

Bharatiya Vidya Bhavan's
Sardar Patel Institute of Technology
(Autonomous Institute Affiliated to University of Mumbai)

Revision: SPIT-1-19



Master Of Computer Application

First Year MCA

(Sem. I and Sem. II)

Effective from Academic Year 2019-20

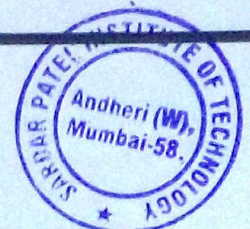
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Sardar Patel Institute of Technology
Munshi Nagar, Andheri (W),
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Foundale

FYMCA Subject Scheme

2019-20

SEM I

Course Code	Course Name	Group	Teaching Scheme (Hrs/week)			Credits
			L	T	P	
MCA11	Object Oriented Programming	ICT	3	-	-	3
MCA12	Software Engineering	ICT	3	1	-	4
MCA13	Discrete Mathematics	M	3	1	-	4
MCA14	Principles of Management	BM	3	-	-	3
MCA15	Banking and Finance	BM	3	-	-	3
MCA L11	Object Oriented Programming Lab	ICT	-	-	4	2
MCAL16	Web Technology Lab	ICT	-	-	4	2
MCAL17	LINUX Lab	ICT	-	1	2	2
MCAP11	Mini Project	PR	-	-	2	1
	Total		15	3	12	24

SEM II

Course Code	Course Name	Group	Teaching Scheme (Hrs/week)			Credits
			L	T	P	
MCA21	Operating System	ICT	3	1	-	4
MCA22	Computer Networks	ICT	3	-	-	3
MCA23	Data Structures	ICT	3	-	-	3
MCA24	Software Project Management	BM	3	1	-	4
MCA25	Probability and Statistics	M	3	1	-	4
MCAL22	Computer Networks Lab	ICT	-	-	2	1
MCAL23	Data Structures Lab	ICT	-	-	4	2
MCAL26	Python Programming Lab	ICT	-	-	4	2
MCAP21	Mini Project-II	PR	-	-	2	1
	Total		15	3	12	24



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Evaluation Scheme

FYMCA 2019-20

SEM I						
Course Code	Course Name (Theory)	Marks				Total
		ISE	MSE	ESE		
MCA11	Object Oriented Programming	20	20	60		100
MCA12	Software Engineering	20	20	60		100
MCA13	Discrete Mathematics	20	20	60		100
MCA14	Principles of Management	ISE I 35	20	ISEII 35	Attendance 10	100
MCA15	Banking and Finance	ISE I 35	20	ISEII 35	Attendance 10	100
MCA L11	Object Oriented Programming Lab	40	--	--		40
MCAL16	Web Technology Lab	40	--	--		40
MCAL17	LINUX Lab	40	--	--		40
MCAP11	Mini project-I	25	--	25		50
Total						670

SEM II						
Course Code	Course Name (Theory)	Marks				Total
		ISE	MSE	ESE		
MCA21	Operating System	20	20	60		100
MCA22	Computer Networks	20	20	60		100
MCA23	Data Structures	20	20	60		100
MCA24	Software Project Management	20	20	60		100
MCA25	Probability and Statistics	20	20	60		100
MCAL22	Computer Networks Lab	40	--	--		40
MCAL23	Data Structures Lab	40	--	--		40
MCAL26	Python Programming Lab	40	--	--		40
MCAP21	Mini Project-II	25	--	25		50
Total						670



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SEM-I



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCA11	Object Oriented Programming	3	--	--	3	--	--	3
		Examination Scheme						
		ISE		MSE		ESE		
		20		20		60		

Pre-requisite Course Codes	---	
		Student will be able to
Course Outcomes	CO1	Construct programs using basic control structures.
	CO2	make use of objects and structures in problem solving
	CO3	Use arrays and pointers efficiently to solve the problems.
	CO4	Design the solutions using inheritance and polymorphism.
	CO5	Apply concepts of virtual functions, exception handling to create efficient solutions.
	CO6	Construct the solutions using File handling and Standard Template Library.

Module No.	Unit No.	Topics	Ref.	Hrs.
1	1.1	Problem Solving Methodology and Techniques Understanding of the problem, Identifying minimum number of inputs required for output, Step by step solution for the problem Breaking down solution into simple steps, Identification of arithmetic and logical operations required for solution Using Control Structure: Conditional control and looping (finite and infinite)	2	2
	1.2	Introduction to Object-Oriented Programming Why Do We Need Object-Oriented Programming?-Procedural Languages vs Object-Oriented Approach Characteristics Of Object-Oriented Language (Objects, Classes, Abstraction, Overloading, Inheritance, and Polymorphism)	1,3	2
	1.3	Basic Elements of C++ C++ character set, C++ Tokens (Identifiers, Keywords, Constants, Operators), Structure of a C++ Program (include files, main function); Header files – iostream.h, iomanip.h; cout, cin	1,3,4	2



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		Use of I/O operators (<< and >>), Use of endl and setw(), Cascading of I/O operators, Error Messages; Use of editor, basic commands of editor, compilation, linking and execution Standard input/output operations from C language: gets(), puts() of stdio.h header file, Data Types in C++, Scope And Storage Classes.		
	1.4	Control Structures (Selection and Repetition) Conditional Operators, Logical Operators, If, If-Else, If-Else Ladder, Switch, Loops And Controls(for, while, do-while), Nested Loop	1,3	3
2	2.1	Objects and Classes A Simple Class, Classes and Objects, Defining the Class, Physical C++ Objects as Data Types		2
	2.2	Structures and Functions Function Structure, Objects As Function Arguments, Returning Objects From Functions, Passing Arguments To Functions Returning Values From Functions, Reference Arguments, Recursion, Inline Functions, Default Arguments, macros, friend function, static functions, Constructors, Destructors	1,3,4	4
3	3.1	Arrays and Strings Arrays as class Member Data, Arrays of object, String, The standard C++ String class, Addresses and pointers, The address of operator and pointer and arrays	1,3	4
	3.2	Pointers Memory management: New and Delete, pointers to objects, Pointers to objects, this pointer, Pointer to functions		2
4	4.1	Overloading Overloaded Functions, Overloading unary operations. Overloading binary operators, data conversion, pitfalls of operators overloading and conversion keywords.	1,3,5	4
	4.2	Inheritance Inheritance: Concept of inheritance. Derived class and based class. Derived class constructors, member function, class hierarchies, public and private inheritance Aggregation : Classes within classes, inheritance and program development		4
5	5.1	Virtual Functions Normal Member Functions Accessed with Pointers Virtual Member Functions Accessed with Pointers Late Binding, Abstract Classes and Pure Virtual Functions Virtual Destructors, Virtual Base Classes Friend Functions, friend Classes, Static Functions, Accessing static Functions, Numbering the Objects		2
	5.2	Exception Handling Introduction of Exception handling–throw, catch, Re-throw an exception , specifying exceptions etc.	1,3,5	2
6	6.1	Templates	1,3	2



