration into Cloud. , Layer and Types of Clouds, Services models, Cloud Reference Model.

Unit-II

Cloud Computing Architecture: Data center Design and interconnection Network, Architectural design of Compute and Storage Clouds. Cloud Programming and Software: Features of cloud programming, Parallel and distributed programming paradigms-MapReduce, Hadoop , High level Language for Cloud. Service Oriented Architecture – REST and Systems of Systems – Web Services – Publish Subscribe Model

Unit-III

Virtualization Technology: Definition, Understanding and Benefits of Virtualization. Implementation Level of Virtualization, Virtualization Structure/Tools and Mechanisms, Hypervisor VMware, KVM, Xen. Virtualization: of CPU, Memory, I/O Devices, Virtual Cluster and Resources Management, Virtualization of Server , Desktop, Network, and Virtualization of data-center.

Unit-IV

Securing the Cloud: Cloud Information security fundamentals, Cloud security services, Design principles, Policy Implementation, Cloud Computing Security Challenges, Cloud Computing Security Architecture. Data Security in Cloud: Risk Mitigation , Understanding and Identification of Threats in Cloud, SLA-Service Level Agreements, Trust Management.

Cloud Platforms in Industry: Amazon web services, Google AppEngine, Microsoft Azure Design, Aneka: Cloud Application Platform -Integration of Private and Public Clouds Cloud applications:

Protein structure prediction, Data Analysis, Satellite Image Processing, CRM and ERP, Social networking, Applications.

Recommended Books:

1. Cloud Computing ,Principle and Paradigms, Edited By RajkumarBuyya, JemesBroberg, A. Goscinski, Pub.- Wiley-2016
2. Kumar Saurabh, "Cloud Computing" , Wiley Pub 2016
3. Distributed and Cloud Computing, Kai Hawang , GeofreyC.Fox, Jack J. Dongarra Pub: Elservier, 2013
4. Krutz , Vines, "Cloud Security " , Wiley Pub,2010
5. Velte, "Cloud Computing- A Practical Approach" ,TMH Pub,2009
6. Katarina Stanoevska-Slabeva, Thomas Wozniak, SantiRistol, "Grid and Cloud Computing – A Business Perspective on Technology and Applications", Springer,2010

MIT 302 : .NET Frame Work and ASP.NET

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Introduction to .Net framework: Advantages and Components of .NET Framework, Features of .NET Framework, Managed Code and the CLR, Intermediate Language, Metadata and JIT Compilation, Automatic Memory Management.

Language Concepts and the CLR: Visual Studies .Net, Using the .Net Framework, The Framework Class Library: .Net objects- ASP.NET, .NET web services, Windows Forms. Elements, Data types, Control and Looping structures.

Unit-II

Windows Programming: Creating windows forms, windows controls, Mouse Events, Menus and Dialog Boxes.

Working with Data Controls : Basics of ADO.NET,Architecture of ADO.NET, ADO.NET providers, Connection, Command, Data Adapter, Dataset, Connecting to Data Source, Accessing Data with Data set and Data reader, Create an ADO.NET application, Using Stored Procedures.

Unit-III

ASP.NET Framework : Client and server architecture, All standard Controls, Validation Controls, Rich Web Controls, Creating and Implementing User and Custom Controls, Designing Website with Master Pages.

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ASP.NET Configuration : Session and Application Management, of States and Structure; Change the Home Directory in IIS, Caching, Security-Authentication and Authorization.Localization and Globalization, Exception handling using AJAX Control toolkit.
Creating Web Controls: Web Controls, HTML Controls, Using Internist Control, Using Input Validation Controls, Selecting Controls for Applications, Data Controls and Adding web controls to a page. Creating Web Forms: Server Controls, Types of Server Controls, Adding ASP.NET Code to a page.

Unit-IV

Overview of XML : XML Serialization in the .NET Framework-SOAP Fundamental-Using SOAP with the .NET Framework.

Web Services and WCF : Web Services protocol and standards – WSDL Documents-Overview of UDDI – Calling a Web Service from a Browser-Calling a Web Service by Using a proxy – Creating a simple web service – Creating and Calling a Web Service by Using Visual Studio.NET Architecture of WCF, WCF Client.

Recommended Books :

- Mathew Mac Donald: Beginning ASP.NET 4.0 in C# 2010, 3rd Edition, A Pres.
- BillEvjenScottHanselman, DevinRader: Professional ASP.NET4, 2010, Willey.
- GeorgeShepherd: Microsoft ASP.NET Step by step, 2010 Microsoft Press.
- ImarSpaanjaars: Beginning ASP.NET 4: in C# and VB (Wrox Programming to Programmer) , 2010 Wiely Publishing.
- StevenHolzner; ASP.NET 4.0 (Cover C# & VB) Black Book; Dreamtech Press.
- StevenHolzner; .NET Programming Black Book; Dreamtech Press.

MIT-303: Python Programming

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

- Candidate has to attempt five questions in all. All questions carry equal marks.
- Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
- Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Introduction: What is Python, Origin, Comparison, Comments, Variables and Assignment, Identifiers, Basic Style Guidelines, Python Objects, Standard Types, Internal Types, Operators, Built-in Functions, Numbers and Strings. Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Sequences: Strings, Sequences, String-only Operators, Built-in Functions, String Built-in Methods, Special Features of Strings, Memory Management, Python Application Examples. Conditionals and Loops: if statement, else Statement, elif Statement, while Statement, for Statement, break Statement, continue Statement, pass Statement, else Statement

Unit-II

Object and Classes: Classes in Python, Principles of Object Orientation, Creating Classes, Instance Methods, Class variables, Inheritance, Polymorphism, Type Identification.

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Lists and Sets: Built-in Functions, List type built in Methods, Special Features of Lists, Tuples, Tuple Operators and Built-in Functions, Special Features of Tuples,Set: Introduction, Accessing, Built-in Methods (Add, Update, Clear, Copy, Discard, Remove), Operations (Union, Intersection, Difference).

Dictionaries : Introduction to Dictionaries, Built-in Functions, Built-in Methods, Dictionary Keys, Sorting and Looping, Nested Dictionaries.

Unit-III

Files: File Objects, File Built-in Function, File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules.

Regular Expression and Exception Handling : Regular Expression: Introduction/Motivation, Special Symbols and Characters for REs, REs and Python.

Excetiptons: What Are Exceptions? Exceptions in Python, Detecting and Handling Exceptions, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions.

Unit-IV

Database Interaction : SQL Database Connection using Python, Creating and Searching Tables, Reading and storing config information on database, Programming using database connections, Python Multithreading: Understanding threads, Forking threads, synchronizing the threads, Programming using multithreading.

