



## MCA Programme Structure (2020-2022 Batch)

First Semester					
Theory					
Sl. No	Category	Course Code	Course Title	L-T-P	Credit
1	IT	20MC101	Data Structure using C	3-0-0	3
2	IT	20MC102	Computer Organization and Architecture	3-0-0	3
3	BM	20MC103	Principles and Practice of Management	3-0-0	3
4	MATH	20MC104	Mathematics - I: (Numerical Methods & Quantitative Tech.)	3-0-0	3
5	BM	20MC105	Communicative English	2-0-0	2
6	BM	20MC106	Environmental Science	3-0-0	0
Total Credit (Theory)					14
Practical					
1	LAB	20MC107	Data Structure Lab	0-0-3	2
2	LAB	20MC108	Computer Organization and Architecture Lab	0-0-3	2
3	LAB	20MC109	Communicative English Lab	0-0-3	2
6	SEM	20MC110	Seminar/PPT	0-0-1	1
Total Credit (Practical)					7
Total Semester Credit					21



20MC 101	Data Structure using C (3-0-0)	3 Credits
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**Course Objective:**

1. To impart the basic concepts of Programming and Algorithms
2. To understand concepts about searching and sorting techniques
3. To Understand basic concepts about stacks, queues, lists and trees
4. To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures

**Module- I: Introduction to Programming (12 Hrs.)**

Introduction to Language: Structure of C Program, Keywords, Identifiers, Primitive Data types, variables, constants, input/output statements. Operators and Expressions: Expression evaluation: Operator Precedence and Associativity. Conditional Branching: One (simple if), two (if else) and multi way selection (else if ladder and switch and nested selection), Iteration and loops: Iterative statements, nested loops, break and continue statements. Arrays & Strings: One-dimensional, Two dimensional and Multi-dimensional arrays

**Module- II: Function, Pointer & Structure (12 Hrs.)**

Function: Declaration, Definition, Call by value, Call by reference, Scope of variables, Storage classes, Recursive functions. Defining pointers, Use of Pointers in Inter-function communication via arrays, matrices. Strings handling, Introduction to pointers. Dynamic memory allocation. Structures, Defining structures and Array of Structures, Structure vs Union, self-referential structures, notion of linked list (no implementation).

**Module- III: (10 Hrs.)**

Abstract Data Types - Definition and Representation, ADT of rational number, ADT of Stack, Data Structure and ADT. Stack and its usages: reversing string, matching parentheses, in fix to postfix. Queue: linear & circular queue. Linked list and its representation: using array, using self-referential structure. Singly, circular and double linked lists. Operations on linked list - Insertion, Deletion, Traversals. Usages of Linked list - insertion sort.

**Module- IV: (10 Hrs.)**

Tree: Definition and Terminologies, child and parent nodes, Sub tree, root, leaf node, internal node, height of a Binary tree. Binary tree traversals. Sorting and Searching: Bubble sort, selection sort quick sort and merge sort. Linear and binary search, Fibonacci search.



### Course Outcomes:

Upon the successful completion of the course, students will be able to:

1. Describe the basics of programming language and its syntax and understand the problem-solving aspect.
2. Design and develop C program to solve different real-life problems efficiently.
3. Analyse and compare different possible solutions.

### Text Books:

1. Behrouz A. Forouzan & Richard F. Gilberg, “A structured Programming Approach Using C”, 3rd Edition, Cengage Publication, ISBN: 9788131503638, 2007.
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, 2<sup>nd</sup> Edition, Prentice Hall of India, 2015.
3. Byron Gottfried, Schaum's Outline of Programming with C, 3<sup>rd</sup> Edition, McGrawHillBook, 1<sup>st</sup> July 2017.
4. Data Structures: A Pseudocode Approach with C - Gilberg & Forouzan, 2<sup>nd</sup> Edition, Cengage, Indian Reprint 2016
5. Data Structures and Program Design in C - Kruse, Leung, 2<sup>nd</sup> Edition, Pearson, 2008

### Suggested MOOC Course (s):

1. <https://nptel.ac.in/courses/106105085/4> [Last accessed on: 08/05/2019]



20MC 102	Computer Organization and Architecture (3-0-0)	3 Credits
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**Course Objectives:**

1. Able to understand the basic organizational structure of computer system along with the operational concepts, the concepts of ALU, CU and Memory design, the concept of cache memory, virtual memory and principle of pipelining.
2. Able to solve the problems related to cache memory and performance, page replacement algorithms, memory construction, arithmetic operations, and pipelining.
3. Able to analyze the performance differences of computing evolution on basic operation like addition, multiplication and division, page replacement algorithms and cache memory mappings.