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	Class templates, function templates Overloading of template function		
6.2	STL (Standard template library) Introduction to STL, components of STL, Containers, Iterators and function objects		3
6.3	Managing Console I/O operations and Working with files C++ streams, unformatted / formatted I/O operations, Managing output with manipulators, creating/ opening / closing / deleting files, File pointers and their manipulators, random access to file, Errors handling during file operations, command line arguments.	1,3	4
Total			42

References :

- [1] Robert Lafore, "Object-Oriented Programming In C++", Sams Publishing, Fourth Edition
- [2] Walter Savitch, "Problem solving with C++", Pearson/Addison-Wesley, Sixth Edition
- [3] Balaguruswamy, "Object Oriented Programming with C++", McGraw Hill Education, Fourth edition
- [4] Bjarne Stroustrup, "C++ programming language", Third edition
- [5] Joyce Farrell, "Object-Oriented Programming Using C++", Thomson/Course Technology, Fourth Edition



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCA12	Software Engineering	3	1	--	3	1	--	4
		Examination Scheme						
		ISE		MSE		ESE		
		20		20		60		

Pre-requisite Course Codes		--
		Student will be able to
Course Outcomes	CO1	Identify process model for given Problem
	CO2	Design software requirement specification and elaborate requirement elicitation
	CO3	Formulate project plan and apply estimation techniques.
	CO4	Evaluate quality of software and its maintenance.

Module No.	Unit no.	Topics	Ref.	Hrs.
1	1.1	Introduction to Software Engineering and Process models Introduction and Importance of software engineering, Software Process Models:- . Evolutionary Process Model: Prototype and Spiral Model. Incremental Process model: Iterative approach, RAD, JAD model. Concurrent Development Model. Agile Development: Extreme programming, Scrum	1	7
2	2.1	Software Analysis Feasibility Study and its type , Software requirement specification	1,2	7
	2.2	Requirement Engineering , Interviews, Questionnaire, Brainstorming, Facilitated Application Specification Technique(FAST)		
3	3.1	Software Project Planning and Scheduling Measures ,Metrics and Indicators, Software Measures : Size oriented, Function Oriented, Software Project Estimation, Decomposition Techniques, LOC based, FP based, Empirical Estimation: COCOMO, COCOMO-II Relationship between people and effort: Staffing level estimation, effect of schedule change on cost. Selecting software engineering tasks: Degree of rigor, task set selector.	1	7
4	4.1	Software Design Activities Design Concepts ,Effective Modular Design,	1,2	5



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	4.2	Software architecture, Data Design, Mapping requirements into a Software architecture		
5	5.1	Software Risk management Risk strategies, Software risks, Risk Identification, Projection, Risk Refinement ,RMMM,	1,2	6
6	6.1	Software Quality and Management Quality concepts, SQA activities, Software reviews, FTR, SQA plan,software reliability and measures	1,2	6
	6.2	Software configuration Management ,elements of SCM,SCM process, version control, change control, configuration audit, Status reporting	1,3	
7	7.1	Software Testing Software testing fundamentals, black box and white box testing,types of maintenance,Refactoring,software reverse engineering	1,3	4
			Total	42

References:

- [1] Roger Pressman ,”Software Engineering” , Tata McGraw Hill ,sixth edition.
- [2] Pankoj Jalote, ,”Software Engineering”, Wiley Publication, fourth edition.
- [3] KK Agarwal, Software Engineering, New age Publication, third edition

Tutorials on Software Engineering

Tut. No	Topic	Number of hours
1	Case study on identification of various software process models.	1
2	Case study on Requirement techniques.	2
3	Case study SRS	2
3	Case study on Project Planning.	2
4	Case study on Project scheduling	2
5	Case study on Software designing	2
6	Case study on Risk management	1
7	Case study on Software Quality	1
8	Case study on Software Testing	1
	Total	14 hrs



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCA 13	Discrete Mathematics	3	1	--	3	1	--	4
		Examination Scheme						
		ISE		MSE		ESE		
		20		20		60		

Pre-requisite Course Codes	Basic Knowledge of Mathematics.	
	Student will be able to	
Course Outcomes	CO1	Develop mathematical and logical thinking
	CO2	Analyze number of logical possibilities and probability of events.
	CO3	Formulate problems of graphs, trees.
	CO4	Formulate problems of recursive relations.
	CO5	Construct Grammars, languages.
	CO6	Construct theoretical designs.

Module	Unit	Topics	Ref	Hrs.
1		Mathematical Logic	1,3	5
	1.1	Propositions and logical operations, Conditional Statements		
	1.2	Methods of Proof , Mathematical Induction,		
	1.3	Mathematical Statements , Logic and Problem Solving		
2		Set, Relation and Function	1,2,	7
	2.1	Set Theory: Definition of Sets, Venn Diagrams, complements, Cartesian products, power sets, counting principle, cardinality and countability (Countable and Uncountable sets), proofs of some general identities on sets, pigeonhole principle.		



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	2.2	Relation: Definition, types of relation, composition of relations, domain and range of a relation, pictorial Representation of relation, properties of relation, partial ordering relation, Relations and digraphs, Paths in Relations and Digraphs, Properties of Relations , Equivalence Relations, 3Operations on Relations, Partially Orders Sets, Hasse diagram, Lattice		
	2.3	Function: Definition and types of function, composition of functions, recursively defined functions.		
3		Graph and Tree	2,4	4
	3.1	Graph terminology, types of graph connected graphs, components of graph, Representation of Graph		
	3.2	Adjacency matrix, Adjacency list		
	3.3	Euler graph and Circuits, Hamiltonian path and circuits		
	3.4	Subgraphs and Subgraph isomorphism, Tree		
4		Combinatorics and Recurrence Relation	1,2,	8
	4.1	Recursive mathematical definitions, basics of counting		
	4.2	Introduction to permutations and combinations, inclusion-exclusion		
	4.3	Recurrence relation - Fibonacci series, Tower of Hanoi		
	4.4	Lines in a plane Homogenous linear equations with constant coefficients, Particular Solution, Total Solution		
	4.5	Divide and Conquer Recurrence Relations (Fast Multiplication of Integers, Fast matrix Multiplication)		
5		Regular Grammar (RG)	5,6	8
	5.1	Regular Grammar		
	5.2	Regular Expression (RE): Definition, Equivalence and		
	5.3	Equivalence of RG and FA and Conversions,		
	5.4	Equivalence of RE and FA and Conversions.		
6		Finite Automata	5,6	10
	6.1	Deterministic and Nondeterministic Finite Automata (DFA and NFA), Definitions, Languages, Transitions (Diagrams, Functions and Tables)		
	6.2	Eliminating epsilon transitions from NFA,DFA		
	6.3	NFA applications: Reductions and Equivalence		
	6.4	FSM with output: Moore and Mealy machines.		
Total			42	



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References:

- [1] Kenneth H. Rosen, "Discrete Mathematics and Its Applications", McGraw Hill, 4th e
- [2] Kolman, Busby, Ross, "Discrete Mathematical structures", PHI, 4th Edition
- [3] Tremblay and Manohar, "Discrete Mathematical Structure", Tata McGraw Hill
- [4] C. L. Liu, "Elements of Discrete Mathematics", TMH 2002nd Edition.
- [5] J.E.Hopcraft, R. Motwani and J.D.Ullman, "Introduction to Automata Theory languages & Computation", Pearson Education Asia.
- [6] K.L.P.Mishra, N. Chandrashekharan, "Theory of Computer Science", PHI

