BHARATI VIDYAPEETH

DEEMED TO BE UNIVERSITY

PUNE, INDIA

FACULTY OF MANAGEMENT STUDIES

Board of Studies in Computer Applications

Structure of Master of Computer Applications

Programme

(Under Choice Based Credit System)

To be effective from 2018-19 at Part I

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INTRODUCTION

The MCA Program is a full time 150 Credits programme offered by Bharati Vidyapeeth Deemed to be University, Pune and conducted at its management institutes in Pune, Karad, Kolhapur, Sangli, and Solapur. All the five institutes have excellent faculties, Laboratories, Library, and other facilities to provide proper learning environment. The University is reaccredited by NAAC with an 'A+' grade (3rd cycle). The expectations and requirements of the software industry, immediately and in the near future, are visualized while designing the MCA programme. This effort is reflected in the Vision and Mission statements of the MCA programme. Of course, the statements also embody the spirit of the vision of Late Dr. PatangraojiKadam, the Founder of Bharati Vidyapeeth and Chancellor, Bharati Vidyapeeth Deemed to be University which is to usher in "Social Transformation through Dynamic Education."

2.   VISION STATEMENT OF MCA PROGRAMME

To create high caliber solution architects and innovators for software development.

3.   MISSION STATEMENT OF MCA PROGRAMME

To teach 'things, not just words', 'how to think', and 'how to self-learn'.

4.   OBJECTIVES OF THE MCA PROGRAMME

The main objectives of MCA Programme are to prepare the youth to take up positions as system analysts, system engineers, software engineers, programmers and of course as versatile teachers in any area of computer applications. Accordingly the course curriculum aims at developing 'systems thinking' 'abstract thinking', 'skills to analyze and synthesize', and 'skills to apply knowledge', through 'extensive problem solving sessions', 'hands on practice under various hardware/software environments', 'four minor projects and 'one semester full-time internship project'. In addition, 'social interaction skills', 'communication skills', 'life skills', 'entrepreneurial skills', and 'research skills' which are necessary for career growth and for leading quality life are also imparted.

5.   LEARNING OUTCOMES FROM THE MCA PROGRAMME:

At the end of the course the student should be able to:

(a) Analyze problems and design effective and efficient software solutions.

(b) Develop software under latest Application Development Environments.

(c) Learn new technologies with ease and be productive at all times.

(d) Read, write, and contribute to technical literature.

(e) Work in teams.

(f) Be a good citizen in all respects.

6.   ELIGIBILITY FOR ADMISSION TO THIS PROGRAMME:

Admission to the programme is open to any candidate (Graduate) of any recognized University satisfying the following conditions.

1. The candidate should have secured at least 50% (45% for SC/ST).

2. Mathematics as one of the subject at 12th or graduation.

7   DURATION OF THE PROGRAMME

The duration of this programme is three years divided in to six semesters or a minimum of 150 credits whichever is later. The medium of instruction and examination will be only English.

Minimum - 3 Years, Maximum - 6 Years

Grading System for Programmes under Faculty of Management Studies:

8   **Grade Points**: The Faculty of Management Studies, Bharati Vidyapeeth Deemed to be University has suggested the use of a 10-point grading system for all programmes designed by its various Board of Studies. A grading system is a 10-point system if the maximum grade point is 10. The system is given in Table I below.

Table I: The 10-point Grading System Adapted for Programmes under FMSfor entire evaluation of course

Range of Percent Marks	[75, 100]	[70,74.9]	[65, 69.9]	[60, 64.9]	[55, 59.9]	[50, 54.9]	[45, 49.9]	[40, 44.9]	[00, 39.9]
Grade Point	10.0	9.0	8.0	7.0	6.0	5.5	5 0	4.5	0.0
Grade	O	A+	A	B+	B	C	+ C	D	F

9   **Scheme of Examination**: For some courses there is Internal Assessment (IA) conducted by the respective institutes as well as a University Examination (UE) at the End-of-the Term. UE will be

conducted out of 60marks and IA will be conducted for 40 marks then these are converted to grade points and gradesas per the Table I above. For courses having only Continuous Assessment (CA) the respective institutes will evaluate the students in varieties of ways, three or four times, during the term for a total of 100 marks. Then the marks will be converted to grade points and grades using the Table I above.

10 Performance in a Course: The performance in a course is indicated by a Grade Point Index (GPI). For courses with both UE and IA components, the GPI is computed as a weighted average of grade points in UE and IA with respective weights 60% and 40%. That is,

$$\textbf{GPI} = \textbf{0.6* GP(UE)} + \textbf{0.4*GP(IA),}$$

Where GP (UE) is the grade point corresponding to UE and GP (IA) is the grade point corresponding to IA.

