Learning Outcomes based Curriculum Framework (LOCF)

Bridge Course

for

Students Passed B.Sc. / B.Com. / B.A. with Mathematics at 10+2 level or at Graduation Level

Master of Computer Applications
(MCA)

(w.e.f. 2022-23)

Department of Computer Science and Information Technology

School of Technology

MAULANA AZAD NATIONAL URDU UNIVERSITY

1. Vision and Mission

1.1 Vision

To meet the requirements of the society by imparting knowledge, ethics and moral values with a holistic approach.

1.2 Mission

To impart quality education and to undertake research and extension with emphasis on application and innovation that cater to the emerging societal needs through all-round development of students of all sections enabling them to be globally competitive and socially responsible citizens embedded with ethical values.

1.3 Strategies for Attaining the Vision and Fulfilling the Mission

Following strategies will be used to ensure the accomplishment of the stated vision and mission:
1. To create an ambiance for healthy teaching-learning process and attract the motivated students to the Department of Computer Science and Information Technology
2. Ensure that the curriculum followed is comparable to the relevance of local, national, regional and global development
3. To motivate the potential faculty members/ educators who are constantly upgrading their pedagogical approaches to motivate students and to enhance learning among them
4. Provide opportunities to students for global exposure, industrial internships, project based and research-based learning

2. Program Educational Objectives

Program Educational Objectives (PEOs) are broad statements that describe the career and professional accomplishments that CS&IT Department is preparing its graduates to achieve during the graduation. Following four PEOs are defined as:

PEO 1. To train the graduates to acquire in depth knowledge of fundamental concepts and programming skills for holistic development.

PEO 2. To prepare the graduates for productive careers in software industry, corporate sector, Government Organizations.

PEO 3. To prepare graduates to acquire excellent computing ability so that they can analyze, design and create Solutions for real time problems.

PEO 4. To apply the current tools and techniques to create systems for solving Industry oriented problems.

3. Program Outcomes (POs)

Program outcomes are the narrower statements that describe what students are expected to know and be able to do upon graduation. POs represent the knowledge, skills and attitudes the students should have at the end of a program. Following are the statements for POs for computer application program. At the time of completing their degree requirements, students will be able to:

PO₁: Apply the knowledge of Mathematics, Science, and Engineering fundamentals, and an engineering specialization to solution of complex engineering problems **(Engineering Knowledge)**.

PO₂: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences (**Problem analysis**).

PO₃: Design of solutions for complex engineering problems and design of system components or processes that meet the specified needs with appropriate considerations of public health and safety, and cultural, societal, and environmental considerations (**Design/development of solutions**).

PO₄: Use research-based methods including design of experiments, analysis and interpretation of data and synthesis of information leading to logical conclusions **(Conduct investigations of complex problems**).

PO₅: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling complex engineering activities with an understanding of limitations (**Modern tool usage**).

PO₆: Apply reasoning within the contextual knowledge to access societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice **(The engineer and society)**.

PO₇: Understand the impact of the professional engineering solutions in the societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable developments (**Environment and sustainability**).

PO₈: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice (**Ethics**).

PO₉: Function effectively as an individual independently and as a member or leader in diverse teams, and in multidisciplinary settings (**Individual and team work**).

PO₁₀: Communicate effectively on complex engineering activities with the engineering community and with society at large such as being able to comprehend and write effective reports and design documentation, make effective oral presentations, and give and receive clear instructions (**Communication**).

PO₁₁: Demonstrate knowledge and understanding of engineering management principles and apply those to one's own work as a member and leader of a team to manage projects in multidisciplinary environments (**Project management and finance**).

PO₁₂: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change (**Life-long Learning**).

4. Program Specific Outcomes (PSOs)

Program Specific Outcomes (PSOs) are the statements that define outcomes of a program which make students realize the fact that knowledge and techniques learnt in a specific course has direct implication for the betterment of society and its sustainability.

PSO 1: The ability to design and develop applications using the knowledge of Mathematics, Science and Engineering fundamentals.

PSO 2: Ability to test and analyze the quality of developed applications and to integrate them in order to evolve a larger computing system.