Tutorial Discrete Mathematics

No.	Topic	Number of Hours
1	Determine whether whether Tautology	1
2	Show that given logical statements are equivalent.	1
3	Solve the problem on Pigeonhole principle	1
4	Example on properties of relations	1
5	Solve problem on equivalence relation	1
6	Solve problem on partial order relation	1
7	Adjacency Matrix and adjacency matrix.	1
8	Euler path and Euler circuit.	1
9	Hamiltonian path and Hamiltonian circuit	1
10	Tower of Hanoi problem.	1
11	Lines in a plane in general.	1
12	Particular Solution of recurrence relation	1
13	Equivalence of regular grammar and finite automata	1
14	Finite State Machine with output:	1
	Total	14



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCA14	Principles of Management	3	--	--	3	--	--	3
		Examination Scheme						
		ISE	MSE	Attendance				
		70	20	10				

Pre-requisite Course Codes	--	
	Students will be able to :	
Course Outcomes	CO1	Explain management evolution and management's four functions.
	CO2	Explain social responsibility and ethical issues involved in business situations
	CO3	Analyze the importance and nature of planning.
	CO4	Analyze how organizations adapt to an uncertain environment
	CO5	Develop leadership styles to anticipate the consequences of each leadership style and communication.
	CO6	Explain the changes in the organizations

Module No.	Unit No.	Topics	Ref.	Hrs.
1		Management and evolution of its thought	1,2,3	10
	1.1	What is management, how is management defined, is management art or science?, Role of managers, Mintezberg's set of Ten Roles, managerial skills, The P-O-L-C framework		
	1.2	Management Classical approach: Classical thought of management, Henry Fayol's universal Process theory, Behavioral and human relations approach Management, The modern Theory: Chester Barnard and social systems theory, Quality school of management, Kaizen approach, Reengineering approach.		
2		Management Framework	2,3,4	10
	2.1	Vision, Mission and values: Role played by vision and mission, values, stakeholders, Identifying key stakeholders, Personality and attitude: Role of personality and attitude in organization, importance of personality, The Big-5 Personality Traits , Work Attitude and Behavior, Positive work attitude, Job Satisfaction, Organizational commitment		



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3		Planning	2,3	4
	3.1	Nature, Types and steps of planning, Importance of planning; The strategic planning process, Nature of objectives, Management by Objectives (MBO); Nature and purpose of strategies and policies, Major kinds of strategies and policies, Effective implementation strategies		
4		Organizational Structure and Decision Making	2,3	4
	4.1	The importance and limitations of rational decision making, Decision making under certainty, Risks and uncertainty, Factors affecting decision making, Decision making styles, Decision making Tools.		
	4.2	Importance of organizing, Principals of organizing, Types of Organizational structure, The Organizational Process		
5		Human Factors, Motivation, Leadership & Communication	1,2,4	8
	5.1	Human factors in managing, Motivation and motivators; Styles and functions of leadership, Special motivational techniques, Defining Leadership, Ingredients of leadership, Trait approach to leadership, Situational or contingency approaches to leadership		
	5.2	Definition of communication, The communication process, Barriers and breakdowns in communication; Towards effective communication, Electronic media in communication		
6		Change and Comparative Management	2,4	6
	6.1	Need of Change, Organizational Change factors (Internal environment and external Environment), Planning Organizational change, Resistance to changes, Impact of change, Overcoming Resistance to change		
	6.2	Special features of management Japan, China and Germany.		
Total				42

References:

- [1] Koontz Harold & Wehrich Heinz, "Essentials of Management", MGH, 8th edition.
- [2] Tripathi, P. C. & Reddy, P.N, "Principles of management", Tata McGraw Hill, 10th edition.
- [3] Ramasuamy.V.S. & Namakumari, S., "Marketing Management: Planning implementation and control", Mcmillan & Co, Seventh Edition



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCA15	Banking and Finance	3	--	--	3	--	--	3
		Examination Scheme						
		ISE		MSE		Attendance		
		70		20		10		

Pre-requisite Course Codes	Mathematics	
Course Outcomes	Student will be able to	
	CO1	Demonstrate broad and coherent knowledge of the Financial Services Industry
	CO2	Integrate technical and conceptual knowledge to work effectively within the Financial Services Industry
	CO3	Analyze credit ratings in India
	CO4	Explain Deposit accounts and attorney
	CO5	Explain various Banking Services
	CO6	Analyze Lending Scheme and Foreign Exchange

Module No.	Unit No.	Topics	Ref.	Hrs.
1		Banking Operations and Financial Institution in India	1,2,4	8
	1.1	Evolution, meaning, importance, indigenous bankers- Functions, Modern banking, Commercial banks- Structure, Functions, RBI Monetary policy, instruments of monetary policy-bank rate, CRR, SLR, Repo rate, reverse Repo rate. Banker-customer relations, Know Your Customer(KYC) guidelines, Different deposit products, services rendered by banks, Mandate and Power of Attorney, Banker's lien-right of set off, garnishee order, income tax attachment order etc.		
	1.2	Utility of loans and advance, type of loans-secured and unsecured, demand loan, term loan, cash credit, overdraft, student loans, auto loans, personal loans, business loans, consolidated loans.		
	1.3	Commercial Banks, Cooperative Banks, Regional Rural Banks, Agriculture and Rural Development Banks (SLDBs), Development Banks and NBFCs. Bank's constitution, Functions, Working and Evolution. Reserve Bank of India: Traditional and Developmental Functions and Working. Objectives, Instruments		



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		of Monetary Policy		
2		Financial markets and Capital Markets in India	2,4	10
	2.1	Structure, institution and operating mechanism and its role in Economic Development. Developed and Underdeveloped Markets, Money Market in India: Importance, features instruments. Measures to strengthen money market in India.		
	2.2	Recommendations of the working group on money market, Report of the task force on money market and mutual funds.		
	2.3	New issue market and stock exchange, importance of stock exchanges: National stock exchange, methods of floating new issues, types of shares and debentures. The Securities and Exchange Board of India (SEBI), need for establishment of SEBI. Objectives and role of SEBI, Capital Market reforms		
3		Credit Rating in India	1,3	5
	3.1	Why and what is credit rating, credit rating institutions in India, limitation to rating, depository services, factoring, leasing and hire purchase		
	3.2	Venture capital, securitization of assets, portfolio management, risk and return, reforms in banking and finance,		
	3.3	Reports of the committees; Chakravarty committee, Narsimham committee I & II		
4		Deposit Accounts	1,3	4
	4.1	Opening Operations and Closure of a) Fixed Deposit Account b) Recurring Account c) Savings Account d) Current Account e) Deposit Schemes for NRIs. Other Deposit Schemes,		
	4.2	Mandate and Power of Attorney – Nomination Facility – Insurance of Bank Deposits		
5		Banking Services	1,3	6
	5.1	Remittances – Safe Custody – Safe Deposit Vaults – Collection Facility – MICR Clearing ATMs – Credit cards and Debit Cards – Travellers' Cheques – Gift Cheques		
	5.2	Ombudsman and Customer Services – Fraud Detection and Control Accounting conventions, basic accounting principles,		
	5.3	bank reconciliation statements, procedure leading to preparation of final accounts, self-balancing ledgers		
	5.4	Accounting in banking companies under computer environment – Introduction to accounting standards		
6		Lending Schemes and Foreign Exchange	1,3	9
	6.1	Socio – Economic and poverty alleviation programmes/Self-employment schemes: DRI, IRDP,SEEUY, SEPUP, Micro Financing: Financing of self-help groups by banks and NGOs – Women Entrepreneurs, Small borrowers, SSIs, Personal and Consumer loans, Housing Finance, Agriculture finance, Loan syndication, Federal Financing.		
	6.2	Concept of Foreign Exchange (FE), Principles of foreign		