For courses with CA only, the grade point itself would be the GPI.

11 Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):
At the end of each term, SGPA is calculated as the weighted average of all GPI of courses in the current semester in which the student has passed, the weights being the credit values of respective courses. Similarly, at the end of each semester, CGPA is calculated as the weighted average of all GPI of all courses in which the student has passed **up to** the current Semester.

12 **Standards of Passing**:

a) In order to pass in a course, a student must obtain a minimum grade point index of 4.5in UE and IA separately.

(b) A student who has passed in all heads of passing in Part-I, Part-II and Part-III with minimum of 150 credits, and who wishes to discontinue the program will be awarded the degree of Master of Computer Applications (MCA) with the honors according to Table II.

(c) A student who completed the minimum credits required for a programme (i.e.150credits) will be declared to have completed the programme with the honors according to Table II and will be awarded the degree of Master of Computer Applications.

Table II: CGPA Ranges for Class Declaration

Range of CGPA	[4.00, 4.99]	[5.00, 5.49]	[5.50, 5.99]	[6.00, 7.99]	[8.00, 10.00]
Division	Pass Class	Second Class	Higher Second Class	First Class	First Class with Distinction
Range of Marks(%)	[40.0, 49.9]	[50.0, 54.9]	[55.0, 59.9]	[60.0, 69.9]	[70.0, 100.0]

6. **Equivalence between CGPA and Percent Marks**: Any stakeholder may convert GPI of a course, SGPA, or CGPA to an equivalent percent marks using the formula

marks(%) =   10 * CGPA if CGPA in [4.00, 6.00]

$$5 * CGPA + 30 \text{ if CGPA in } [6.00, 9.00]$$

$$25 * CGPA - 150 \text{ if CGPA in } [9.00, 10.00]$$

The above formula gives values in the Table III. For values which are not in the Table III, use the formula directly.

Table III: CGPA and Corresponding Marks (%)

CGPA	MARKS (%)	CGPA	MARKS (%)	CGPA	MARKS (%)	CGPA	MARKS (%)	CGPA	MARKS (%)	CGPA	MARKS (%)
4.0	40.0	**5.0**	50.0	**6.0**	60.0	**7.0**	65.0	**8.0**	**70.0**	**9.0**	**75.0**
4.1	41.0	**5.1**	51.0	**6.1**	60.5	**7.1**	65.5	**8.1**	70.5	**9.1**	77.5
4.2	42.0	**5.2**	52.0	**6.2**	61.0	**7.2**	66.0	**8.2**	71.0	**9.2**	80.0
4.3	43.0	**5.3**	53.0	**6.3**	61.5	**7.3**	66.5	**8.3**	71.5	**9.3**	82.5
4.4	44.0	**5.4**	54.0	**6.4**	62.0	**7.4**	67.0	**8.4**	72.0	**9.4**	85.0
4.5	45.0	**5.5**	55.0	**6.5**	62.5	**7.5**	67.5	**8.5**	72.5	**9.5**	87.5
4.6	46.0	**5.6**	56.0	**6.6**	63.0	**7.6**	68.0	**8.6**	73.0	**9.6**	90.0
4.7	47.0	**5.7**	57.0	**6.7**	63.5	**7.7**	68.5	**8.7**	73.5	**9.7**	92.5
4.8	48.0	**5.8**	58.0	**6.8**	64.0	**7.8**	69.0	**8.8**	74.0	**9.8**	95.0
4.9	49.0	**5.9**	59.0	**6.9**	64.5	**7.9**	69.5	**8.9**	74.5	**9.9**	97.5

MCA REVISED SYLLABUS STRUCTURE

(To be effective from July 2018)

Semester I

Course Number	Course Title	Credits	Hours/Week			IA Marks	EoTE Marks
			L	T	P		
101	C Programming	4	3	1	-	40	60
102	Computer Organization And Architecture	4	3	1	-	40	60
103	Database Management Systems	4	3	1	-	40	60
104	Discrete Structures	3	2	1	-	40	60
105	Management Functions	3	2	1	-	40	60
106	Web Supporting Technologies	4	2	-	4	40	60
107	C Lab	2	0	-	4	40	60
108	Soft Skills	2	2	-	-	50	0
109	Self learning-1 (Societal Related Topic)	2	0	-	-	50	0
	Total	28	17	5	8	380	420

Semester II

Course Number	Course Title	Credits	Hours/Week			IA Marks	EoTE Marks
			L	T	P		
201	Data structure and Algorithms	4	3	1	-	40	60
202	Operating Systems	4	3	1	-	40	60
203	Software Engineering	4	3	1	-	40	60
204	Statistical Techniques	3	2	1	-	40	60
205	Financial Accounting	3	2	1	-	40	60
206	Database Management Systems Lab	4	2	-	4	40	60
207	DataStructures Lab	2	0	-	4	40	60
208	Project-I	2	2	-	-	50	0
209	Self-learning-2 (Societal Related Topic)	2	0	-	-	50	0
	Total	28	17	5	8	380	420