**Module-I: (10 hrs)**

**Functional blocks of a computer:** CPU, memory, input-output subsystems, Von-Neuman vs Harvard Architecture, Instruction set architecture of a CPU-registers, instruction execution cycle, Basic Operational Concepts, addressing modes, instruction set. Case study - instruction sets of some common CPUs.

**Module-II (12 hrs)**

**Computer arithmetic** - integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication - shift-and add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, signed number representation, fixed and floating-point representations, floating point arithmetic.

**CPU control unit design:** hardwired and micro-programmed design approaches, Case study - design of a simple hypothetical CPU.

**Module-III (8 hrs)**

**Memory system design:** semiconductor memory technologies, memory organization.

**Memory organization:** Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.

**Module-IV (6 hrs)**

**Peripheral devices and their characteristics:** Input-output subsystems, I/O device interface, I/O transfers-program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes-role of interrupts in process state transitions, I/O device interfaces - SCII, USB



**Module-V**

**(6 hrs)**

**Pipelining:** Basic concepts of pipelining, throughput, speedup and efficiency, pipeline hazards: Structural hazards, data hazards, control hazards.

**Course Outcomes:**

1. Describe the fundamental organisation of a computer system
2. Explain the functional units of a processor
3. Explain addressing modes, instruction formats and program control statements
4. Distinguish the organization of various parts of a system memory hierarchy
5. Describe basic concept of parallel computing
6. Describe fundamentals concepts of pipeline and vector processing

**TEXT BOOKS:**

1. "Computer Organization" 5<sup>th</sup> edition Carl Hamacher, Zvonkovanescic, Safwat Zaky, McGraw Hill.
2. "Computer Organization and Design: The Hardware/Software Interface", 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.

**REFERENCE BOOKS:**

1. "Computer Architecture and Organization", 3rd Edition by John P. Hayes, WCB/McGraw-Hill.
2. "Computer Organization and Architecture: Designing for Performance", 10th Edition by William Stallings, Pearson Education.

"Computer System Design and Architecture", 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education.

<p align="center"><b>20MC 103</b></p>	<p align="center"><b>Principles and Practices of Management (3-0-0)</b></p>	<p align="center"><b>3 Credits</b></p>
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**Course Objective:**

1. To study the functions and principles of management.
2. To learn the application of the principles in an organization.
3. To enable the effective and barriers communication in the organization .
4. To study the system and process of effective controlling in the organization

**Module- I: (10 Hrs.)**

Nature and functions of Management: What Managers do? Definition, Management as a Science, Art, Profession, Levels of Managers, Management Process, Skills of Managers, Role of Managers. Scientific Management Theory (Taylor), Administrative Management Theory (Fayol), Behaviouristics Management (Mayo). Systems Theory, Contingency Management theory.

**Module- II: (10 Hrs.)**

Planning Nature and Purpose of Planning, Planning Process, Principles of Planning, Types of Planning, Advantages and Limitations of Planning and Effective Planning. Organizing: Nature and Purpose of Organizing, Key components of organizing, Bases of Departmentation, Span of Management and its determinants, Line and Staff Relationship, Line-Staff Conflict, Bases of Delegation, Kinds of Delegation and Decentralization.

**Module- III: (10 Hrs.)**

Staffing: Importance, manpower planning, Recruitment and selection, Training and Development, Performance appraisal. Leadership: Different sources of power, Management and leadership Approaches to leadership and styles.

**Module- IV: (10 Hrs.)**

Controlling: Concept and Process of Control, Control Techniques, Human Aspects of Control, Control as a Feedback System, Feed Forward Control, Preventive Control, Profitand Loss Control, Control Through Return on Investment, The Use of Computer for Controlling and Decision Making, The Challenges Created by IT as a Control Tool. Decision Making Process, Individual Decision-Making Models.