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		exchange, Meaning of foreign trade, Commercial terms, Documents used in the delivery of goods and payments, Instruments of International Remittances: Drafts, Mail and Telegraphic Payment Orders, Collection of Bills of exchange both clean and documentary covering exports and imports, letters of credit		
			Total	42

References:

- [1] Indian Institute of Banking and Finance, "Principles and Practices of Banking", Macmillan Publication
- [2] Khan M Y., "Indian Financial System", Tata McGraw Hill, Delhi
- [3] P.N. Varshney, "Banking Law and Practice", Sultan Chand & sons
- [4] H.R.Machiraju, "Indian Financial System", Vikas Publishing House



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCAL11	Object Oriented Programming Lab	--	--	4	--	--	2	2
		Examination Scheme						
		ISE		MSE		ESE		
		40		--		--		

Pre-requisite Course Codes	--	
	Student will be able to	
Course Outcomes	CO1	Demonstrate use of control structures and derived data types
	CO2	Implement dynamic memory management techniques with pointers, constructors, destructors etc.
	CO3	Implement polymorphism and Inheritance
	CO4	Demonstrate use of Standard Template Library, File and exception handling

Exp. No.	Experiment details	Ref	Marks
1	To apply various control structures, recursive functions to solve given problem	1,2,3	10
2	To apply concept of Constructors & Destructors	1,2	10
3	To apply various operations on arrays and strings	1,2	10
4	To develop an application by applying concepts Inheritance	1,2,3	10
5	To develop an application by applying Overloading and virtual function	1,2,3	10
6	To develop an application by applying Exception handling and File handling.	1,2,3	10
7	To apply concept of Friend Function & Friend Class to solve given problem.	1,2	10
8	To develop an application using Class Templates And STL	1,2	10
Total Marks			80
Marks			80/2=40

References:

- [1] Steve Oualline, "Practical C++ Programming.", O'Reilly & Associates, Inc., First Edition.
- [2] Steve Oualline, "Practical C++ Programming (Nutshell Handbook)", O'Reilly Media; First Edition
- [3] Madhusudan Mothe, "C++ Programming: A practical approach Pearson Education", 1st Edition



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Course Code	Course Name	Teaching Scheme (Hrs/ week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCA L16	Web Technology Lab	--	--	4	--	--	2	2
		Examination Scheme						
		ISE		MSE		ESE		
		40		--		--		

Pre-requisite Course Codes	Basic understanding of programming fundamentals	
	Student will be able to:	
Course Outcomes	CO1	Apply HTML5, CSS3, and Client side scripting to design static web page.
	CO2	Apply AJAX and Bootstrap to design interactive and responsive web page.
	CO3	Apply PHP and MySQL to build dynamic web pages.
	CO4	Apply PHP framework to build website.
	CO5	Develop web application.
	CO6	Create documentation for web application.

Module No.	Module Details	Ref.	Hours
1.	Introduction to web technologies, HTML & HTML5: Concept of www, protocols: HTTP, SHTTP, web browser and web server. Basics of HTML, HTML and HTML5 elements, form designing, HTML Graphics, HTML Media.	1,2	2
2.	Cascading Style Sheets3: Introduction to CSS, types of CSS, syntax and structure. Introduction to CSS3, CSS3 modules: Selectors, Box model, backgrounds and borders, Image values and replaced content, text effects, 2D/ 3D transformations, animations, multiple column content, user interface.	1,2,6	2
3.	Java script and JQuery: Introduction to Java script, variable, number and array, functions, pop up boxes, event handling, form validation, Introduction to DOM. JQuery basics, jQuery Effects, jQuery HTML	3,4,6	2
4.	AJAX : Making a server request, loading HTML scriptlets from server, AJAX events, AJAX style file upload.	7	2
5.	Bootstrap: Bootstrap: Introduction to Bootstrap, Bootstrap Grid System, Bootstrap Grid System, Container Layouts. Bootstrap CSS: Typography, code, tables, forms, buttons, images, icons. Bootstrap Layout components. Bootstrap JavaScript plugins.	5	2
	PHP: Configuration and installation of PHP, basic syntax of PHP, expressions,		4



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6.	statements, arrays, strings, functions, regular expression, form validation. File handling: File operations - create, write, read, copy, move, delete, update and upload file.	6,7	
7.	MySQL: Database: SQL Query, DDL and DML queries. PHP connection to database server. Database operations – create, select, insert, update, delete, & join operation. Session management – using cookies & sessions. AJAX with PHP and My SQL.	6,7	2
8.	PHP Framework: Laravel: Introduction, Setting up a development environment, First application, Eloquent ORM, Testing.	8	4
Total Hours			20

References:

- [1] DT Editorial Services, "HTML 5, Black Book", dreamtech Press, 2nd Edition, 2016.
- [2] Ben Frain, "Responsive web design with HTML5 and CSS3", Packt, 2nd Edition, 2015.
- [3] Michael Morrison, "Head First JavaScript", O'Reilly publication, 2008.
- [4] Jonathan Chaffer, Karl Swedberg, "Learning jQuery", Packt, Shroff Publication, 4th Edition, 2013.
- [5] Jake Spurlock, "Bootstrap", O'Reilly publication, 2013.
- [6] Nixon, Robin, "Learning PHP, MySQL, & JavaScript: with jQuery, CSS & HTML5", Shroff Publication, 4th Edition, 2013.
- [7] Harwani, "Developing Web Applications in PHP and AJAX", McGrawHill, 2010.
- [8] Martin Bean, "Laravel 5 Essentials", Packt publication, 2015.