Semester III

Course Number	Course Title	Credits	L	T	P	IA Marks	EoTE Marks
			Hours/Week				
301	Artificial Intelligence	4	3	1	-	40	60
302	Computer Networks	4	3	1	-	40	60
303	Object Oriented Analysis And Design	4	3	1	-	40	60
304	Probability and Graph theory	3	2	1	-	40	60
305	Organizational Behaviour	3	2	1	-	40	60
306	Object Oriented Programming	4	3	1	0	40	60
307	Object Oriented Programming Lab	2	0	-	4	40	60
308	Project-II	2	2	-	-	50	0
309	Self learning-3 (Societal Related Topic)	2	0	-	-	50	0
	Total	28	18	6	4	380	420

- For Lateral Bridge Course will be on:
    1. Database Management Systems
    2. Discrete Structures

Semester IV

Course Number	Course Title	Credits	L	T	P	IA Marks	EoTE Marks
			Hours/Week				
401	Data Warehousing and Data Mining	4	3	1	-	40	60
402	Information Security	4	3	1	-	40	60
403	Design Patterns	4	3	1	-	40	60
404	Elective-I	3	2	1	-	100	-
405	Elective-II	3	2	1	-	100	-
406	Lab Elective-I	4	2	-	4	40	60
407	Linux Lab	2	0	-	4	40	60
408	Project-III	2	2	-	-	50	-
409	Self learning-4 (Computer Related Topic)	2	0	-	-	50	-
	Total	28	17	5	8	500	300

- For Lateral Bridge Course will be on:
    1. Data Structures and Algorithms
    2. Statistical Techniques

Semester V

Course Number	Course Title	Credits	Hours/Week			IA Marks	EoTE Marks
			L	T	P		
501	Data Science	4	3	1	-	40	60
502	Optimization Techniques	4	3	1	-	40	60
503	Software Project Management	4	3	1	-	40	60
504	Elective-III	3	2	1	-	100	-
505	Elective-IV	3	2	1	-	100	-
506	Lab Elective-II	4	2	-	4	40	60
507	Lab on Current Trends	2	0	-	4	40	60
508	Project-IV	2	2	-	-	50	0
509	Self learning-5 (Computer Related Topic)	2	0	-	-	50	0
	Total	28	17	5	8	500	300

SEMESTER VI

Course Number	Course Title	Credits	Hours/Week			IA Marks	EoTE Marks
			L	T	P		
601	Internship Project	10	-	-	-		100

Practical Examinations:

For courses Nos. 106,107,206,207,307,406,407,506 and 507 there will be practical examination.

For course No 507 Lab on Current Trends, Every center can decide the Programming Language to be taught depending upon the current industry demand and students interest.

Self Learning:

For Self Learning- 1 (109), Self Learning- 2 (209), Self Learning- 3 (309), Self Learning- 4 (409), Self Learning- 5 (509), students should select any one recent/upcoming topic related to Societal Concerns (SEM I to SEM III) and on computer science (SEM IV and V) , study it thoroughly and submit a project report at the end of the semester.

SEMESTER I

Course Number	Course Name	L-T-P- Credits	Year of Introduction
101	C Programming	3 L + 1 T +0P = 4 C	2018-19

Course Objective :

This is a first course in programming. The objective of this paper is to teach the Programming Language C. However, the process of learning a computer language will also be emphasized. Emphasis is also on semantics and problem solving.

Expected Outcome :

At the end of the course a student should be able:

- To solve a given problem using C Program C
- Understand and use C libraries,
- Trace the given C program manually
- Effectively use of Arrays and functions
- Write C program for simple applications of real life using structures and Unions.

References (Books, Websites etc) :
1. Let us C - Y.Kanetkar, BPB Publications4. YashawantKanetkar, let Us C, BPB Publication
2. Programming in C - Gottfried B.S., TMH 2.
3. The 'C' programming language - B.W.Kernighan, D.M.Ritchie, PHI
4. Programming in ANSI C - Balaguruswami, TMH
5. C- The Complete Reference - H.Sohildt, TMH
6. A Structured Programming Approach using C – B.A. Forouzan& R.F. Gillberg, THOMSON Indian Edition
7. Computer fundamentals and programming in C – PradipDey& ManasGhosh, OXFORD

Suggested MOOC :
Please refer these websites for MOOCS:
NPTEL / Swayam
www. edx.com
www.coursera.com