Recommended Books:

1. R. Nageswara Rao, "Core Python Programming", Dreamtech Press, 2nd Edition, 2018
2. Dr. M. Suresh Anand, Dr. R. Jothikumar, Dr. N. Vadivelan, "Python Programming" , Notion Press, 1stEdition, 2020
3. Martin C. Brown, "The Complete Reference Python", McGraw Hill Education, 4thEdition, 2018
4. Allen B. Downey, "Think Python", O'Reilly Media, 2016
5. Amit Ashok Kamthane, Ashok NamdevKamthane, " Programming and Problem Solving with Python" , McGraw Hill HED, 1st Edition, 2017
6. SakisKasampalis, Quan Nguyen, Dr Gabriele Lanaro,Ingram, "Advanced Python Programming", short title, 2019

MIT 304 : Artificial Intelligence

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

General Issues and overview of AI : The AI problems: what is an AI technique, Characteristics of AI applications Problem Solving, Search and Control Strategies General Problem solving. Production

systems, Control strategies, forward and backward chaining Exhaustive searches: Depth first, Breadth first search.

Heuristic Search Techniques : Hill climbing, Branch and Bound technique, Best first search and A* algorithm, AND/OR Graphs, Problem reduction and AO* algorithm, Constraint Satisfaction problems Game Playing Min Max Search procedure, Alpha-Beta cutoff, Additional Refinements.

Unit-II

Knowledge Representation : First Order Predicate Calculus, Resolution Principle and Unification, Inference Mechanisms Horn's Clauses, Semantic Networks, Frame Systems and Value Inheritance, Scripts, Conceptual Dependency AI Programming Languages Introduction to LISP, Introduction to PROLOG.

Unit-III

Natural Language Processing: Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – Regular Expressions, Finite-State Automata – English Morphology, Tokenization, Unsmoothed N-grams, Evaluating N-grams, Smoothing, Part-of-Speech Tagging, Issues in Part-of-Speech tagging.
Semantics and pragmatics-Requirements for representation, Syntax-Driven Semantic analysis, Semantic attachment-Word Senses, Relations between Senses.

Syntactic analysis: Context-Free Grammars, Grammar rules for English, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, and Ambiguity.

Unit-IV

Probability and Expert Systems: Probabilistic Reasoning and Uncertainty, Probability theory, Bayes Theorem and Bayesian networks, Certainty Factor.

Introduction to Expert Systems: Architecture of Expert Systems, Expert System Shells, Knowledge Acquisition, Case Studies, MYCIN, Learning, Rote Learning, Learning by Induction, explanation based learning.

Recommended Books:

1. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill, 3rd edition, 2009.
2. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", Prentice Hall of India, 1st edition, 1997.
3. Winston, Patrick, Henry, "Artificial Intelligence", Pearson Education, 3rd edition, 2004
4. SubhasreeBhattacharjee, "Artificial Intelligence for Student" Shroff Publishers and Distributors Pvt.LTD., 1st Edition, 2016
5. Daniel Jurafsky, James H. MartinSpeech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
6. Steven Bird, Ewan Klein and Edward Loper, Natural Language Processing with PythonII, First Edition, OReilly Media, 2009.
7. Nils J. Nilsson, "Principles of Artificial Intelligence (Symbolic Computation / Artificial Intelligence)", reprint edition, 2014.
8. Stuart Russell, Peter Norving, "Artificial Intelligence: A Modern Approach", Pearson Education, 3rd edition, 2010.

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Practical Examination

Each practical paper shall be of 3 hours duration on one day and carry 100 marks for the practical examination. The practical examination will involve 3 exercises, each of 20 marks, practical record of 15 marks and viva-voce examination of 25 marks.

MIT 311 : .NET Lab

Practical Lab : Examination : Practical Examination
Lab Exercise based on Theory Paper MIT 302.

List of experiments:

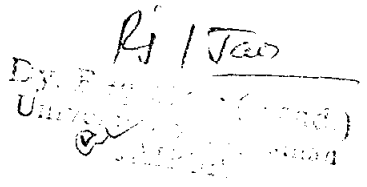
- Simple application of window programming
- Use of control structures in array handling
- Implementation of basic data structures
- Functions overloading
- Working with GUI controls
- Handling of multiple classes using interfaces
- Event handling with controls
- Working with Data Controls
- Dynamic data binding
- Use of Validation controls
- Creating Forms & Dialog boxes
- Working with Web Controls
- Creating & Implementation User controls
- Create Web sites
- Session Management
- Exception handling using Ajax toolkit
- Web Services and WCF.

MIT312: Python Lab

Practical Lab
Examination: Practical Examination-
Exercises based on the Theory paper MITA 303.

List of Experiments:

1. Implement a sequential search
2. Create a calculator program
3. Explore String Functions
4. Implement Selection Sort
5. Implement Stack
6. Read and Write into a file
7. Demonstrate usage of basic regular expression
8. Demonstrate use of advanced regular expressions for data validation
9. Demonstrate use of List
10. Demonstrate use of Dictionaries
11. Create Comma separate files(CSV), Load CSV files into internal data structure
12. Write script to work like a SQL SELECT statement for internal data structure



MIT 313 : Communication and Soft Skill Lab

Practical Lab : Examination : Practical Examination
Contents:

1. **Communication :**Objectives & Process of Communication, Essential components of the Process of Communication, Importance and Objectives of Communication, Differences between general and technical communication. Types of Communication (Extrapersonal, Intrapersonal, Interpersonal, Organisational & Mass communications).

2. **Verbal & Non-verbal Communication :**Listening, Speaking, Reading and Writing. Verbal and Non-verbal Communication. Intra, inter-personal and group communication skills. Gestures, postures, Proxemics, Kinesics. Listening to Lectures, Discussions, Talk Shows, News Programs.

3. **Writing Skills :**Formal & Informal writings, report writing, creative writing. Composition. Resume Writing, Cover letters, Business Letter Writing, Persuasive Letters, Job Applications and Official Correspondence, E-Mail etiquette, Precise writing.

4. **Presentation Skills :**Elements of effective presentation, structure of presentation, external factors and content, Seminar, Speeches, Lectures, Interviews, Mock Interviews.

5. **Group Discussion :** Structure of GD, Moderator led and other GDs, Strategies in GD, Team work body language, Mock GD, Problem solving, Reflective thinking, Critical thinking, Negotiation skills.

6. **Career Skills :** Goal setting, Work ethics, Problem solving skills, Active listening, Dressing etiquette and office etiquettes. SWOT Analysis, IQ, EQ and SQ, Art of giving feedback, Decision making, Time Management, Team Management and Leadership Skills, Habits of successful people.