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCAL17	LINUX Lab	--	1	2	--	1	2	2
		Examination Scheme						
		ISE		MSE		ESE		
		40		--		--		

Prerequisite Course codes	--	
		Student will be able to
Course Outcomes	CO1	Understand the basic system configuration and installation.
	CO2	Apply linux commands for user administration process management
	CO3	Demonstrate various editors and software management configuration.
	CO 4	Implement network configuration and server

Expt. No.	Experiment List	Ref.	Marks
1	Linux Installation: -Ubuntu installation	1,3,2	5
2	Linux User Administration and Process Management Add and manage User - Add and manage Group - Setting Permission with ACL - Adding Directories for user to collaborate Process Management Commands(ps, top, kill)	1,3,2	5
3	Linux Editors- vim, nano, gedit	1,3,2	5
4	Software Management –packages ,repository	1,4	5
5	Linux Network Configuration - Linux to configure various network services of the system such as IP Address, Default Gateway, Name servers - DNS, hostname and much more	1,4	5
6	Server Configuration : FTP,DHCP-setting up file transfer protocol, dynamic host configuration protocol	1,3	5
7	Shell Scripting :- - Shell scripting(Bourne and C Shell, Shebang Construct, Basic Shell and Extended Shell) - Using Variables, Special Variables, Arrays in Shell Script - Using Basic Operators in Shell Script - Using Decision making Statements, Loops and Loop Control in Shell Script	1	5
8	Text processing and Manipulation:- SED - AWK - GAWK	1	5
Total Marks			40



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Sr. No.	Tutorial List	Hrs.
1	To study Linux Operating system	2
2	To study Linux network commands and configuration commands	2
3	To understand Linux editor and software management packages and repository	1
4	Study of logging/logout details	1
5	Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system.	2
6	Introduction to Shell scripting -Bourne and C shell using variables, special variables,Arrays,basic operators, decision making statements and loops	3
7	Text Processing and Manipulation-SED-AWK,GAWK	2
8	Study of Unix/Linux file system (tree structure).	1
Total Hours		14

References:

- [1] Kogent Learning solutions, "Linux Lab: Hands on Linux", dreamtech, edition 2000.
- [2] Christopher Negus, "Linux Bible", Wiley Publications ,Ninth Edition,2015.
- [3] Richard Blum and Christine Bresnahan , "Linux Command Line and Shell Scripting Bible", Wiley Publications,Third Edition, 2008.
- [4] Richard Petersen, "Linux Programming A Beginner's Guide" ,Tata McGraw Hill Education,2001.



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCA P11	Mini Project-I	--	--	02	--	--	01	01
		Examination Scheme						
		Phase I (ISE -I)		Phase II (ISE- II)		ESE		Total
		10		15		25		50

Pre-requisite Course Codes :	Programming Language		
	Student will be able to		
Course Outcomes	CO1	Formulate a real world problem and develop its requirements.	
	CO2	Develop a design solution for the identified requirements.	
	CO3	Test the prototype against identified requirements.	
	CO4	Develop effective communication skills for presentation of project related activities.	

Evaluation Scheme

1. Project assessment is done by internal and external examiner. The project carries weightage of 50 marks.
2. The internal assessment is done in two phases. Phase I carry 10 marks, Phase II carries 15 marks. Students will be continuously assessed by the internal examiner in the middle of the semester (phase I) and at the end of the semester (phase II).
3. The external examination is conducted to evaluate the students for 25 marks at the end of the semester.
4. ESE for project shall carry maximum 50 marks in each semester. These 50 marks shall be given by the internal and external examiner together.

Guidelines

- In this semester, mentor is allocated to the students. Group of 2 students shall be formed.
- Student shall decide the project under the guidance of the mentor.
- Students will design functional and nonfunctional requirements.
- Students will select the best SDLC model for their project.
- Students will draw PERT chart and Gantt chart for the selected project.
- Students will create a prototype of the project. Documentation for the above part will be completed.

*The separate / Full projects can be undertaken with prior permission of mentor and Head of the department. Complexity of the project should be maintained proper throughout six month.



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SEM-II



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCA21	Operating System	3	1	--	3	1	--	4
		Examination Scheme						
		ISE		MSE		ESE		
		20		20		60		

Prerequisite Course codes	-	
	Student will be able to	
Course Outcomes	CO1	Study fundamentals of operating system design and system software
	CO2	Analyze process management and concurrency control
	CO3	Analyze memory management and I/O techniques
	CO4	Study files systems and protection & security concepts.

Module No.	Unit No.	Topics	Ref.	Hrs
1	1.1	Introduction to Operating System Overview of all system softwares: Compiler, Assembler, Linker, Loader, Operating system, OS services and Components Types of OS-Batch, multiprocessing, multitasking, timesharing, System Calls ,types of System calls, Buffering, Spooling	1	4
2	2.1	Process and Thread Management Concept of process and threads, Process states, Process management, Context switching, Interaction between processes and OS, Multithreading	1,3	3
	2.2	CPU scheduling CPU scheduling algorithms, multiprocessor scheduling algorithms, Real time scheduling algorithms	1,2	5
3	3.1	Concurrency Control Concurrency and Race Conditions, Mutual exclusion requirements, Software and hardware solutions, Semaphores, Monitors, Classical IPC problems and solutions, Deadlock, Characterization, Detection, Recovery, Avoidance and Prevention	1,3,4	6
4	4.1	Memory Management Memory partitioning, Swapping, Paging, Segmentation Virtual memory, Overlays, Demand paging, Virtual memory concepts, Page replacement algorithms, Allocation algorithms	1,5,6	8
5	5.1	Mass Storage Structure Secondary-Storage Structure, Disk structure, Disk scheduling, Disk management, Swap-space management, Disk reliability,	1,3	6



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		Stable storage implementation, Introduction to clock, Clock hardware, Clock software		
	5.2	File systems File concept, File support, Access methods, Allocation methods, Directory systems, File protection, Free space management	1,3	4
6	6.1	Protection & Security Protection- Goals of protection, Domain of protection, Access matrix, Implementation of access matrix, Revocation of access rights Security- The security problem, Authentication, One-Time passwords, Threats		4
	6.2	Case Study Study of different Operating, Systems(Linux, Windows, Android OS, iOS)		2
Total				42

References:

- [1] Silberschatz and Galvin , “Operating System Concepts” , Wiley ,9th Edition ,2008
- [2] William Stallings , “Operating Systems (5th Ed) – Internals and Design Principles” , Prentice Hall, 2000.
- [3] Andrew S. Tanenbaum, Herbert BOS , “Modern Operating Systems”, Pearson, 4th Edition,2016
- [4] Gary Nutt, NabenduChaki, SarmishthaNeogy, “Operating Systems”, Pearson ,3rd Edition.
- [5] Achyut S. Godbole, “ Operating Systems”, Tata McGraw Hill ,Second Edition,2010
- [6] D.M.Dhamrdhere , “Operating Systems” , Tata McGraw Hill , Second Edition,2008

Tutorials on Operating Systems

Sr. No	Tutorials List	No. of hours
1	Numerical on Real time os scheduling algorithm	2
2	Numerical on Memory management techniques	2
3	Numerical on Page replacement algorithms	1
4	Numerical on disk scheduling algorithm	1
5	Implement System calls in Unix OS.	2
6	Implement Multi- threading, Multiprocess application.	2
7	Implement CPU scheduling algorithm.	2
8	Implement Producer consumer problem using Semaphore.	2
	Total	14



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCA22	Computer Networks	3	-	--	3	-	--	3
		Examination Scheme						
		ISE		MSE		ESE		
		20		20		60		

Pre-requisite Course Codes		--
		Student will be able to
Course Outcomes	CO1	Examine the fundamental concepts of Digital communication in Computer Networks.
	CO2	Categorize different Internetworking devices, topologies and their functions.
	CO3	Analyze the various Protocols, Services and features of the layered architecture of Networking.
	CO4	Adapt various TCP /IP Algorithms.