Course Plan	
Uni t	**Contents**
1	**Basics to learn a Programming Language:**
	Evolution of programming languages, structured programming, the compilation process, object code, source code, executable code, operating systems, interpreters, linkers, loaders, compilers, fundamentals of algorithms, flow charts. Concepts of a Program and subprogram, Procedures and functions, Syntactic, Semantic, and Logical Errors in a program; Program Correctness- Verification and Validation, Concept of Test Data
2	**C Language Fundamentals:**
	Origins of C, Characters and Character Set of C, Variables and Identifiers, Built-in Data Types, Variable Definition, Constants and Literals, Simple Assignment Statement, Operators and operands, Unary and Binary Operators, Concept of Expression, Arithmetic Expressions, Relational

	Expressions, Assignment Expressions. Evaluation of Expressions, Concepts of Precedence and Associativity, Table of Precedence and Associativity. Basic Input/Output Statement, The function main()
3	**Control Statements:** Control Structures, Decision Making within a Program, Conditions, Relational Operators, Logical Connectives, Decision Making and Branching: If Statement, If-Else Statement, Switch Statement Decision Making & Looping: While Loop, Do While, For Loop. Nested Loops, Infinite Loops, Structured Programming
4	**Arrays:** One Dimensional Arrays: Array Manipulation; Searching, Linear Search, Binary Search; Finding The Largest/Smallest Element in an Array; Two Dimensional Arrays: Addition/Multiplication of Two Matrices, Transpose of a Square Matrix; Strings as Array of Characters
5	**Functions:** User defined and standard functions, Formal and Actual arguments, Functions category, function prototypes, parameter passing, Call-by-value, Call-by-reference, Recursion, Storage Classes. Strings in C and String manipulation functions, Input, output of string statements
6	**Pointers:** Address Operators, Pointer Type Declaration, Pointer Assignment, Pointer Initialization, Pointer Arithmetic, Passing parameters by reference, pointer to pointer, linked list, pointers to functions, Arrays and Pointers, Pointer Arrays, Dynamic memory allocation
7	**Structures, Unions:** Declaration of structures, declaration of unions, pointer to structure & unions. **Additional Features in C**: Command line arguments, bit wise operators, enumerated data types, type casting, macros, the C preprocessor, more about library function

Course Number	Course Name	L-T-P- Credits	Year of Introduction
102	Computer Organization and Architecture	3 L+1 T+0 P=4 C	2018-19

Course Objectives :

Main objective of this paper is to learn structure and functioning of various hardware components of digital computer. Also study the interactions and communication among these hardware components

Expected Outcome :

At the end of this course, student should be able to understand

- Simple machine architecture and the reduced instruction set computers.
- Memory control, direct memory access, interrupts, and memory organization
- Basic data flow through the CPU (interfacing, bus control logic, and internal communications).
- Number systems, instruction sets, addressing modes, and data/instruction formats.

References (Books, Websites etc) :

1. M Morris Mano Computer systems Architecture third edition Prentice Hall of India Publication

2. Anita Goel : Computer Fundamentals Pearson Publications

Suggested MOOC :

Please refer these websites for MOOCS:

NPTEL / Swayam

www. edx.com

www.coursera.com

Course Plan	
Unit	**Contents**
1	**Introduction To Computer Hardware & Computer security:** Computer: Block diagram, Generations, types, Applications, Interconnecting the units of computer, performance of computer. Computer Security: threats and security attack, Malicious software, Hacking, Security services, Firewall.
2	**Introduction To Digital Computer –** Data Representation – Data Types – Complements – Arithmetic Operations – Representations – Fixed –Point, Floating – Point , Decimal Fixed – Point – Binary Codes- Logic Gates, Boolean Algebra, Map Simplification – Combinational Circuits: Half-Adder, Full Adder- Flip Flops - Sequential Circuits
3	**Introduction To Digital Components And Micro Operations** ICs – Decoders – Multiplexers – Registers – Shift Registers – Binary Counters – Memory Unit – Register Transfer Language – Register Transfer – Bus And Memory Transfers – Arithmetic, Logic And Shift Micro Operations , Arithmetic Logic Shift

	Unit.
4	**Computer organization And Programming –** Instruction Codes – Computer Registers – Computer Instructions – Timing And Control – Instruction Cycle – Memory Reference Instructions – I/O And Interrupt – Machine Language – Assembly Language – Assembler - Program Loops – Programming Arithmetic And Logic Operations – Subroutines – I/O Programming.
5	**Memory Organization And CPU –** Memory Hierarchy – Main Memory – Auxiliary Memory – Associative Memory – Cache Memory – Virtual Memory – Memory Management Hardware – CPU: General Register Organization – Control Word – Stack Organization – Instruction Format – Addressing Modes – Data Transfer And Manipulation – Program Control, RISC
6	**Input – Output Organization** Peripheral Devices – Input-Output Interface – Asynchronous Data Transfer – Modes Of Transfer – Priority Interrupt – DMA – IOP – Serial Communication
7	**Pipeline And Vector Processing –** Parallel processing – Pipelining - Arithmetic pipeline - Instruction pipeline - RISC pipeline, - Vector processing - Array processor