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Elective Theory Papers for Elective Group-1 of M.Sc.(IT) III Sem

MIT A01 : Big Data Analytics

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

- Candidate has to attempt five questions in all. All questions carry equal marks.
- Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
- Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Understanding Big Data : Introduction, Need, convergence of key trends, structured data Vs. unstructured data , industry examples of big data, web analytics – big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and its applications in healthcare, medicine, advertising etc.

Mining Data Streams: - Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Real Time Sentiment Analysis- Stock Market Predictions.

Unit-II

Big Data Technologies: Hadoop : Open source technologies, cloud and big data, Crowd Sourcing Analytics, inter and trans firewall analytics .

Introduction to Hadoop: Introduction, Data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes. Design of Hadoop distributed file system (HDFS), HDFS concepts – Java interface, data flow, Data Ingest with Flume and Sqoop. Hadoop I/O – data integrity, compression, serialization,
Avro – file-based data structures.

Unit-III

Hadoop Related Tools: Introduction to Hbase: The Dawn of Big Data, the Problem with Relational Database Systems. Introduction to Cassandra: Introduction to Pig, Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries.

NOSQL Data Management: Introduction to NoSQL, aggregate data models, key-value and document data models, relationships, graph databases, schemaless databases, materialized views, distribution models, sharding, master-slave replication, peer-peer replication Consistency: relaxing consistency, version stamps.

Unit-IV

Predictive Analytics: Simple linear regression- Multiple linear regression- Interpretation 5 of regression coefficients. Visualizations - Visual data analysis techniques- interaction techniques - Systems and applications.

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Map Reduce Applications: MapReduce workflows, unit tests with MRUnit, test data and local tests, anatomy of MapReduce job run, classic Map-reduce – YARN, failures in classic Map-reduce and YARN – job scheduling, shuffle and sort, task execution, MapReduce types -- input formats – output formats, MapReduce – partitioning and combining, Composing MapReduce Calculations.

Recommended Books:

1. Big Data, Black Book, DT Editorial Services, Dreamtech Press 2015
2. Professional NOSQL, Shashank Tiwari, Wrox, September 2011
3. Hadoop in Practice, Alex Homes, Dreamtech Press, 2015
4. HBase: The Definitive Guide, Lars George, O'Reilley, 2011.
5. Cassandra: The Definitive Guide, Eben Hewitt, O'Reilley, 2010.
6. Programming Pig, Alan Gates, O'Reilley, 2011.
7. NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, P. J. Sadalage and M. Fowler, Pearson Education, Inc. 2012.
8. Programming Hive, E. Capriolo, D. Wampler, and J. Rutherglen, O'Reilley, 2012
9. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
10. Tom White "Hadoop: The Definitive Guide" Third Edition, O'reilly Media, 2012

MIT A02:Advanced Java Programming

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

- Candidate has to attempt five questions in all. All questions carry equal marks.
- Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
- Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

J2EE Overview : Need of J2EE, J2EE Architecture, J2EE APIs, J2EE Containers. Web Application Basics, Architecture and Challenges of Web Application, Applet Life Cycle, Servlet Life Cycle, Developing and Deploying Servlets, Exploring Deployment Descriptor (web.xml), Handling Request and Response, Initializing a Servlet. Servlet Chaining, Session Tracking and Management .

Unit-II

JDBC: The JDBC Connectivity Model, Types of JDBC Drivers., Basic steps to JDBC, setting up a connection to database, Creating and executing SQL statements, ResultSet and ResultSet Metadata Object,Accessing Database.

Unit-III

Java Server Pages : Basic JSP Architecture, Life Cycle of JSP, JSP Tags & Expressions, JSP Implicit Objects, JSP Directives, Tag Libraries ,Using JDBC with JSP , Accessing a Database, Adding a Form, Updating the Database.

Unit-IV

Introduction to Spring : Overview of Spring Framework- Inversion of Control / Dependency Injection Concepts, Aspect Oriented Programming - concept ,Spring MVC Architecture , Bean Factory and Application Context, Attaching and Populating beans, Injecting data through setters and

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constructors , Listening on events, Publishing events, Spring MVC Layering, Dispatcher Servlet, Writing a Controller, DAO, Models, Services, Spring Configuration File,Error handling Strategy.

Recommended Books:

1. Herbert Schildt, "Java: The Complete Reference", 10th Edition, McGraw-Hill, 2017.
2. Marty Hall and Larry Brown, "Core Servlets and Java Server Pages", 2nd Edition. 2003.
3. MertCaliskan, Kenan Sevindik, Rod Johnson, Jurgen Holler, "Beginning Spring", Wrox publication, Feb 2015.
4. E. Balagurusamy, "Programming with Java: A Primer", Tata McGraw-Hill, 2019.
5. Bryan Basham, Kathy Sierra & Bert Bates, "Head First Servlets and JSP" Paperback – 2011
6. Bruce Eckel, "Thinking in Java", 4th Edition, Prentice Hall, 2006.
7. Cay S. Horstmann, "Core Java, Volume I: Fundamentals", 9th Edition, Pearson Education, 2014.
8. Santosh Kumar K, "JDBC, Servlet, and JSP: Black Book", Kogent Solutions Inc., 2008.
9. Madhusudhan Konda, "Just Spring", 1st edition, O'Reilly, 2011.

MIT A03 : Computer Graphics

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

- Candidate has to attempt five questions in all. All questions carry equal marks.
- Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
- Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Introduction: Elements of graphics workstation , Video Display Devices. Raster Scan Systems. Random Scan systems. Input devices, Graphics Software Coordinate Representations.
Algorithms: Line drawing algorithms- DDA Algorithm. Bresenham's Line Algorithm. Frame buffers. Midpoint Circle Algorithm. Midpoint Elipse Algorithm. Sean-Line polygon fill algorithm. Inside-Outside tests Scan-Line fill of curved Boundary Areas. Boundary fill algorithms. Flood fill Algorithm.

Unit-II

Graphics Primitives: Primitive Operations, The display file interpreter, Normalized Device Coordinates. Attributes of output primitives: Line attributes, Color and gray scale levels. Colortables. Gray scale. Area-Fill Attributes, Fill styles. Pattern fill. Soft fill. Character Attributes.
Geometric Transformations: Matrices. Scaling Transformations. Sin and Cos Rotation. Homogeneous Co-ordinates and Translation. Co-ordinate Translations. Rotation about an arbitrary point. Inverse Transformations, Scaling Transformation, Reflection and Shear transformations, Transformations Routines.