Module No.	Unit no.	Topics	Ref.	Hrs.
1	1.1	Introduction to digital communication Signal propagation, signal types, signal parameters, Channel effects on transmission –attenuation, effects of limited bandwidth, delay distortion, noise, Multiplexing - FDM ,TDM, Data rate limits-Nyquist's theorem , Shannon's theorem	1	4
2	2.1	Basics of Computer Network Topology & types of topologies, types of networks, LAN, MAN, WAN, types of communications (Asynchronous and synchronous)	1,2	3
	2.2	Modes of communications Simplex, Half Duplex, Full Duplex	1,2	
	2.3	Switching Techniques Circuit Switching, Message Switching ,Packet Switching	1,2	
3	3.1	Networking models Design issues of the layer, ISO-OSI Reference Model, Internet Model (TCP/IP), Comparison of ISO-OSI & TCP/IP Model.	1,2	4
	3.2	Connectivity Devices	1,2	



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		Passive & Active Hubs, Switch, Bridges, Gateways.		
4	4.1	Physical Layer Wired media – Twisted Pair ,Coaxial Cable ,Fiber Optics, Wireless media - The electromagnetic Spectrum ,Radio Transmission ,Microwave transmission ,Infrared Waves	1,2,3	4
5	5.1	Data Link Layer Error Detection and Correction Techniques, Multiple Access Protocols, LAN Addresses and ARP & RARP , PPP: The Point-to-Point Protocol, Medium access sub layer : ALOHA (Pure, slotted, reservation) Carries Sense Multiple Access Protocols, Collision free Protocols, Ethernet standards – IEEE 802.3, 802.5, FDDI, 802.6.08	1,2,3	8
6	6.1	Network Layer Network Layer Design issues Routing Algorithm Distance Vector and Link state routing –Routing protocols -RIP, OSPF, BGP, IGRP, Congestion control algorithms: Open Loop congestion Control, Closed Loop congestion control	1,2,3	8
	6.2	IP Addressing Subnets, IP – IPv4, IPv6, Internet Control Management Protocol, Internet Group Management Protocol. Address mapping -ARP, RARP, BOOTP, DHCP,NAT and its type	1,2,3	
7	7.1	Transport layer The TCP protocol and the TCP Segment Header, UDP, Congestion Control algorithm, Quality of Service: Introduction, Queue Analysis, QoS Mechanisms, Queue management Algorithms, Feedback, Resource, Reservation.	1,2,3	6
8	8.1	Application layer Principles of Application Layer Protocols, The Web and HTTP, FTP, Telnet ,Simple Network Management Protocol ,Electronic Mail in the Internet (SMTP, MIME, POP3, IMAP), DNS	1,2,3	5
			Total	42

References:

- [1] Behrouz Forouzan, "Data communication and Networking", Tata McGraw Hill, Fifth Edition, New Delhi, MGH, 2006.
- [2] Andrew Tanenbaum, "Computer Networks", PHI, Fifth Edition, Pearson C2014.
- [3] Behrouz Forouzan, "TCP/IP Protocol Suite", Tata McGraw Hill edition, Fourth Edition, 2005, Addison-Wesley, 2010.



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCA23	Data Structures	3	--	--	3	--	--	3
		Examination Scheme						
		ISE		MSE		ESE		
		20		20		60		

Pre-requisite Course Codes	MCA11	
	Student will be able to	
Course Outcomes	CO1	Compare Efficiency of various sorting algorithms.
	CO2	Make use of searching and hashing techniques for efficient data retrieval and data mapping.
	CO3	Apply various operations of Linear data structures to solve problems from different domains.
	CO4	Apply creative thinking to solve problems from different domains using Nonlinear data structures.

Module No.	Unit No.	Topics	Ref.	Hrs.
1	1.1	Introduction Introduction to Data Structures, Types of Data Structures, ADT (Abstract Data type), Introduction to Time complexity and Space complexity, Asymptotic notations (Big O, Omega, Theta)	1,2,3	3
	1.2	Sorting Techniques Internal Sorting Techniques (Bubble sort, Insertion sort, Selection Sort, Radix Sort, Quick sort, Heap Sort), External Sorting Techniques (Merge Sort), Complexity calculation of Sorting Techniques using Asymptotic notation	1,2,3	5
2	2.1	Searching and Hashing Techniques Sequential search, Binary search, Interpolation Search, Hashing Techniques (Direct, Subtraction, Modulo Division, Mid square, Digit Extraction, Folding, Double hashing), Collision resolution techniques (Linear probe, Quadratic probe, Key offset, Chaining)	1,2,3	5
3	3.1	Linked list Linked List as an ADT, Linked List Vs. Arrays, Types of Linked List: Singly, Doubly, Circular, Operations of Linked List (Insert, delete, traverse, count, search), Application of Linked List: Polynomial	1,2,3	8



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		addition and Subtraction, Sparse Matrix.		
	3.2	Stack The Stack as an ADT, Stack operations, Array Representation of Stack , Linked list Representation of Stack, Application of stack – Evaluation of Postfix expression, Balancing of Parenthesis, Recursion, Polish Notation	1,2,3	5
	3.3	Queue The Queue as an ADT, Queue operations, Array Representation of Queue, Linked Representation of Queue, Circular Queue, Priority Queue. Doubly Ended Queue, Application of Queues – Johnson's Algorithm , Round Robin CPU Scheduling Algorithm	1,2	7
4	4.1	Tree Tree Definition and Terminologies, Binary Tree, Representation and traversal techniques, Binary Search Tree- Definition, Operations, Threaded Binary tree, Expression tree and Huffman tree, AVL tree- Definition, AVL tree rotation with examples M way Tree- Introduction, B tree-definition and examples Heaps-Definition, Operations, Application of Trees: Manipulation of Arithmetic expressions, Syntax Analysis	1,3	7
	4.2	Graph Graph Definition, Terminologies and Operations, Graph Representation, Applications of Graph -- DFS and BFS	1,2, 3	2
			Total	42

References :

- [1] Richard F Gilberg, Behrouz A Forouzan, "Data Structure A Pseudocode Approach with C", Brooks/Cole Publishing Company, Second edition, 2004.
- [2] Moshe, Tenenbaum, "Data Structures Using C and C++", Pearson Education Asia Pvt. Ltd., Second edition, 2009
- [3] Tremblay, Jean-Paul & Sorenson, "An Introduction to Data Structures with Applications", Tata McGraw-Hill, Second edition, 2002



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCA24	Software Project Management	3	1	--	3	1	--	4
		Examination Scheme						
		ISE		MSE		ESE		
		20		20		60		

Pre-requisite Course Codes		MCA12
Course Outcomes	CO1	Make use of knowledge of Project Life Cycle to successfully implement the projects in the corporate world.
	CO2	Identify the inputs, tools and techniques to get the required Project deliverables and product deliverables using 10 Knowledge areas of project management.
	CO3	Explain the 47 Project Management Processes defined by PMBOK
	CO4	Analyze the project management processes needs to successfully complete project in IT industry.