Course Number	Course Name	L-T-P- Credits	Year of Introduction
103	Database Management Systems	3L + 1T + 0P = 4C	2018-19

Course Objective:
The goal of this course is to teach the fundamentals of the database systems at a master level. A variety of topics will be covered that are important for modern databases in order to prepare the students for real life applications of databases. The course aims to impart knowledge of the concepts related to database and operations on databases. It also gives the idea how database is managed in various environments with emphasis on security measures as implemented in database management systems.

Expected Outcome :
After going through this course a student should be able to:
- Understand the concept of database and techniques for its management.
- Design different data models at conceptual and logical level and translate ER Diagrams to Relational Data Model.
- Normalize the database.
- Write queries using Relational Algebra.
- Describe the file organization schemes for DBMS.
- Describe and use features for Concurrency and Recovery.
- Understand data security standards and methods.
- Understand the fundamentals of Distributed Database Systems.

References :
Books:
1. "Fundamentals of Database Systems" Global Edition ByRamezElmasri, Shamkant B. Navathe
2. "Database System and Concepts"A Silberschatz, H Korth, S Sudarshan,McGraw-Hill.

Suggested MOOC :
Please refer these websites for MOOCS:
NPTEL / Swayam
www. edx.com
www.coursera.com

<div align="center">Course Plan</div>

Unit	Contents
1	**Introduction to DBMS:** Difference between Data, Information, Data Processing & Data Management. File Oriented Approach, Database oriented approach to Data Management, Need for DBMS, Characteristic of Database, Database Architecture: Levels of Abstraction, Database schema and instances, 3 tier architecture of DBMS,Data Independence. Database users, Types of Database System. Database Languages, DBMS interfaces.
2	**Data Modeling in Database :** Data Models, Logical Data Modeling: Hierarchical Data Model, Network Data Model, Relational Data Model. Conceptual Data Modeling: Entity Relationship Model, Entities, Attributes, Types of Attributes, Relationships, Relationship set, Degree of relationship Set, Mapping Cardinalities, Keys, ER Diagram Notations, Roles Participation: Total and Partial,

	Strong and Weak Entity Set.The extended entity relationship (EER) model, Subclass, Superclass, generalization, specialization, Attribute Inheritance. **Relational Data Model** Codd's Rules for RDBMS, Translating ER Diagram to Relational Database.
3	**Normalization and Relational Algebra:** Normalization Vs De-Normalization, Decomposition, Lossy and Lossless Decomposition,Functional Dependencies,Normal forms1NF, 2NF, 3NF, BCNF, Case Studies on Normalization. **Relational Algebra:** Keys: Composite, Candidate, Primary, Secondary, Foreign,Relational Relational Algebra Operators: Select, Project, Divide, Rename. Set Operations: Union, Intersect, Difference, And Product,Joins: Outer Joins, Inner Joins with example.
4	**File Structures and Data Administration:** File Organization, Overview of Physical Storage Media, Magnetic Disk, RAID, Tertiary Storage, Storage Access, Data Dictionary Storage, Organization of File (Sequential, Clustering), Indexing and Hashing, Basic Concepts, indices, B+ Tree index file, B- tree index file, Static hashing, Dynamic Hashing.
5	**Concurrency Control And Recovery Techniques:** **Concurrency Control:** Single User and Multiuser systems, Multiprogramming and Multiprocessing, Basic Database access operations, Concept of transaction, transaction state, ACID properties, Schedules, Serializability of schedules., Concurrency Control, Need for Concurrency control, lock based protocols, timestamp based protocols, Multiple granularity, Multiple Version Techniques, Deadlock and its handling, Wait-Die and Wound-Wait, Deadlock prevention without using timestamps, Deadlock detection and time outs, Starvation **Recovery Techniques:** Database Recovery, Types of Failures, Storage Structure: Volatile, Non Volatile and stable storage, Data access. Recovery and atomicity, Recovery Techniques / Algorithms: Log Based Recovery, Check points, Shadow Paging
6	**Data Administration And Security:** Data administration, Role and Responsibility of DBA, Creating/Deleting/Updating table space, Database Monitoring, User Management, Basic data security principles – user privileges, data masking, encryption and decryption. Data Security Implementation, revalidation of user, role, privileges. Data Quality Management, Basic quality principles, data quality audit, data quality improvement
7.	**Introduction to Advance Databases:** **Distributed Database:** Heterogeneous and Homogeneous Databases, Distributed database features and needs, Advantages and Disadvantages, Distributed DatabaseArchitecture. Levels of distribution, transparency, replication. Fragmentation. **Data Warehouse:** Data Warehouse defined, Need for Data Warehouse, Characteristics of Data Warehouse, Multidimensional Data Model, OLTP vs. OLAP, A three tier Data Warehouse Architecture, Data Mart Vs. Data Warehouse.