Unit-III

2-D Viewing – The viewing pipeline, Viewing co-ordinate, Reference Frame. Windows to view ports. Co-ordinate transformation 2-D Viewing functions. Clipping operations point clipping. Line clipping. Cohen-Sutherland. Line Clipping. Polygon clipping. Sutherland Hodge man clipping.

3-D concepts: Three dimensional Display Methods, Parallel projection. Perspective projection, Visible line and surface identification. Surface rendering. Three Dimensional Object

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representations. Bezier curves and surfaces. B-Spline curves and surfaces. Visibility, Image and Object Precision Z-buffer algorithm.

Unit-IV

Computer Animation: Design of Animation Sequence, General computer Animation Function-Raster animations, Key Frame system, Morphing, Simulating Accelerations, Motion Specifications, Kinematics and Dynamics.

Recommended Books:

1. Hearn D., Baker P.D.: Computer Graphics; 2nd editions; Pearson.2003.
2. Foley J.D.; Van D.A. : Fundamentals of Interactive Computer Graphics; 2nd Edition; Addision-Viley,2000
3. Ronger D.F. ; Elements of Computer Graphics;
4. Giloi W.K. ; Interactive Computer Graphics; PHI
5. Mewman W, Sproul R.F. ; Principles of Interactive Computer Graphics; Mc Graw Hill.

MIT A04 : Cyber Security

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit- I

Introduction to Cyber Security: Overview of Cyber Security, Internet Governance: Challenges and Constraints, Cyber Threats, Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, Need for a Comprehensive Cyber Security Policy, Need for a Nodal Authority, International convention on Cyberspace.

Unit- II

Introduction to Cybercrime and Laws: Origins of Cybercrime, Classifications of Cybercrimes, information Security, Cybercriminals, Criminals Plan for Attacks, Cybercafe, Botnets, Attack Vector, The Indian IT ACT 2000 and amendments.

Tools and Methods used in Cybercrime: Introduction, Proxy Server and Anonymizers, Password Cracking, Keyloggers and Spyware, Virus and Warms, Trojan and backdoors, DOS and DDOS attack, SQLinjection.

Unit- III

Phishing and Identity Theft: Introduction to Phishing, Methods of Phishing, Phishing Techniques, Phishing Toolkits and Spy Phishing. Identity Theft: PII, Types of Identity Theft, Techniques of ID Theft. Digital Forensics Science, Need for Computer Cyber forensics and Digital Evidence, Digital Forensics Life Cycle. Introduction to Intellectual Property Law – The Evolutionary Past - The IPR Tool Kit- Para -Legal Tasks in Intellectual Property Law – Ethical obligations in Para Legal Tasks in Intellectual Property Law –types of intellectual property rights.

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Unit- IV

Network Defence tools: Firewalls and Packet Filters: Firewall Basics, Packet Filter Vs Firewall, Packet Characteristic to Filter, Stateless Vs Stateful Firewalls, Network Address Translation (NAT) and Port Forwarding, Virtual Private Networks, Linux Firewall, Windows Firewall, Snort Detection System, Introduction to block chain technology and its applications.

Recommended Books:

1. Mike Shema, Anti-Hacker Tool Kit (Indian Edition), Publication McGraw Hill.
2. Nina Godbole and SunitBelpure, Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Publication Wiley.
3. Marjie T. Britz, Computer Forensics and Cyber Crime: An Introduction, Pearson Education
4. Chwan-Hwa (John) Wu,J. David Irwin, Introduction to Computer Networks and Cyber security, CRC Press
5. Bill Nelson, Amelia Phillips, Christopher Steuart, Guide to Computer Forensics and Investigations, Cengage Learning
6. Debirag E.Bouchoux, Intellectual Property, Cengage Learning.

Elective Theory Papers for Elective Group-2 of M.Sc.(IT) III Sem

MIT B01 : Theory of Computation

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

UNIT-I

Automata : Introduction of automata, computability, and complexity; mathematical notations and terminology; finding proofs and types of proofs.
Automata and Languages: Regular languages, finite automata, formal definition of a finite automaton, formal definition of computation, designing finite automata.

UNIT-II

Non-deterministic finite automata: Equivalence of NFAs and DFAs, closure under the regular operations, Regular Expressions: formal definition of a regular expression, equivalence with finite automata, nonregular languages: pumping lemma for regular languages.

UNIT-III

Push down Automata and Context free languages: Context free grammars, designing context free grammar, ambiguity in CFG and its removal, Chomsky normal form push down automata: formal definition, graphical notations, Languages accepted by PDA, Equivalence of PDA and CFG, Non-context free languages.

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UNIT-IV

Turing Machines and Computability: Formal definition of turing machines with examples, graphical notations, variants of turing machines, church-turing thesis, Hubert's problem.
Decidability, undecidability and reducibility: Decidable languages; decidable problems concerning regular languages and context free languages, the halting problem, undecidable problems, mapping reducibility, decidability of logical theories, turing reducibility.

Recommended Books:

1. Michael Sipser, "Introduction to the Theory of Computation", Second Edition, 2007, CENGAGE learning India Pvt. Ltd., New Delhi.
2. John E. Hopcroft, Rajeev Motwani & Jeffrey D. Ullman, "Introduction to Automata Theory,Languages, and Computation", Third Edition, 2007, Pearson Education Inc
3. K.L.P Mishra & N.Chandrasekaran,"Theory of Computer Science", PHI Learning
4. Michael Sipsev,"Theory of Computation",Cenage Learning
5. John C Martin, "Introdution to languages and theory of computation", McGraw Hill
6. Daniel I.A. Cohen,"Introduction to Computer Theory",Wiley India.
7. Kohavi,"Switching & Finite Automata Theory",TMH

MIT B02 : Soft Computing

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

UNIT-I

Introduction to Soft Computing : Introduction of Hard and Soft Computing, Unique features of Soft computing, Components of Soft computing, Fuzzy Computing, Evolutionary Computation, Genetic Algorithm, Swarm Intelligence, Ant Colony Optimizations, Neural Network, Machine Learning , Associative Memory, Adaptive Resonance Theory, Introduction to Deep Learning.

UNIT-II

Fuzzy Logic : Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion, Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzificataions, Fuzzy Inference Systems, Mamdani Fuzzy Model, Sugeno Fuzzy Model, Fuzzy Controller, applications.

UNIT-III

Neural Networks : Introduction and Architecture: Neuron, Nerve structure and synapse, Artificial Neuron and its model, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Back propagation networks architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propagation learning methods, back propagation algorithm, applications.

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UNIT-IV

Genetic Algorithms : Basic concepts of GA, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, applications.