Module No.	Unit No.	Topics	Ref.	Hrs.
1	1.1	Introduction to Project Management: What is project? What is project Management, The role of project Manager, The project Management Profession Understanding organizations, Stakeholder management, Project phases,	1,2,3	6
	1.2	Conceptualizing and Initializing IT project : Information Technology Project Methodology, Business case, Project selection and Approval, Project management processes, Project charter, Project Planning Framework.		
2	2.1	Project Scope management Scope Planning -Statement of work , scope statement Scope definition -project oriented scope , product oriented scope, Scope verification Scope change Control procedures Creating workbreak down structure.	1,3	4
3	3.1	Scheduling and Budgeting Developing the Project Schedule, Schedule Control, Basic Principles of Cost Management, Cost Estimating: Types of cost estimates, Cost estimation tools and techniques	1,2,3	8
	3.2	Cost Control: Earned Value Management, Project Portfolio.		
4	4.1	Project Quality and Communication management Tools and Techniques for Quality Control, Pareto Analysis Statistical Sampling, Six Sigma, Quality.	1,2	7



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	4.2	Modern Quality management: Juran and the importance of Top management commitment to Quality Crosby and Striving for Zero defects, Ishikawa and the Fishbone Diagram.		
	4.3	The Project Communication Plan Reporting Performance		
5	5.1	The Importance of Project Procurement Management Planning Purchases and Acquisitions, Planning Contracting, Requesting Seller Responses, Selecting Sellers, Administering the Contract, Closing the Contract Using Software to Assist in project.	1	6
	5.2	Procurement Management & Out Sourcing: The Beginning of the outsourcing phenomenon, Types of outsourcing relationship, The Realities of outsourcing, Managing the outsourcing relationship.		
6	6.1	Human Resource Management Human Resource Planning, Acquiring the Project Team: Resource Assignment, Resource Loading, Resource Leveling, Developing the Project Team, Managing the Project Team.	1	5
	6.2	Change management: Dealing with Conflict & Resistance Leadership & Ethics.		
7	7.1	The Project Implementation Plan and Closure Project Implementation, administrative Closure, Project Evaluation, Leadership & Ethics in Projects: Project Leadership, Ethics in Projects, Multicultural Projects.	3	6
			Total	42

References :

- [1] Kathy Schwalbe, "Managing Information Technology Projects", Cengage Learning, sixth edition.
 [2] Kathy Schwalbe, "Information Technology Project Management" Thomson Publication, sixth edition
 [3] Jack T. Marchewka, "Information Technology Project Management", Wiley Publication, fourth edition.

Tutorials on Software Project Management

Tut. No.	Topic	Hours
1	Case study on project organizations	1
2	Case study on project selection and approval	2
3	Case study on project scope management and work break down structure.	1
4	Case study on project scheduling and budgeting	2
5	Case study on tools and techniques for quality control.	2
6	Case study on project procurement management.	1
7	Case study on human resource and change management.	1
8	Case study on project implementation and ethics in project	2
	Total	14



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCA 25	Probability and Statistics	3	1	--	3	1	--	4
		Examination Scheme						
		ISE		MSE		ESE		
		20		20		60		

Pre-requisite Course Codes	MCA13	
	Student will be able to	
Course Outcomes	CO1	Distinguish between quantitative and categorical data
	CO2	Apply different statistical measures on various types of data
	CO3	Identify, formulate and test hypothesis problems
	CO4	Analyze different types of Probability and their fundamental applications
	CO5	Apply discrete probability distribution to real problems.
	CO6	Apply continuous probability distribution to real problems.

Module	Unit	Topics	Ref.	Hrs.
1		Measures of central tendency & Measures of Dispersion	1	4
	1.1	Continuous Frequency Distribution		
	1.2	Histogram, Frequency Polygon, Stem and leaf diagram, ogives		
	1.3	Arithmetic Mean, Geometric mean, Harmonic mean, Median,		
	1.4	Range, Quartile Deviation, Mean Deviation,		
	1.5	Box whisker plot, Standard Deviation, Coefficient of Variation		
2		Skewness, Correlation and regression	1,3	6
	2.1	Karl Pearson's coefficient of Skewness, Bowley's coefficient of Skewness, Scatter Diagram		
	2.2	Karl Pearson's coefficient of correlation, Spearman's rank		
	2.3	Linear Regression and Estimation		
	2.4	Coefficients of regression		
3		Skewness and Kurtosis	2,7,8	8
	3.1	Hypothesis, Type I and Type II errors,		
	3.2	Tests of significance– Student's t-test:Single Mean, Difference of		
	3.3	Paired t-test		
	3.4	Chi-Square test:Test of Goodness of Fit, Independence Test		
4		Axiomatic Approach to Probability	4	6



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	4.1	Random experiment, sample space, events		
	4.2	axiomatic Probability		
	4.3	Algebra of events		
	4.4	Conditional Probability, Multiplication theorem of Probability		
	4.5	Independent events		
	4.6	System reliability, Baye's Theorem		
5		Random variables and Mathematical Expectation	4,5,6	9
	5.1	Discrete random variable		
	5.2	Continuous random variable, Two-dimensional random variable		
	5.3	Joint probability distribution		
	5.4	Stochastic independence		
	5.5	Properties of expectation		
	5.6	Properties of variance		
	5.7	Covariance		
6		Special Theoretical Probability Distributions	4,5,6	9
	7.1	Bernoulli		
	7.2	Binomial		
	7.3	Poisson		
	7.4	Geometric		
	7.5	Normal		
	7.6	Uniform		
	7.7	Exponential		
	7.8	Gamma		
	7.9	Beta		
			Total	42

Reference Books

- [1] S.C.Gupta, V.K.Kapoor , S Chand, "Fundamentals of Mathematical Statistics" ,1 st Edition
- [2] J.Susan Milton, Jesse C. Arnold, "Introduction to Probability & Statistics", Tata McGraw Hill, 4th Edition
- [3] S C Gupta, "Fundamentals of Statistics", Himalaya Publishing house, 7th edition.
- [4] Kishore Trivedi, "Probability and Statistics with Reliability, Queuing, And Computer Science Applications", PHI (English) 1st Edition
- [5] Schaum's, "Outlines Probability, Random Variables & Random Process", Tata McGraw Hill, 3rd Edition
- [6] Dr J Ravichandran , "Probability & Statistics for Engineers", Wiley
- [7] Dr Seema Sharma, "Statistics for Business and Economics", Wiley
- [8] Ken Black, "Applied Business Statistics", Wiley, 7th Edition



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Tutorial on probability & Statistics

No.	Topic	Number of hours
1	Measures of central tendency for grouped frequency data.	1
2	Coefficient of variation for grouped frequency data.	1
3	Study correlation between two variables.	1
4	Fit two regression lines and estimate the value of one variable.	1
5	Karl Pearson's coefficient of skewness.	1
6	Baye's Theorem on probability and example.	1
7	Addition theorem of probability and example..	1
8	To find marginal & conditional probability of discrete R.V.	1
9	To find marginal & conditional probability of continuous R.V	1
10	To find Expectation and variance of cont R.V.	1
11	Problem of binomial distribution.	1
12	Problem of Poission distribution.	1
13	Problem of exponential distribution.	1
14	Problem of normal distribution.	1
	Total	14



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCAL22	Computer Networks Lab	--	--	2	--	--	1	2
		Examination Scheme						
		ISE		MSE		ESE		
		40		--		--		

Pre-requisite Course Codes		MCA22
		Student will be able to
Course Outcomes	CO1	Implement error correction and detection techniques.
	CO2	Configuring various networking protocols.
	CO3	Use and demonstrate networking tools.