PSO 3: Apply appropriate techniques, resources, and modern engineering and IT tools to address societal, health, safety, legal, and cultural issues.

PSO 4: To analyze and assess various functional and technical security challenges in protecting various digital assets and infrastructure in the internet era and to design and develop innovative technological solutions for the same

PSOs have to be attained by the students in due course of the two years program either as part of their Core, Discipline Specific Electives, Tools and techniques or as part of their various levels of seminar/ internship and project work.

5. Mapping between PEOs, POs and PSOs

The following Table lists the relationships between the PEOs, POs. and PSOs. The attainment of POs can be viewed as a strategy for attaining the PEOs. Each PEO is supported by multiple POs to ensure strength in compliance. Also, the relationship between individual PO and PEOs can vary between **Reasonable (1)** and **Strong (3)**.

PEOs	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
PEO1	1	2	1	2	1	2	1	1	1	1	1	2	1	2	1	1
PEO2	1	1	3	1	2	2	2	1	2	1	2	1	1	2	1	2
PEO3	2	2	2	2	3	2	1	2	3	2	1	2	1	1	2	2
PEO4	1	3	1	2	1	2	1	1	1	2	1	2	3	2	1	1

1 – Reasonable

2 – Significant

3 – Strong

6. Course Outcomes (COs)

Course Outcomes are narrower statements that describe what students are expected to know and be able to do at the end of the course. Course outcomes are defined for all courses as part of the syllabus for the course and are measured through performance on assignments, written and oral presentation reports related to individual and team projects and through the mid-term and semester end examinations. Detailed syllabi for each course associated with Course Objectives and Course Outcomes has been for specific outcomes associated with the course. Attaining the COs is at the heart of the educational activity. If COs of individual courses are successfully attained and the curriculum has been designed to achieve the Program Outcomes, then attainment of the POs is also ensured. An effective Assessment Plan has been devised to meet the objective, quantitative and independent measures to demonstrate that all POs and PEOs are being attained by the program.

7. Continuous Quality Improvement and Assessment Plan

The purpose of the Assessment Plan is to ensure attainment of all Program Outcomes (POs) and also the attainment of the Program Educational Objectives (PEOs) and to independently confirm that the POs and PEOs are being attained. Periodic monitoring of progress allows faculty members and the leadership to take corrective actions where the POs and PEOs are not meeting established targets. The process consists of assessing and evaluating the extent to which the student outcomes are being attained. The results of these assessments and evaluations are subsequently used as the primary inputs for making improvements to the program.

MAULANA AZAD NATIONAL URDU UNIVERSITY

DEPARTMENT OF CS&IT
SCHEME OF INSTRUCTIONS, EXAMINATION & EVALUATION
(Effective for Batch Admitted from 2022-23 Academic Year)
Bridge Course for MCA
Total Credits (2 Semester Course): 14

Course Code	Description	Course Title	Hours/Week			Credits	Score		End Exam Duration
			L	T	P		Internal	External	
MMBC121FCT	BC	Discrete Mathematics	3	1	0	4	30	70	3 Hrs.
MMBC122PCT	BC	Information & Communication Technology	3	1	0	4	30	70	3 Hrs.
MMBC123PCT	BC	Introduction to Computer System & Hardware	3	1	0	4	30	70	3 Hrs.
MMBC161PCP	BC	Problem Solving Using 'C' Language Lab	0	0	4	2	30	70	3 Hrs.
Total Credits per semester						**14**	**400**		
Mandatory Induction Program- 3 Weeks Duration									
Note: End Semester Examinations of the subject(s) weighted more than 2 credits will be for three Hrs. duration with maximum 100 marks score (30+70)									

Course Code		Course Title		Lecture			Semester: I
MMBC121FCT		Discrete Mathematics		L	T	P	
Version: 1.2		Date of Approval: 16th BoS 17-11-2022		3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): Basic knowledge of Mathematics

Course Objectives:
1. To understand the fundamental concepts of Discrete Mathematics
2. To apply logical reasoning to solve a variety of problems.
3. To study and identify a real-life problems and computing requirements for its solution.
4. To apply logical reasoning to solve a variety of problems.