Hybrid Systems : Integration of neural networks, fuzzy logic and genetic algorithms. GA Based Back Propagation Networks, Fuzzy Back Propagation Networks, Fuzzy Associative Memories, Simplified Fuzzy ARTMAP.

Recommended Books:

1. S. Rajasekaran and G.A.Vijaylakshmi Pai,"Neural Networks Fuzzy Logic, and Genetic Algorithms", Prentice Hall of India 2004.
2. K.H.Lee. First Course on Fuzzy Theory and Applications, Springer-Verlag.

MIT B03 : Computer Based Optimization Techniques

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

- Candidate has to attempt five questions in all. All questions carry equal marks.
- Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
- Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Linear Programming Problems (LPP): formulation of an LPP, Solution of an LPP using graphics method and simplex method, Slack, Surplus & Artificial Variables, Two-phase and big-M method.

Special cases in LPP: alternate optimum solution, an unbounded solution, infeasible Solution, Duality in LPP, Revised Simplex method.

Unit-II

Transportation Problem: Definition, methods for finding initial basic feasible solutions – North West corner rule, least cost cell entry method, Vogel's approximation method, methods for finding optional solution – MODI Method.

Assignment Problems; Definition & concept, solution of an assignment problem for optimum solution – Hungarian Method.

Sequencing: Job – problems for processing N Jobs on 2 machines, processing N jobs on 3 machines, processing N jobs on processing M machines, processing 2 jobs on M machines (Graphic Method).

Unit-III

Inventory Models: What is inventory? Types of Inventories, Inventory Decisions, Cost involved in inventory problems, Controlled & Uncontrolled variables, deterministic inventory control system, concept of an average inventories, concept of economic order quantity (EOQ) . (In short Model-I, II and Model III).

Replacement Models; introduction – The replacement problem, replacement of items that deteriorate (with money value), replacement of items that fail completely (Mortality theorem).

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Unit-IV

Project Management by PERT & CPM: Introduction – Historical Development of CPM/PERT, Application of PERT – CPM techniques network diagram representation, rules for drawing network, time estimation & critical path in network analysis

Queuing theory: Introduction queuing system, queering problem, transient & steady states, traffic intensity, distribution of queuing system (Birth & Death Process), Queuing Models – I,II & III.

Recommended Books:

1. GilletteB.E.: Introduction to Operations Research – A Computer Oriented Algorithmic approach, Tat McGraw Hill Pub.Co, New Delhi.
2. TahaHatndy: A Operation Research- An Introduction, Fifth Edn. PHI, New Delhi.
3. Metal K.V. &MohanC: Optimization Methods in Operations Research and system Analysis, 3rd Edn. New age international Publishers, New Delhi.
4. Hiller, F.S. & Limrman, G.L. : Introduction to Operations research, 2nd Edn. Holden day inc., London, 1974.
5. SharmaS.D. Operations Research, KedarNat R. & Com. Meerut, 2003
6. Kapoor V.K.: Operations Research, Sultan Chand & Sons, 1999.
7. P.K.Gupta&D.S. Hira : Operation Research, S.Chand & Company Ltd. New Delhi 2000

MIT B04 : Network Security &Cryptography

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit I

Introduction to Security Attacks : Cryptography, Security Attacks, Security Services and Mechanism.
Classical Encryption Techniques : Classical Techniques, Conventional Encryption Model. Classical Encryption Techniques.
Modern Techniques: Simplified DES, Block Ciphers Principles, DES Standards, DES Strength, Differential & Linear Cryptanalysis, Block Cipher Design Principles, Block cipher Modes of Operation.

Unit II

Conventional Encryption Algorithms: Triples DES, International Data Encryption Algorithm, RC5, RC2 placement & Encryption Function, Key Distribution, Random Number generation, Placement of Encryption Function.
Public Key Encryption: Public Key Cryptography: Principle of public key Cryptosystems, RSA algorithm, Key Management, Fermat's Theorem & Euler's Theorem, The Chinese remainder theorem.

Unit III

Message Authentication & Hash Function: Authentication Requirements, Authentication Function, Message Authentication Codes, Hash Function, Birthday Attacks, Security of Hash Function & MAC's, MD5 Message Digest algorithm, Secure Hash Algorithm(SHA).

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Digital Signatures: Digital Signature, Authentication Protocol, Digital Signature Standard(DSS). proof of digital signature algorithm.

Unit IV

Network and System Security: Authentication Application-Kerberos x.509, Dictionary Authentication Services, Electronic Mail Security, Pretty Good Privacy (PGP), S/mime. Security: Architecture, Authentication Header, Encapsulation security payloads, combining security association, Key Management. **Web Security**: Secure socket layer & Transport layer security, Secure electronic transaction (SET). System Security: Intruders, viruses, firewall Design principle, Trusted Systems.

Reference Books:

1. Willium Stalling; Cryptography and Network Security, Fifth Edn, Pearson.;
2. AtulKahate; Cryptography and network Security; TataMcgrawHill.
3. V.K.Pachghare; Cryptography and Information Security; PHI.
4. MattBishop, Sathyanarayana; Introduction to Computer Security;Pearson.

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M.Sc.(IT)-Fourth Semester 2023-24 Onwards

S. No.	Subject Code	Subject Title	Course Category	Credit	Contact Hours per Week			EoSE* Duration (Hrs)	
					L	T	P	Thy	P
1	MIT 401	Digital Marketing	CCC	4	3	0	0	3	0
2	MIT***	Elective -III(Any One in Elective Group –III)	ECC	4	3	0	0	3	0
3	MIT 411	Digital Marketing Lab	CCC	4	0	0	6	0	3
4	MIT ***	Elective - IV(Any One in Elective Group –IV)	ECC	4	0	0	6	0	3
5	MIT 413	Industrial Project : Minimum Three Months in an Organization approved by the Director/Head of the Centre/Department	CCC	20	0	0	18	0	3
			Total Credit	36					

*EoSE- End of Semester Examination

/*: Please see the List of Elective papers (Elective-III and Elective-IV corresponding.)

Elective Papers:

Elective Course Code	Course Category	Subject Title	Prerequisite	Semester
Elective Group-III (Any one)				
MIT C01	ECC	Data Science with R	-	IV
MIT C02	ECC	Machine Learning	-	IV
MIT C03	ECC	Analysis and Design of Algorithms	-	IV
MIT C04	ECC	Open Source Operating System	-	IV
Elective Group-IV (Any one)				
MIT D01	ECC	Data Science with R Lab	-	IV
MIT D02	ECC	Machine Learning Lab	-	IV
MIT D03	ECC	ADA Lab	-	IV
MIT D04	ECC	Open Source Operating System Lab	-	IV

Note: Student have to take any one subject in Elective Group-III and also have to take one elective lab of same subject from the Elective Group-IV.