Exp No.	Experiment details	Ref.	Marks
1	Simulate basic network topology for the given scenario	1	5
2	Demonstrate Framing mechanism for given scenario	1	5
3	Demonstrate Error Detection and Correction code for given scenario	1	5
4	Calculate the IPv4 Address for the given scenario	1	5
5	Simulation of Routing protocol for given scenario	2	5
6	Create VLAN for the given scenario	2	5
7	Simulation of Address translation protocols	2	5
8	Simulation of Application layer protocols	2	5
Total Marks			40

References:

- [1] Addison-Wesley Professional, "C++ Network Programming", Addison-Wesley Professional, Second Edition.
- [2] A.Jesen, "Packet Tracer Network Simulator", PACKT publisher, Third Edition.



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCAL23	Data Structures Lab	--	--	4	--	--	2	2
		Examination Scheme						
		ISE		MSE		ESE		
		40		--		--		

Pre-requisite Course Codes	MCAL11	
	Student will be able to	
Course Outcomes	CO1	Demonstrate various sorting techniques.
	CO2	Apply searching and hashing techniques for efficient data retrieval and data mapping.
	CO3	Demonstrate various operations of linear data structures i.e. stack, queue and linked list
	CO4	Create binary tree and its variants.
	CO5	Apply graph traversal techniques.

Exp. No.	Suggested List of Experiments	Ref	Marks
1	Sorting Techniques: Bubble , Insertion , Selection , Shell , Quick , Radix	1,2,3	5
2	Searching Techniques: Sequential search, Binary Search Hashing Techniques: Modulo division, Digit Extraction, Folding, Mid square Collision Resolution technique: Linear probe	1,2,3	5
3	Stack implementation Implementation of Stack(using Array & Linked list).	1,2,3	5
4	Queue implementation Implement all the different types of queues(eg: Simple Queue, Doubly Ended Queue, Circular Queue)	1,2	5
5	Singly linked list implementation A menu driven program that implements singly linked list for the following operations: create , display , count , insert , delete , search, sort, reverse Doubly linked list implementation A menu driven program that implements doubly linked list for the following operations: create , display , count , insert , delete , search ,sort, reverse Singly circular linked list implementation A menu driven program that implements Singly circular linked list for the following operations: create , display , count , insert , delete , search ,sort, reverse	1,2,3	5
6	Binary Search Tree implementation	1,3	5



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	A menu driven program a. Create a Binary search tree b. Traverse the tree in In order, Preorder and Post order c. Search the tree for a given node and delete the node		
7	Heap Tree implementation A menu driven program that implements Heap tree (Maximum and Minimum Heap tree) for the following operations: (Using Array) Insert, Delete	1,3	5
8	Graph Implementation Implementation of insert and delete nodes in a graph using adjacency matrix along with Graph Traversal(DFS and BFS)	1,2,3	5
TOTAL			40

References :

- [1] Richard F Gilberg, Behrouz A Forouzan, "Data Structure A Pseudocode Approach with C", Brooks/Cole Publishing Company, Second edition, 2004.
- [2] Moshe, Tenenbaum, "Data Structures Using C and C++", Pearson Education Asia Pvt. Ltd., Second edition, 2009
- [3] Tremblay, Jean-Paul & Sorenson, "An Introduction to Data Structures with Applications", Tata McGraw-Hill, Second edition, 2002



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCAL26	Python Programming Lab	--	--	4	--	--	2	2
		Examination Scheme						
		ISE		MSE		ESE		
		40		--		--		

Pre-requisite Course Codes	Basic understanding of programming fundamentals	
	Student will be able to:	
Course Outcomes	CO1	Make use of data types in Python programs.
	CO2	Create functions, modules in Python.
	CO3	Apply Object oriented features in Python program.
	CO4	Design GUI application with database connectivity.
	CO5	Develop application using Python.
	CO6	Create documentation for Python application.

Module No.	Module Details	Ref.	Hours
1	Introduction to Python Downloading and Installing python, Accessing python on system, Interacting with python, python Data types, Keywords & Identifiers in python, Operators in python	1,2,3	1
2	Python flow control Conditional statements, Looping statements and Control statements, If..else, for ,while, break and continue, pass statements	1,2,3	1
3	String, List, Tuple and Dictionary	1,2	1
4	Functions and Modules Function arguments, Recursion, Anonymous function, import statement, module search path, reloading module, dir() function	1,2,3	1
5	Exception handling Different types of Exception and Error handling	1,3,4	1
6	Python with OOP concepts Class and Object, inheritance, Operator Overloading	1,2,3	2
7	GUI programming and Database connectivity and File Tkinter programming	2,3,4	2
8	Data Visualization in Python	3,4	1
Total Hours			10

References:

- [1] John Paul Mueller, "Beginning Programming with Python for Dummies", Wiley,2015
- [2] Allen Downey, "Think Python : How to think like a computer scientist", Green tea press,2016
- [3] Wesley J. Chun, "Core Python Programming", Prentice Hall PTR, 3rd Edition, 2012.
- [4] Laura Cassell and Alan Gauld, "Python Projects", Wrox A Wiley brand,1st Edition,2014



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCA P21	Mini Project-II	--	--	02	--	--	01	01
		Examination Scheme						
		Phase I (ISE -I)		Phase II (ISE- II)		ESE		Total
		10		15		25		50

Pre-requisite Course Codes :	Programming Language	
	Student will be able to	
Course Outcomes	CO1	Formulate a real world problem and develop its requirements.
	CO2	Develop a design solution for the identified requirements.
	CO3	Test the prototype against identified requirements.
	CO4	Develop effective communication skills for presentation of project related activities.

Evaluation Scheme

- Project assessment is done by internal and external examiner. The project carries weightage of 50 marks.
- The internal assessment is done in two phases. Phase I carry 10 marks, Phase II carries 15 marks. Students will be continuously assessed by the internal examiner in the middle of the semester (phase I) and at the end of the semester (phase II).
- The external examination is conducted to evaluate the students for 25 marks at the end of the semester.
- ESE for project shall carry maximum 50 marks in each semester. These 50 marks shall be given by the internal and external examiner together.

Guidelines

In this semester, the implementation phase is undertaken. Students will have to implement the project based on the requirements of project. Documentation for the phase II need to be maintained.

- The separate / Full projects can be undertaken with prior permission of mentor and Head of the department.
- Complexity of the project should be maintained proper throughout six month