**Module- V: (as per choice of faculty) (6 Hrs.)**

Portion covered can be tested through Internal evaluation only not to be included in University examination)

**Course Outcomes:**



Upon the successful completion of the course, students will be able to:

1. Explain the importance of employee motivation in an organization.
2. Explain needs-based theories of motivation.
3. Explain process-based theories of motivation.
4. Describe the job characteristics that affect motivation.

**Reference Books:**

1. Stephen P. Robbins, David A. Decenzo, Sanghmitra Bhattacharya, Madhushree Nanda Agarwal, Fundamentals of Management, Pearson Education, 2009
2. Kreitner, Management Theory and Applications, Cengage Learning, India, 2009
3. Robbins, Management, 9th edition Pearson Education, 2008,
4. Griffin, Management Principles and Applications, Cengage Learning, India First Edition
5. Harold Koontz, O'Donnell and Heinz Weihrich, Essentials of Management. New Delhi, Tata McGraw Hill, 2006
6. Stoner, Management, PHI Learning, 2008
7. Richard L. Daft, Principles Of Management, CengageLearning,India, 2009
8. Principles of Management, Meenakshi Gupta, PHI
9. Principles of Management, RN Gupta, S.Chand



20MC 104	Mathematics - I (3-0-0)	3 Credits
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**Course Objective:**

- i. To provide suitable and effective methods called Numerical Methods, for obtaining approximate representative numerical results of the problems.
- ii. To understand the concept of accuracy and precision with examples.
- iii. To locate roots of the equations by using Bisection method.
- iv. To understand one point iterative method to find appropriate roots. To Know the open method like Newton-Raphson Method and Secant method
- v. To understand various skills like interpolation, numerical integration and solution of differential equation.
- vi. To introduce students the use of quantitative methods & techniques for effective decision making
- vii. Model formulation.
- viii. Application that are used in solving business decision problems.
- ix. Decision to maximize profit and minimize loss.
- x. Taking decision involving queuing lines.
- xi. To handle project planning effectively.

**Module-I:**

**(10 Hours)**

**Numerical Method-1:** Approximations and Errors in Computation. Root finding methods: Bisection, Newton Raphson and Secant methods. Interpolation: Newton Divide Difference, Lagrange Method and System of linear equations: Gauss elimination method, Gauss Seidal method. Eigen values & Eigen vectors.

**Module-II:**

**(07 Hours)**

**Numerical Method-2:** Integration: Trapezoidal, Simpson's 1/3 rule & Gauss Quadrature methods for two and three point. Ordinary differential equations of First order by Euler's, Modify Euler's & Runge-Kutta Methods.

**Module-III:**

**(08 Hours)**

**Operation research-1:** Introduction to Linear Programming Problem: Formulation of LPP. Solution of LPP by: Graphical, Simplex, Big-M, Dual Simplex Methods. Integer Linear Programming by Branch and Bound Method.

**Module-IV:**

**(08 Hours)**

**Operation reseach-2:** Transportation Problem: Mathematical formulation, initial basic feasible solution, test for optimality solution by MODI Method, degeneracy, unbalanced transportation problem. Assignment Problem: Mathematical formulation, method of



solving assignment problem and solution by Hungarian method, maximization assignment problem. Introduction to Queuing Theory: Characteristics of queuing models, solution to single channel with poisson arrivals and exponential service with finite and infinite population models:-  $(M / M / 1):(\infty / FCFS)$ ,  $(M / M / 1):(N / FCFS)$

### Module-V: Operation research-3

(07 Hours)

Project Management: Visual display of a project, scheduling a project with PERT/CPM, dealing with uncertain activity, Time-cost trade-offs, Scheduling and controlling project costs, evaluation of PERT/CPM.

#### Test Books:

- 1.M. K. Jain, S.R.K. Iyenger and R.K. Jain," Numerical Methods for Scientific and engineering Computations" , New age International Publication (P) Ltd.
2. P.K. Gupta and D.S.Hira **Operations Research**, S CHAND.

#### Reference Books:

1. S.S. Sastry, "Introductory Numerical Methods", Prentice Hall India Ltd.
2. Operations Research, Hiller, Libwerman, 8th edition TMH 2005.
3. Operation Rearch, Panneerselvam, PHI



20MC 105	Communicative English (3-0-0)	3 Credits
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### Course Objective:

1. To enhance the learner's communication skills by giving adequate exposure in LSRW listening, speaking, reading and writing skills and the related sub-skills.
2. To impart better writing skills by sensitizing the learners to the dynamics of effective writing.