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Syllabus of MC.Sc.(IT) IV Semester-2023-24

Note :

1. Papers MIT 401, MIT402, MIT411, MIT 412 and MIT413 are compulsory(CCC) and Paper MIT403 is elective(ECC).
2. Continuous assessment(Internal) will be done by the concerned teacher on the basis of test papers, regularity in the class and performance of the student. Maximum marks in continuous assessment of each paper is 100.

MIT-401 : Digital Marketing

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Digital Marketing Fundamentals : Marketing v/s Sales, Marketing Mix and 4 Ps, Digital Marketing, CRM platform, CRM models, CRM platform, Marketing Automation, Inbound vs Outbound Marketing, Content Marketing, Understanding Traffic, Understanding Leads, Strategic Flow for Marketing Activities

Unit-II

Website Planning and Structure :WWW, Domains, Buying a Domain, Website Language & Technology, Core Objective of Website and Flow, One Page Website, Google Analytics, Tracking Code, Website Auditing.

Search Engine Optimization: Basic Concepts, Search Engine working, Keywords, titles, meta tags, Understating the SERP, Google processing, Indexing , Crawling,On page optimization techniques, Off page Optimization techniques, Web 2.0 Submission, Article Submission, Image Submission, Video Submission,SEO Audit & Future ofSEO.

Unit-III

Email Marketing: Content Writing, Email Machine – The Strategy, Email Frequency, Triggers in Email using 4Ps, Sequence of Email Triggers, Email Software and Tools, Importing Email Lists, Planning Email Campaign, Email Templates and Designs, Sending HTML Email Campaigns, WebForms Lead Importing, Integrating Landing Page Forms Campaign Reports and Insights, Segmentation Strategy Segmentation, Lists Auto-Responder Series Triggering Auto – Responder Emails

Google Adwords : Basics, Google Ad Types, Pricing Models, PPC Cost Formula, Ad Page Rank, Billing and Payments, Adwords User Interface, Keyword Planning, Keywords Control, Creating Ad Campaigns, Creating Text Ads, Creating Ad Groups, Bidding Strategy for CPC.

Unit-IV

Social Media Optimization (SMO) : Introduction Social Media Optimization, Introduction to Social Media networks, Types of Social media Websites, Social Media Optimization Concept, Facebook, Google+, LinkedIn, YouTube, Pinterest, Hashtags, image optimization

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Social Media Marketing (SMM) : Facebook Optimization, Fan Page Vs profile Vs Group, Creating Facebook page for Business, Increasing fans and Doing Marketing, Facebook Analytics, Facebook Advertising and Its types, Creating Advertising Campaigns, Payment modes, Introduction to Twitter, Creating Strong profiles on twitter,Followers Retweet, clicks LinkedIn Optimization, Branding on LinkedIn, Google plus, Tools and Techniques.

Webmaster Tools: Adding site and verification ,Setting Geo-target Location, Search queries analysis, Filtering search queries, External Links report, Crawls stats and Errors, Sitemaps, Robots.txt and Link Removal, HTML suggestion.

Recommended Books:

1. Ian Dodson, "The Art of Digital Marketing ", Wiley, 2018
2. Seema Gupta, "Digital Marketing" Mc-Graw Hill, 1st Edition, 2017
3. **References:** Puneet Singh Bhatia, "Fundamentals of Digital Marketing", Pearson, 1st Edition, 2017
4. Vandana Ahuja, "Digital Marketing", Oxford University Press
5. Philip Kotler, "Marketing 4.0: – Moving from Traditional to Digital", Wiley, 2017

Practical Examination

Each practical paper shall be of **3** hours duration on one day and carry 100 marks for the practical examination. The practical examination will involve 3 exercises, each of 20 marks, practical record of 15 marks and viva-voce examination of 25 marks.

MIT 411 : Digital Marketing Lab

Practical Lab :
Examination : Practical Examination
Lab Exercise based on Theory Paper MIT401.

List of Experiments(Contents):

1. Search Engine Optimization
2. Blogs Creation
3. Website Analytics and Auditing
4. Social media Ad Structure
5. FaceBook Campaigns
6. YouTube Marketing
7. Email Marketing
8. Google Adwords

Elective Theory Papers for Elective Group-III of M.Sc.(IT) IV Sem

MIT C01 : Data Science with R

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

- Candidate has to attempt five questions in all. All questions carry equal marks.
- Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
- Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Introduction to Data Science : What is Data Science, Need for Data Science, Components of Data Science, Big data, Facets of data: Structured data, Unstructured data, Natural Language, Machine-generated data, Graph-based or network data, Audio, image and video, Streaming data. The need for Business Analytics, Data Science Life Cycle, Applications of data science.

Unit-II

Data Science Process : Overview of data science process, setting the research goal, Retrieving data, Cleansing, integrating and transforming data, Exploratory data analysis, Data Modeling, Presentation and automation, Types of Analytics: Descriptive analytics, Diagnostic analytics, Predictive analytics, Prescriptive analytics.

Unit-III

Statistics : Basic terminologies, Population, Sample, Parameter, Estimate, Estimator, Sampling distribution, Standard Error, Properties of Good Estimator, Measures of Centers, Measures of Spread, Probability, Normal Distribution, Binary Distribution, Hypothesis Testing ,Chi-Square Test , ANOVA.

Unit-IV

Data Science Tools and Algorithms : Basic Data Science languages- R, Python, Knowledge of Excel, SQL Database, Introduction to Weka, Regression Algorithms: How Regression Algorithm Work, Linear Regression, Logistic Regression, K-Nearest Neighbors Algorithm, K-means algorithm.

Recommended Books :

1. Samuel Burns, "Fundamentals of Data Science: Take the first Step to Become a Data Scientist" , Amazon KDP Printing and Publishing, First Edition, 2019
2. Davy Cielen, Arno D.B. Meysman, Mohamed Ali, "Introducing Data Science", Manning Publications, 2016
3. Cathy O'Neil and Rachel Schutt, "Doing Data Science, Straight Talk From The Frontline", O'Reilly. 2014.

MIT C02 : Machine Learning

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

- Candidate has to attempt five questions in all. All questions carry equal marks.

- Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
- Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Introduction : Machine Learning, Machine Learning Foundations-Overview, Applications, Types of Machine Learning, Basic Concepts in Machine Learning – Examples of Machine Learning, Perspectives/Issues in Machine Learning, AI vs. Machine Learning.