Course Outcomes (CO):

COs No.	Statement	Mapped Program Outcomes (POs)
CO$_1$	Develop mathematical and logical thinking.	PO$_1$, PO$_2$, PO$_3$
CO$_2$	Utilize the concepts of relations and functions to solve simple real-life problems.	PO$_2$, PO$_3$
CO$_3$	comprehend real life problems it in terms of predicates, quantifiers, and logical connectives and obtained its solution	PO$_3$
CO$_4$	Apply logical reasoning to solve a variety of problems	PO$_3$, PO$_5$, PO$_9$

PO$_1$- Engineering Knowledge, **PO$_2$**- Problem analysis, **PO$_3$**- Design/development of solutions, **PO$_4$**- Conduct investigations of complex problems, **PO$_5$**- Modern tool usage, **PO$_6$**- The engineer and society, **PO$_7$**- Environment and sustainability, **PO$_8$**- Ethics, **PO$_9$**- Individual or team work, **PO$_{10}$**- Communication, **PO$_{11}$**- Project management and finance, **PO$_{12}$**- Life-long Learning

Mapping of course outcomes with program outcomes

Course Outcomes	PO$_1$	PO$_2$	PO$_3$	PO$_4$	PO$_5$	PO$_6$	PO$_7$	PO$_8$	PO$_9$	PO$_{10}$	PO$_{11}$	PO$_{12}$
CO$_1$	2	1	2									
CO$_2$		1	2									
CO$_3$			2									
CO$_4$			2		1				1			

1 – Reasonable; 2 – Significant; 3 – Strong

Detailed Contents:

Unit: 1	Mathematical Logic: Statements and notations, Logical Connectives, Compound statements, Well-formed formulas, Truth Tables, tautology, implications and equivalence of statements, Normal forms: disjunctive & Conjunctive normal forms and simplification, Quantifiers, universal quantifiers. Predicates: Predicative logic, Free & Bound variables, Rules of inference,
Unit: 2	Relations and Functions: Relations: Review of set concepts, Relations and its representations, Properties of binary relation –Reflexive, irreflexive, symmetric, Asymmetric, transitive, Equivalence, Inverse & Composition of a relation, closure of relations, its types, Warshall Algorithm, Partial ordering relation, Hasse diagram, minimal elements, upper bound, lower bound, Lattices Functions: definition, floor functions, ceiling functions, surjective, injunctive and bijective functions, Inverse Function, Composition of functions, recursive Functions, Pigeon hole principles and its application.
Unit: 3	Elementary Combinatorics: Basics of counting, Combinations & Permutations, with repetitions, Constrained repetitions, Binomial Coefficients, Binomial and Multinomial theorems, the principles of Inclusion – Exclusion, Derangements – Nothing in its right place integer solutions to linear equations
Unit: 4	Graph Theory: Basic concept, Graphs and their properties, Degree, Connectivity, Path, Cycle,, simple and weighted graph, complete graph, regular graph, Perfect Graph, Multi graphs, bipartite graph, complete bipartite, Sub Graph, Isomorphism,

	complement of graph, connected graphs, paths-simple, elementary, circuit – simple, elementary, Edge connectivity, vertex connectivity, Eulerian path and Eulerian circuit, planar graph	
Unit: 5	Introduction, Applications of Trees, Tree Traversal, Trees and Sorting, Spanning Trees, Minimum Spanning Trees.	

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:	
1	Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw – Hill
2	Ralph P. Grimaldi, Discrete and Combinatorial Mathematics An Applied Introduction

Reference Books:	
1	C L Liu and D P Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, 3rd Edition by, Tata McGraw – Hill.
2	Schaum's Outlines Series, Seymour Lipschutz, Marc Lipson, Discrete Mathematics, Tata McGraw – Hill

Course Code		Course Title		Lecture			Semester: I
MMBC122PCT		Information & Communication Technology		L	T	P	
Version: 1.2		Date of Approval: 16th BoS 17-11-2022		3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): No Prerequisite

Course Objectives:
1. Vision and Introduction to Computer System.
2. Understand Computer Networks.
3. Data and Knowledge Management in ICT.
4. Understand the effect of using ICT and its applications.