Course Number	Course Name	L-T-P- Credits	Year of Introduction
104	Discrete Structures	2L + 1T + 0P = 3C	2018-19

Course Objective:

1.To learn basic mathematical course ,eg. Sets, Functions, Graph.

2. To be familiar with formal mathematical reasoning eg. Logic proofs.

3.To improve problem solving skills.

4. To see the connections between Discrete structure Computer Science

Expected Outcome :

a)Apply standard Mathematical methods.

b)Write code to implement solution procedures.

c)Search for information in tacking advanced problems.

d)Formulate AI problems mathematically.

Reference Books:

Kenneth H.Rosen,Discrete Mathematics and its Applications Edition 6 th Tata McGraw Hil

Schaum's outlines Discrete Mathematics

Discrete Mathematics N CH S N Lyneger and K.A. Venkatesh

Suggested MOOC :

Please refer these websites for MOOCS:

NPTEL / Swayam

www. edx.com

www.coursera.com

Course Plan	
Unit	**Contents**
1	**Propositional logic**: Proposition logic, basic logic, logical connectives, truth tables, tautologies, contradiction , normal forms(conjunctive and disjunctive), modus ponens and modus tollens, validity, predicate logic, universal and existential quantification. Notion of proof: proof by implication, converse, inverse, contrapositive, negation, and contradiction, direct proof, proof by using truth table, proof by counter example.
2	**Set and Relation** **Set Theory**: Definition of Sets, Venn Diagrams, complements, Cartesian products, power sets, counting principle, cardinality and count ability (Countable and Uncountable sets), Partition of set , proofs of some general identities on sets, Fuzzy set ,Fuzzy set operation, rough set concept **Relation**: Definition, types of relation, composition of relations, domain and range of a relation, pictorial representation of relation, properties of relation, partial ordering relation ,Equivalence Relation, Relation Matrices
3	**Function**: Definition and types of function (one to one, onto, Inverse) composition of functions, Graph of Functions, Some Functions in Computer Science, Growth of Functions recursively functions.
4	**Algorithm, the Integers and Matrices**: Algorithm, growth of function, Complexity of algorithm, Primes and Greatest Common Divisors, Integers algorithm

5	**Partial Order and Structure: Partially Ordered,** Sets ,Lexico graphics Order, Hasse Diagram, Maximal and Minimal elements of a Poset, Concept of Lattice, Boolean Functions, Logic Gates, Minimization of Combinational circuit
6	**Combinatories :** Mathematical induction, recursive mathematical definitions, basics of counting, permutations, combinations, inclusion-exclusion, recurrence relations (nth order recurrence relation with constant coefficients, Homogeneous recurrence relations, Inhomogeneous recurrence relation), generating function (closed form expression, properties of G.F., solution of recurrence relation using G.F, solution of combinatorial problem using G.F.)
7	**Modelling Computation:** Language and Grammar, Finite State Machine with output**,** , Finite State Machine with no output, Language Recognition

Course Number	Course Name	L-T-P- Credits	Year of Introduction
105	Management Functions	2L + 1T + 0P = 3C	2018-19

Course Objective:
1. To orient the students to principles of management
2. To make them comprehend the process of management
3. To internalize the principles through rigorous assignments where they shall observe, analyze and infer the presence of principles transformed into practice.

Expected Outcome :
At the end of the course, the students shall acquire
1. Understanding of functions of management
2. Understand the principle of management woven in to the process of management
3. Understand how they are modified in to practice to suit the requirements
4. How IT influences the process of management

References :
Books:
1.H.Welrcih, Mark Cannice, H. Koontz, Management , A Global and Entrepreneurial Perspective , Mcgraw-Hill Companies, 12th edition.
2.P.C.Tripathi, P.N.Reddy, Principles and Practice of Management , Tata Mcgraw Hill , Third Edition
3. L.M. Prasad, Principles and Practice of Management, Seventh Edition
4. Stephan Robbins, Mary Coutler, Management

Suggested MOOC :
Please refer these websites for MOOCS:
NPTEL / Swayam
www. edx.com
www.coursera.com