Supervised Learning : Introduction, Linear Models of Classification – Decision Trees, Naïve Bayes Classification, Linear Regression – Logistic Regression – Bayesian Logistic Regression – Probabilistic Models Neural Network-Feed Forward Network Functions – Error Back Propagation – Regularization - Bayesian Neural Networks – Radial Basis Function Networks, Ensemble Methods – Random Forest – Bagging – Boosting.

Unit-II

Unsupervised Learning : Clustering, K-Means Clustering, EM (Expectation Maximization), Mixtures of Gaussians, EM algorithm in General, The Curse of Dimensionality, Dimensionality Reduction, Factor Analysis, Principal Component Analysis, Probabilistic PCA, Independent Component Analysis. Challenges for Big Data Analytics.

Unit-III

Probabilistic Graphical Models : Directed Graphical Models, Bayesian Networks, Exploiting Independence Properties, From Distributions to Graphs, Examples – Markov Random Fields – Inference In Graphical Models – Learning - Naïve Bayes Classifiers – Markov Models – Hidden Markov Models. Undirected graphical Models – Markov Random Fields – Conditional Independence Properties.

Unit-IV

Advanced Learning : Sampling – Basic Sampling Method – Monte Carlo, Reinforcement Learning-Introduction-The Learning Task,Instance based Learning-Nearest neighbor classification, k-nearest neighbor, nearest neighbor error probability.Elements of Reinforcement Learning, Difference between Reinforcement Learning and Supervised Learning, Applications of Reinforcement Learning, Model based learning, Semi-Supervised Learning, Computational Learning Theory.

Recommended Books:

1. Christopher Bishop, "Pattern Recognition and Machine Learning", Springer 2006
2. EthemAlpaydin, "Introduction to Machine Learning", Prentice Hall of India, 2005
3. Joel Grus, "Data Science from Scratch- First Principles with Python", O'Reilly, 2015
4. Tom Mitchell, " Machine Learning", McGraw-Hill, 1997
5. Stephen MarsLand, "Machine Learning-An Algorithmic Perspective", CRC Press, 2009
6. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012
7. M. Gopal, "Applied MACHINE LEARNING", McGraw-Hill, 2018
8. Mark Summerfield, "Programming in Python 3: A Complete Introduction to the Python Language", Addison Wesley, 2010

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MIT C03 : Analysis and Design of Algorithms

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Introduction: Algorithm Definition and Specifications, Design of Algorithms and Complexity of Algorithms, Asymptotic Notations, Growth function, Recurrences and Performance Analysis.

Divide and Conquer Algorithms: General method, Binary search, Merge sort, Quick Sort.

Unit II

Greedy Methods: General method, Knapsack Problem, Job Selection with Deadline problem, A task scheduling problem ,Minimum Cost Spanning Tree, Single Source Shortest Path.

Dynamic Programming: General method, Multistage graphs, Optimal Binary Search trees, 0/1 Knapsack, Travel Salesman Problem, Flow Shop Scheduling.

Unit III

Advanced data structure: Red-Black Tree, M-way trees, B-trees, Binomial Trees. Fibonacci Heaps. Data Structure for Disjoint Sets.

Backtracking: General method, 8 Queens Problem, Sum of Subsets, Graph Colouring, Hamiltonian Cycles, Knapsack Problem.

Unit IV

Branch and Bound: 0/1 Knapsack Problem, Travel Salesman Problem.
Randomized Algorithms, String Matching, NP-Hard and NP-Completeness, Approximation Algorithms, Vertex Cover Problem, Set Cover Problem, Hamiltonian Cycle, Clique Problem.

Reference Books:

1. ThomasHCormen, C.E.Leiserson, R.L. Rivest,C.Stein; Introduction to Algorithms, 3ed; PHI.
2. E.Horowitz,S. Sahni, S. Raja Sekaran ; Fundamentals of computer Algorithms;
3. Aho A.V , J.D Ulman: Design and analysis of Algorithms, Addison Wesley

MIT-C04 : Open Source Operating System

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.

2. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Introduction to concept of Open Source Software: Introduction to Linux , Evolution of Linux. Linux vs. UNIX, Different Distributions of Linux, Installing Linux, Linux Architecture. **Linux file system** (inode, Super block, Mounting and Unmounting), Essential Linux Commands (Internal and External Commands), Kernel, Process Management in Linux, Signal Handling, System call, System call for Files, Processes and Signals.

Unit-II

Filter-The grep family, advanced filters-sed and awk vi editor: General startup of vi editor and it modes, Creating and editing files, features of vi, screen movement, cursor movement insertion, deletion searching, submitting operations, yank put, delete commands reading & writing files, advance editing techniques vim (improved vi).

Shell: meaning and purpose of shell, introduction to types of shell. the command line. standard input and standard output, redirection pipes, filters special characters for searching files and pathnames.

Unit-III

Shell Programming: Shell Programming – Introduction to Shell, Various Shell of Linux. Shell Commands, I/O Redirection and Piping, Vi and Emacs editor, Shell control statements, Variables, if-then-else, case-switch, While, Until, Find, Shell Meta characters, Shell Scripts, Shell keywords, Tips and Traps, Built in Commands, Handling documents, C language programming, Prototyping, Coding, Compiling, Testing and Debugging, Filters.

Unit-IV

Linux System Administrations: File listings, Ownership and Access Permissions, File and Directory types, Managing Files, User and its Home Directory, Booting and Shutting down (Boot Loaders, LILO, GRUB, Bootstrapping, init Process, System services)

Networking : Networking tools, E-mail Remote login, FTP, Network and Server setup LAN, Connection with Internet Setting-up routers, Proxy Servers, Print-Server, File server, mail Server, Web server and Database server.

Recommended Books:

1. Peterson Richard, " The Complete Reference Linux " Tata McGraw Hill.
2. Simitabha Das, "Unix/Linux Concepts & Applications". Tata McGraw Hill,2008
3. Forouzan B. A., Gilberg R. R., "UNIX and Shell Programming", TMH. 2nd edition, 2008.
4. Beginning Linux Programming N, Mathew, R. Stones, Wrox, Wiley IndiaEd.
5. Yshavant P, Kanetkar, Shell Programming
6. Linux System Programming, RobertLove, O" Reilly SPD.
7. VijayShekhar; Red hat Linux study guide firewall media.
8. RichardPetersen: The Complete Reference ; Linux; TMH
9. Practical Guide to Linux Commands, Editors, and Shell Programming, Sobell, Pearson, 2nd Edition, 2010.
10. A Practical Guide to Fedora and Red Hat Enterprise Linux, Sobell, Pearson, 5th Edition, 2010.

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Elective Lab Papers for Elective Group-IV of M.Sc.(IT) IV Sem

MIT D01 : Data Science with R Lab

Practical Lab : Examination : Practical Examination
Lab Exercise based on Theory Paper MITC01.