#### Module- I: Basics of communication skills (8 Hrs.)

Significance of communication, The process and factors of communication (the communication loop), Difference between General and Technical Communication, Verbal communication and its principles, Non-verbal communication, Paralinguistics, The importance of audience & purpose

#### Module- II: Basics of English pronunciation & Soft Skills (10 Hrs.)

Introduction to English pronunciation with the IPA chart, Received Pronunciation, problems of Indian English, Professional presentations, Group Discussion, Interview etiquette, Leadership skills

#### Module- III: Brush up your Grammar & Vocabulary (6 Hrs.)

Parts of speech & Tense, Concord, Parallelism, Word formation- root words, synonyms, antonyms, homonyms & homophones, Common errors in English Grammar.

(N.B. - Instead of teaching, this unit should be taught by assigning activities to the students in the class)

#### Module- IV: Basics of reading and writing skills (6 Hrs.)

Reading Skill: Types of reading, Sub-skills of reading: Skimming, Scanning, Reading comprehension, Writing Skill: Steps to writing, Describing, Defining, Classifying and Providing examples or evidence.

#### Module- V: Professional writing (10 Hrs.)

Paragraph, Letter, Memos & Circulars, Reports, Proposals, e-mails & CV.

### Course Outcomes:

Upon the successful completion of the course, students will be able to:

1. develop vocabulary and improve the accuracy in grammar.
2. produce words with right pronunciation.
3. Improve LSRW- listening, speaking, reading and writing skills and the related sub-skills.



demonstrate positive group **communication** exchanges

**Reference Books:**

1. Communication Skills by Sanjay Kumar and Pushp Lata, Oxford University Press
2. Technical Communication, Principle and Practice by Meenakshi Raman & Sangeeta Sharma, Oxford University Press
3. Effective Technical Communication, M Ashraf Rizvi, Tata Mc Graw - Hill.
4. Business Communication, Meenakshi Raman & Prakash Singh, Oxford
5. Communication for Management, Urmila Rai and S M Rai, HPH
6. Business and Managerial Communication, Sengupta, PHI
7. Business Communication for Managers, P. Mehra, Pearson
8. Soft Skills K Alex, S Chand

**Suggested Readings:**

1. Manual of English Grammar and Composition. J.C. Nesfield Forgotten Books
2. Practical English Usage. Michael Swan. OUP.
3. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press
4. A Course in English phonetics by T.R.KANSAKAR , ORIENT LONGMEN Press.
5. A Communicative Grammar of English, Leech, Geoffrey & Jan Svartvik, , Longman



20MC 106	Environmental Science (2-0-0)	0 Credits
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### Course Objective:

1. To give students an understanding of how science and the scientific method work to address environmental problems.
2. Students will learn about the interaction of human society (urban sprawl, energy use/generation, resource consumption and economics) with the Earth's systems

### Module – I

Ecological Concepts and Natural Resources: Ecological perspective and value of environment. Ecosystem: Concept, structure & Function of ecosystem; Energy cycle, Food Chain, & Food Web; Ecological pyramid, types; Biodiversity; Ecological Succession: Type of ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystem. Geochemical Cycle: Water cycle, Carbon cycle, Oxygen cycle, Nitrogen cycle, etc., Sedimentation Cycle: Sulphur cycle, phosphorous cycle; Environmental gradients, Tolerance levels of environment factor, Indian Environmental Law; Environmental Auditing.

### Module – II

Water quality standards and parameters, Assessment of water quality, Organic content parameters, Types, sources and consequences of water pollution; Ground water Contamination, Waste Water Treatment: DO and BOD of Waste water; Waste water treatment process: pretreatment, primary treatment, (Sedimentation, equalization and neutralization etc.), secondary treatment (Activated sludge technique and Trickling filter) tertiary treatment methods (Evaporation, Ion exchange, Adsorption, Electrodialysis, Electrolytic recovery, reverse osmosis).