Course Outcomes (CO):

COs No.	Statement	Mapped Program Outcomes (POs)
CO$_1$	Explain and demonstrate various components of Computer.	PO$_1$, PO$_2$, PO$_3$
CO$_2$	Analyze the role and importance of ICT in the modern world.	PO$_2$
CO$_3$	Investigate and propose various requirements of ICT for real world applications.	PO$_2$, PO$_7$
CO$_4$	Evaluate a variety of existing and developing architecture technologies for ICT.	PO$_3$, PO$_4$

PO$_1$- Engineering Knowledge, **PO$_2$**- Problem analysis, **PO$_3$**- Design/development of solutions, **PO$_4$**- Conduct investigations of complex problems, **PO$_5$**- Modern tool usage, **PO$_6$**- The engineer and society, **PO$_7$**- Environment and sustainability, **PO$_8$**- Ethics, **PO$_9$**- Individual or team work, **PO$_{10}$**- Communication, **PO$_{11}$**- Project management and finance, **PO$_{12}$**- Life-long Learning

Mapping of course outcomes with program outcomes

Course Outcomes	PO$_1$	PO$_2$	PO$_3$	PO$_4$	PO$_5$	PO$_6$	PO$_7$	PO$_8$	PO$_9$	PO$_{10}$	PO$_{11}$	PO$_{12}$
CO$_1$	2	1	2									
CO$_2$		2										
CO$_3$		2					1					
CO$_4$			2	2								

1 – Reasonable; 2 – Significant; 3 – Strong

Detailed Contents:

Unit: 1	**ICT**: General abbreviations and terminology, Basics of Internet, Intranet, Browsers, Methods of communication such as fax, Email, Audio/Tele and Video Conferencing, Digital Initiatives in Higher Education, ICT and Governance
Unit: 2	**Basic Computer Networks:** Routers, hubs, bridges, switches and proxy servers, Wi-Fi, LiFi, HiFi, WiMax, Bluetooth, Infrared and ISP. Local Area Network (LAN), Metropolitan Area Networks (MAN), Wireless Local Area Network (WLAN) and Wide Area Network, (WAN), difference between LANs, WLANs, MAN and WANs and their characteristics, Communication Protocols.
Unit: 3	**Data and its Types:** Data Interpretation, Sources, acquisition and classification of Data, Quantitative and Qualitative Data, Graphical representation (Bar-chart, Histograms, Pie-chart, Table-chart and Line-chart) and mapping of Data, Data Interpretation, Data and Governance, Confidentiality and Security of Data.
Unit: 4	**Effect of Using ICT and Ways in which it is used**: Software Copyright, Hacking, Viruses, Employment Patterns, IT in the home, Information from the Internet, Health and Safety, Communication, Data-handling, Measurement, Control and Modelling.
Unit: 5	**Applications of ICT:** Learning Management System including Teaching Support System: Traditional, Modern and ICT based (MOOCs). Publicity, Manufacturing, Finance, Education, Travel & Leisure, Banking, Medicine, Libraries, Expert Systems, Retail.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

	Text Books:
1	Norton, P. (2000). Peter Norton's introduction to computers. Glencoe/McGraw-Hill.
2	Sargent, B., Watson, D., & Brown, G. (2015). Cambridge IGCSE ICT 2nd Edition. Hodder Education.
	Reference Books:
1	Arulsamy, S., & Sivakumar, P. (2009). Application of ICT in Education. Neelkamal Pub.
2	Runkler, T. A. (2012). Data Analytics. Wiesbaden: Springer. doi, 10, 978-3.

Course Code	Course Title	Lecture			Semester: I
MMBC123PCT	Introduction to Computer system and Hardware	L	T	P	
		3	1	0	
Version: 1.2	Date of Approval: 16th BoS 17-11-2022				

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Prerequisite(s): No Prerequisite

Course Objectives:

1. To understand the usage of computers and why computers are essential society.
2. To learn the fundamentals of Hardware.
3. To apply the programs, system software and applications. Organize and work with files and folders.
4. To evaluate a variety of existing and developing architecture technologies for hardware.