Course Plan	
Unit	**Contents**
1	The need of Management Study , Process of Management , Characteristics of Professional Management , Brief Review of Management Thought Social Responsibility of Management
2	Decision Making Process , Planning and Steps in Planning , Types of Plan Making Planning Effective , Case Study on Planning, MBO
3	Organization, Meaning and Process , Departmentalization,, Organization Structure , Authority and Delegation , Centralization verses Decentralization , Team Work , Case Study
4	Co-ordination – meaning and need , Techniques of establishing Co-ordination Difficulties in establishing co-ordination , Case Study
5	Formal and Informal Organization, Manpower Planning , Recruitment and Performance Appraisal, Compensation and Incentives , issues related to Retention Case study
6	An overview of Communication, Supervision and Direction , Leadership Styles , Control – need and types and control techniques . In addition there shall be tutorials of written examination type, field study and presentation.
7.	**Case Studies**

Course Number	Course Name	L-T-P- Credits	Year of Introduction
106	Web Supporting Technologies	**2L-0T-2P = 4C**	2018-19

Course Objectives :
- To understand the basic concepts of the World Wide Web
- To understand and practice HTML as markup language
- To understand and practice embedded dynamic scripting on client side Internet Programming
- To understand and practice web development techniques on client-side
- To understand and practice server-side scripting

Syllabus Outline:
- Understanding of internet and intranet- working of WWW, types Protocols and working of HTTP and types of servers
- UI Design - Markup Language: Introduction to HTML5 - Cascading Style Sheet: Introductionto CSS3.
- Client Side Scripting using JAVASCRIPT - Introduction to JavaScript - Document Object Model -Event Handling - Controlling Windows & Frames and Documents - Browser Management andMedia Management - Object-Oriented Techniques in JavaScript - JQuery.
- Server SideScripting using PHP - Introduction to PHP - Programming basics - Reading Data in WebPages - Embedding PHP within HTML - Establishing connectivity with MySQL database.

Expected Outcome :
Upon successfully completing this course the student will be able to
- Understand concept of internet and how it functions
- Use HTML tag to format contents of web page
- Use Cascading Style Sheets (CSS) to apply user defined look and feel
- Apply Java Script to validate form data and generate dynamic contents
- Make use of PHP to generate server side response using MYSQL as databse

References (Books, Websites etc) :
1. Thomas Powell, Web Design The complete Reference, Tata McGrawHill
2. Thomas Powell, HTML and XHTML The complete Reference, Tata McGrawHill
3. Thomas Powell and Fritz Schneider JavaScript 2.0 : The Complete Reference, Second Edition
4. PHP : The Complete Reference By Steven Holzner, Tata McGrawHil
5. Ivan Bayross (2006) Web Enabled Commercial Application Development Using HTML, DHTML, JavaScript, Perl CGI, BPB Publications.
6. Luke Welling, PHP and MySQL Web Development, Pearson Education; Fifth edition

Suggested MOOC :
Please refer these websites for MOOCS:
NPTEL / Swayam
www. edx.com
www.coursera.com

Syllabus/Course Outline

Unit	Contents
1	Understanding internet and intranet, Introduction toWWW, WWW Architecture, Concept of protocol ant its types: SMTP,POP3,File Transfer, Overview of HTTP, HTTP request and response. Various web server, using Apache as web server, Installation of Apache, Apache Directory Structure, apache configuration, creating application folder, storing and accessing files from server
2	Types of Markup Language and HTML as markup language, basic structure of HTML, Head Section and elements of head section, Meta tags and external link tags HTML body content tags: header tags, Paragraph, span and pre tags, text formatting tags, Ordered and unordered list tag, Table tag, div tag, Frames and framesets, Anchor Links and named anchors, image tag and using image mapping for hotspot, working with forms: Form tag, POST and GET methods, working with Text input, Text Area, Checkbox and radio and other form elements;
3	Introducing CSS, Types of style sheets: inline, embedded and external style sheets, working with CSS properties: text properties, color and background properties, border and shading, box and block properties, positioning with CSS, various types of CSS selectors: universal, class, ID, child, descendent, adjacent sibling, attribute and query.
4	Client Side Scripting: Introduction to JavaScript, data types, Operators, conditional and iterative Statements, Introduction to arrays, arrays with methods, Math, String and Date objects, working with DOM: Window, Navigator, History, Location, Link, Anchor and form elements, functions and objects, methods, handling events and form validations
5	Advanced JavaScript: Browser Management and Media Management – Classes – Constructors – Object-Oriented Techniques in JavaScript – Object constructor and Prototyping - Sub classes and Super classes – JSON - JQuery and AJAX.
6	Why PHP and MySQL?, Server-side web scripting, Installing PHP, Adding PHP to HTML Syntax and Variables, PHP control structures and loop, Passing informationbetween pages, Strings, Arrays and Array, Functions, Numbers, working with String and Regular Expressions
7	Concept of Cookies and sessions, when and how to use cookies and sessions, Using MySQL to create database and tables, using queries to inset and update data, using PHP to interact with MySQL, Displaying data from tables in tables, using form data to insert, update database, deleting data from table by getting criterion through forms, working with E-Mail

Course Number	Course Name	L-T-P- Credits	Year of Introduction
107	C Lab	**0L +0T + 4P= 2C**	2018-19

Course Objective :

This is companion course of C Programming

Syllabus Broad Units:
This Companion course of C programming; Practical aspects of C programming towards problem solving is covered.