### Module – III

Air Pollution : Air pollution and pollutants, criteria pollutants & non-criteria pollutants, Acid deposition, Global climate change -greenhouse gases, Ozone layer Depletion, Smog; Industrial Air Emission Control: Flue gas desulphurization, NOx removal, Fugitive emissions. Methods for control of particulate air pollutants (Mechanical device, Fabric Filtration, scrubber, Electrostatic precipitator)

### Module – IV

Solid Waste Management Source classification and composition of MSW: properties and separation, storage and transportation, MSW Management, Waste minimization of MSW, Reuse and recycling,



Hazardous Waste Management, Hazardous waste and their generation, Transportation and treatment of hazardous waste: Incinerators, Inorganic waste treatment, handling of treatment plant residue. Waste minimization techniques.

Noise Pollution: Physical Properties of sound, Noise criteria, Noise Standards, Noise measurement, Noise control.

### Text Book

1. Environmental Engineering Irwin/ McGraw Hill International Edition, 1997, G. Kiely,
2. Environmental Engineering & Safety by Prof B.K. Mohapatra, Seven Seas Publication, Cuttack

### Reference Books

1. Environmental Engineering by Arcadio P. Sincero & Gergoria A.Sincero PHI Publication
2. Principles of Environmental Engineering and Science, M. L. Davis and S. J. Masen, McGraw Hill International Edition, 2004
3. Environmental Science, Curringham & Saigo, TMH,
4. Man and Environment by Dash & Mishra
5. An Introduction to Environmental Engineering and Science by Gilbert M. Masters & Wendell P. Ela - PHI Publication.



**20MC 107**

**Data Structure Lab (0-0-4)**

**2 Credits**

**Course Objective:**

This course is aimed at concepts of programming and software code development of moderate complexity using C programming language within the framework of structural and procedural programming paradigms and data structure.

**List of Suggested Programs**

1. Familiarity with basic LINUX command, vi editor.
2. Programs on arithmetic expressions, data type limits, operators and precedence.
3. Programs on Conditional Branching and Loops.
4. Programs on 1D and 2D array handling.
5. Programs on String handling and Functions
6. Programs on Pointers and Structure.
7. Implementation of Stack and Queue
8. Infix to Postfix conversion, Insertion sort
9. Linear and Binary Search
10. Bubble sort, Merge sort and Quick sort.

**Course Outcomes:**

Upon the successful completion of the sessional course, students will be able to:

1. Understand problem solving approach of moderate complexity in Linux environment.
2. Design and develop C program to solve different real life problems efficiently.
3. Analyse and compare different possible solutions.



20MC 108	Computer Organization and Architecture Lab (0-0-4)	2 Credits
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### Laboratory Experiments

1.

- (a) Identification of different components of a PC.
- (b) Assembling & disassembling of a PC.

2. Study of different troubleshooting of a dot matrix printer using LX 1050+ Printer Trainer

Module.

3. Study of the functions of SMPS using SMPS Trainer Kit.

- (a) Study of SMPS with Single Output under Line Regulation.
- (b) Study of SMPS with Multi Output under Line Regulation.
- (c) Study of SMPS with Single Output under Load Regulation.

4. Study of different troubleshooting of CPU using CPU Trainer Module.

5. Familiarization of different types of byte addressing instruction using 8085 simulator.

6. Study of assembly Language program in PC using 8086 architecture.

7. Design of digital circuits (H/A, F/A, Decoder & Encoder) in VHDL using Active VHDL.

8. Design of digital circuits (MUX, DEMUX & ALU) in VHDL using Active VHDL.

9. Write a C/C++ program to perform signed bit multiplication using Booth's algorithm.

10. Write a C/C++ program for IEEE-754 floating point representation and perform Addition/Subtraction.



**NATIONAL INSTITUTE OF SCIENCE & TECHNOLOGY (Autonomous)**

(Approved by AICTE, New Delhi, Affiliated to BPUT, Rourkela)

INSTITUTE PARK, BALUPALI, BERHAMPUR, ORISSA - 761 008

**Master of Computer Application**



20MC 109	Communicative English Lab (0-0-4)	2 Credits
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**(This unit involves interactive practice sessions in Language Lab)**

1. Listening Comprehension
2. Pronunciation, Intonation
3. Stress and Rhythm practice
4. Common Everyday Situations: Conversations and Dialogues
5. Formal Presentations
6. Reading Comprehension
7. Report writing
8. Writing letters, e-mails,
9. Writing essay, CV, etc...
10. Grammar activities