R Programming: Fundamentals, Properties & Characteristics, Data Types,Operators,Control & Looping Structures, Array & String handling, Functions, Vector & Matrices processing, Factors, Data Frames, Packages, Data Reshaping, Data and File management, Charts and Graphs.
Data science with R/Python: Overviews, data visualisation using graphics in R, GGplot 2, File format of graphics output, introduction to hypotheses, types of hypothesis, data sampling, confidence and significance level, hypothesis tests, parametric test, non-parametric test,
Regression Algorithms in R/Python : How Regression Algorithm Work, Linear Regression, Logistic Regression, K-Nearest Neighbors Algorithm, K-means algorithm.

MIT D02 : Machine Learning Lab

Practical Lab : Examination : Practical Examination
Lab Exercise based on Theory Paper MITC02.

List of Experiments(Contents):

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training samples. Read the training data from a .csv file.
2. Implement working of the decision tree based ID3 algorithm using appropriate data set to classify it.
3. Develop an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data set.
4. Implement the naïve Bayesian classifier using appropriate data set and compute its accuracy, considering few data sets.
5. Implement Bayesian network considering medical data. Use this model to demonstrate the diagnosis of Heart Disease Data Set.
6. Implement EM algorithm to cluster a set of data stored in a .CSV file.
   Implement k-means algorithm to cluster same set of data as in experiment 6 and compare the results of these two algorithms and comment on the quality of clustering.
7. Implement k-Nearest Neighbor algorithm to classify the iris data set and display both correct and incorrect predictions.
8. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Apply it on an appropriate data set and draw graph.

MIT D03 : ADA Lab

Practical Lab : Examination : Practical Examination
Lab Exercise based on Theory Paper MIT 401.

List of Experiments:

1. Linear search & binary search , Sorting Techniques
2. Stacks and queues operations (with arrays and pointers)
3. Link List and Trees operations (with arrays and pointers)
4. graphs – basic traversal and search techniques

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5. Greedy method:-knapsack problem
6. Greedy method minimum cost spanning tree
7. Dynamic Programming – 0/1 Knapsack
8. Dynamic Programming – traveling salesman problem
9. Backtracking 8-Queens problem
10. Backtracking Sum of Subsets
11. Branch and Bound -0/1 Knapsack problem
12. Sequential and Dynamic Implementations

MIT D04 : Open Source OS Lab

Practical Lab :
Examination : Practical Examination
Lab Exercise based on Theory Paper MITC04.

List of Experiments(Contents):

1. Basic Shell Commands
2. Study of Unix/Linux
    - General purpose utility command
    - File system navigation
    - File attributes
    - System's environment
    - Simple and advanced filters
3. I/O Redirections
4. Working with vi editor

Shell Programs:

5. Implementation of Shell Programming Concepts:
    - Shell programming in bash
    - Shell Variables Input concepts
    - Expression
    - Decisions and repetition
    - Special parameters and variables
    - Command line arguments
    - Case statements
    - Changing positional parameters and argument validation
    - String manipulation
    - File Operations
    - Base conversion
6. User defined functions.

Administration:

7. Installing Linux through bootable media/ through NFS
8. Creating & Managing User Accounts
9. Creating & Managing Groups.

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MIT 413 : Industrial Training (Major Project)

Guidelines for Preparation the Project Report:

1. **Objective : Student should able to develop a small real time application using progrsmming languages which is part of their course curriculum or any new upcoming programming languages/technology.**
2. **Project Report Formulation:**
   a. **The project report should contain the following:**

   - Original copy of the Approved Performa and Project Proposal.
   - Bio-data of the guide with her/his signature and date.
   - Certificate of Originality (Format given).
   - Project documentation.
   - A CD consisting of the executable file(s) of the complete project should be attached on the last page of the project report. In no case, it should be sent separately. The student needs to retain the identical copy of the CD that should be carried while appearing for the viva-voce along with the project report.

   b. **Project Documentation:**

   - Project documentation may be about 100 to 125 pages (excluding coding).
   - The project documentation details should not be too generic in nature.
   - Appropriate project report documentation should be done, like, how you have done the analysis, design, coding, use of testing techniques/strategies, etc., in respect of your project.
   - The project report should normally be printed with single line spacing on A4 paper (one side only). All the pages, tables and figures must be numbered. Tables and figures should contain titles.
   - **Two copies** of the original project report in the bound form along with the CD (containing the executable file(s) of the project should be enclosed in the last page) is to be prepared at the time of final viva. One copy of the same Project Report and the CD containing the executable file(s) shall be retained by the student, which should be produced before the examiner at the time of viva-voce.

3. **MANUAL FOR PREPARATION OF M.Sc.(IT) Project (Prescribed Format and Specification)**

4. **Essential Components of Project Report :**
   a. Title Page
   b. Certificate from Company
   c. Certificate from Guide
   d. Acknowledgement
   e. Index with printed Page Numbers

CHAPTER 1 : INTRODUCTION

1.1 Company/Educational Institute Profile
1.2 Existing System and Need for System
1.3 Scope of Work
1.4 Operating Environment – Hardware and Software

CHAPTER 2: PROPOSED SYSTEM

2.1 Proposed System
2.2 Objectives of System
2.3 User Requirements

CHAPTER 3: ANALYSIS & DESIGN

3.1 Entity Relationship Diagram (ERD)
3.2 System Architecture
3.3 Database Requirements & User Interfaces
3.4 Data Flow Diagram (DFD)
3.5 Data Dictionary
3.6 Table Design
3.7 Code Design
3.6 Menu Screens

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3.7 Input Screens
3.8 Report Formats
3.9 Test Procedures and Implementation

CHAPTER 4: User Manual

4.1 User Manual
4.2 Operations Manual / Menu Explanation
4.3 Forms and Report Specifications
4.4 Drawbacks and Limitations
4.5 Proposed Enhancements
4.6 Conclusions
4.7 Bibliography

Annexure:

Annexure 1: Input Forms with data
Annexure 2: Output Reports with Data
Annexure 3: Sample Code

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Format of Cover Page:

Major Project / Industrial Training

MIT-413

[UNIVERSITY LOGO]

Session: <Session>

A Project Report on

Title of the Project

Submitted for partial fulfillment of requirement for award of the degree of

Master of Science (IT) (M.Sc.(IT)) 2024)

BY STUDENT

Name-
Enrollment No.-
Batch-

Under the Supervision

Name of the guide

To

University Centre for Computer Science & Information Technology (UCCS & IT)

University of Rajastha

Jaipur