Course Outcomes (CO):

COs No.	Statement	Mapped Program Outcomes (POs)
CO$_1$	Utilize the Internet Web resources and evaluate on-line e-business system.	PO$_1$, PO$_3$
CO$_2$	Solve common computer problems using appropriate Information Technology applications and systems.	PO$_3$
CO$_3$	Identify categories of programs, system software and applications. Organize and work with files and folders.	PO$_2$
CO$_4$	Evaluate a variety of existing and developing architecture technologies for hardware.	PO$_4$

PO$_1$- Engineering Knowledge, **PO$_2$**- Problem analysis, **PO$_3$**- Design/development of solutions, **PO$_4$**- Conduct investigations of complex problems, **PO$_5$**- Modern tool usage, **PO$_6$**- The engineer and society, **PO$_7$**- Environment and sustainability, **PO$_8$**- Ethics, **PO$_9$**- Individual or team work, **PO$_10$**- Communication, **PO$_11$**- Project management and finance, **PO$_12$**- Life-long Learning

Mapping of course outcomes with program outcomes

Course Outcomes	PO$_1$	PO$_2$	PO$_3$	PO$_4$	PO$_5$	PO$_6$	PO$_7$	PO$_8$	PO$_9$	PO$_10$	PO$_11$	PO$_12$
CO$_1$	2		1									
CO$_2$			1									
CO$_3$		2										
CO$_4$				2								

1 – Reasonable; 2 – Significant; 3 – Strong

Detailed Contents:

Unit: 1	Introduction to Computer, Organization of computer. Software and hardware, Input/output devices. Operating System Basics & Installation: Introduction to OS, Types of Operating systems, System files FAT and NTFs, Windows 7, Windows 10, LINUX and UBUNTU.
Unit: 2	Introduction to Internet and Intranet, basic networking concepts, network topologies: LAN, WAN, MAN, PAN, CAN, NFC, LORA WAN. **Networking Model:** The OSI model, TCP/ IP Model, Network adapters, Introducing protocols, Cabling and troubleshooting.
Unit: 3	Introduction to various networking devices: Routers, Switches, Modems, Hubs etc. Wired and Wireless technology, Network configuration: MAC address (physical address) Setting IP addresses, Sharing files and folders, Network troubleshooting, PING test, ipconfig etc.
Unit: 4	Introduction to computer hardware, components of mother boards & its types- ports, slots, connectors, add on cards, Power supply units, and cabinet types. Storage devices: Primary & secondary storage
Unit: 5	Hardware Trouble Shooting: Printers, Microphone, Scanner, Network, Hardware failure, Testing, CDROM, Hard disk drive, Monitor, Mother Board, Sound Card, Video Card, graphics card.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:	
1	Deborah Morley and Charles S. Parker; Fundamentals of Computers; Cengage Learning, India edition; 2009.
2	Alexis Leon and Mathews Leon; Fundamentals of Information Technology; Vikas Publication, Chennai
Reference Books:	
1	Pc Hardware: The Complete Reference by ZACKER and CRAIG, McGraw Hill
2	Exploring Computer Systems: The Illustrated Guide to Understanding Computer Systems, Hardware & Networks Wilson, Kevin

Course Code		Course Title		Lecture			Semester: I
MMBC161PCP		Problem Solving Using C language (Lab)		L	T	P	
				0	0	4	
Version: 1.2		Date of Approval: 16th BoS 17-11-2022					

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	2	End Semester	:	70
Instruction Mode	:	Theory & Practical	Exam Duration	:	3 Hrs.

Prerequisite(s): Computer fundamentals

Course Objectives:
1. To understand the fundamentals of C programming.
2. To learn about different problems and the approach to solve them.
3. To gain proficiency with the fundamental concepts of the C programming Language.
4. To apply these concepts to solve real world problems and to a make program in C programming for a given application.

Course Outcomes (CO):

COs No.	Statement	Mapped Program Outcomes (POs)
CO$_1$	Choose the loops and decision-making statements to solve the problem.	PO$_1$, PO$_2$, PO$_3$
CO$_2$	Implement different Operations on arrays.	PO$_3$, PO$_5$
CO$_3$	Use functions to solve the given problem and Understand pointers, structures and unions.	PO$_3$, PO$_4$
CO$_4$	Implement file Operations in C programming for a given application	PO$_3$, PO$_5$

PO$_1$- Engineering Knowledge, **PO$_2$**- Problem analysis, **PO$_3$**- Design/development of solutions, **PO$_4$**- Conduct investigations of complex problems, **PO$_5$**- Modern tool usage, **PO$_6$**- The engineer and society, **PO$_7$**- Environment and sustainability, **PO$_8$**- Ethics, **PO$_9$**- Individual or team work, **PO$_10$**- Communication, **PO$_11$**- Project management and finance, **PO$_12$**- Life-long Learning

Mapping of course outcomes with program outcomes

Course Outcomes	PO$_1$	PO$_2$	PO$_3$	PO$_4$	PO$_5$	PO$_6$	PO$_7$	PO$_8$	PO$_9$	PO$_{10}$	PO$_{11}$	PO$_{12}$
CO$_1$	2	1	2									
CO$_2$			2		1							
CO$_3$			2		1							
CO$_4$			2		1							

1 – Reasonable; 2 – Significant; 3 – Strong

Detailed Contents:

Unit: 1	Introduction to Programming-The Basic Model of Computation, Algorithms, Flow-charts/pseudocodes, Programming Languages, Compilation, Linking and Loading, Testing and Debugging, Documentation. Algorithms for Problem Solving-Exchanging values of two variables, , Decimal to Binary conversion, reversing digits of an integer, GCD of two numbers, Test prime, sorting numbers., square root of a number, factorial computation, Fibonacci sequence, Evaluate 'sin x' as sum of a series, Reverse array, largest number in an array, upper triangular matrix, multiplication of two matrices, Evaluate a Polynomial.
Unit: 2	Character set, Variables and Identifiers, Built-in Data Types, Variable Definition Arithmetic operators and Expressions, Constants and Literals, Simple assignment statement, Basic input/output statement, Simple 'C' programs. Conditional Statements and Loops. Decision making within a program, Conditions, Relational Operators, Logical Connectives, if statement, if-else statement, Loops: while loop, do while, for loop, Nested loops, Infinite loops, Switch statement, structured Programming.
Unit: 3	Arrays-One dimensional arrays: Array manipulation; Searching, Insertion, Deletion of an element from an array; Finding the largest/smallest element in an array; Two dimensional arrays, Addition/Multiplication of matrices, Transpose of matrix; Null terminated strings as array of characters, string functions. Storage Classes Scope and extent: extern and static. Pointers-Address operators, pointer type declaration, pointer assignment, pointer initialization, pointer arithmetic, functions and pointers, Arrays, Pointers, and structures, dynamic memory allocation.

Unit: 4	Functions- Top-down approach of problem solving, Modular programming and functions, Standard Library of C functions, Prototype of a function: Formal parameter list, Return Type, Function call, Block structure, passing arguments to a Function: call by reference, call by value, Recursive Functions, arrays as function arguments. Structures and Unions Structure variables, initialization, structure assignment, nested structure, structures and functions, structures and arrays: arrays of structures, structures containing arrays, unions.
Unit: 5	Self-Referential Structures and Linked Lists -Creation of a singly connected linked list, traversing a linked list, Insertion into a linked list, Deletion from a linked list File Processing-Concept of Files, File opening in various modes and closing of a file, reading from a file, Writing onto a file.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1	Byron S Gottfried "Programming with C" Second edition, Tata McGrawhill, 2007
2	R.G. Dromey, "How to solve it by Computer", Pearson Education, 2008

Reference Books:

1	Kanetkar Y, "Let us C", BPB Publications, 2007.
2	Hanly J R & Koffman E.B, "Problem Solving and Programm design in C", Pearson