Expected Outcome :

The students will develop adequate programming skills with respect to following

1. Implement a real world problem using basic constructs of C language.

2. Develop an application using Decision making and looping

3. Make use of proper operators to solve problem.

4. Make use of Arrays and pointers efficiently and handling strings.

5. Comprehend the dynamic memory allocation and pointers in C.

6. Able to define new data types using enum, structures and typedef.

References (Books, Websites etc) :
1. Let us C - Y.Kanetkar, BPB Publications4. YashawantKanetkar, let Us C, BPB Publication
2. Programming in C - Gottfried B.S., TMH 2.
3. The 'C' programming language - B.W.Kernighan, D.M.Ritchie, PHI
4. Programming in ANSI C - Balaguruswami, TMH
5. C- The Complete Reference - H.Sohildt, TMH
6. A Structured Programming Approach using C – B.A. Forouzan& R.F. Gillberg, THOMSON Indian Edition
7. Computer fundamentals and programming in C – PradipDey& ManasGhosh, OXFORD

C Lab Outline

Sr. No	Programming Exercises
1	Compilation and Executing programs Arithmetic operations Use of Symbolic constants Demonstrating the following gcc options -o, -c, -D, -l, -I, -g, -E Note :*Algorithm of every program should be written. Properly document the programs using comments. Author name and date, purpose of each variable and constructs like loop and functions should be indicated/ documented.* *gcc or an equivalent compiler is assumed*.
2	Program to demonstrate the following - Branching - Nested Branching

	– Looping
	– Selection
3	Working with functions
	– Writing function prototype and definition
	– Using functions to solve problems (Calling a function)
	– Using recursion
	– Storage classes - Using register, extern and static
4	Using debugger and Creating Libraries
	Important Commands - break, run, next, print, display, help
	Functions
	Creating Header file for Function Prototype
	Compiling and storing Function Definition in Library
	(archive) file
5	Arrays
	1D - Linear Search, Sort
	2D - Matrix operations
	Strings, Structure, Union
6	Pointers, Dynamic Memory Allocation
	Structure Pointer
	Array of Pointers, Ragged Arrays, Function pointer
7	Structures
	Making use of structures to define new types(user defined types)

Course Number	Course Name	L-T-P- Credits	Year of Introduction
108	Soft Skills	2L+0T+0P=2C	2018-19

Course Objective :

1. To provide Confidence building and soft skills development.
2. To develop decision making and analytical skills.
3. To let students make a transition from the academic mode to the corporate and entrepreneurial mode

Expected Outcome :

- This course would be handy for those who are attending interviews at the company premises, even if it is arranged by the institute. You need to differentiate yourself as a better candidate than others, which is the key to get a job.
- This will go a long way in improving your career prospects by developing skills required by a practicing manager. Thus, you will be able to handle challenging corporate assignments.
  Being a fresher, you will be closely monitored by your superior. This course will give you confidence to impress them with your professional attitude.
- Industry expects to spot out people for better positions, with the qualities of leadership. This is where this program will help you acquire some of the qualities of leadership.

Suggested MOOC :
Please refer these websites for MOOCS:
NPTEL / Swayam
www. edx.com
www.coursera.com

Course Plan	
Sr. No	
1	**Business Communication Skills – Email correspondence:** E-mail etiquette and Writing Skills, Features of Business Correspondence, Tips for writing Business E-mails, Do's and Don'ts of Business Communication, Examples and Exercises
2	**The Art of Effective Communication:** Communication skills: the importance of removing barriers, Source, Encoding, Channel, Decoding, Receiver, Feedback, Johari's Window, Public Speaking and Presentation tips, Body Language Tips, Listening skills, Common Grammatical mistakes in Written and spoken communication, Negotiation
3	**Time Management:** Importance of setting Tasks, Applying basic principles of Time management; identify productivity cycles, and set goals and priorities, Create a time management plan and a daily plan, Effectively utilize time by using technology and reducing time wastage. Manage interruptions, increase meeting productivity, overcome personal time wasters, and prevent personal work overloads, Screen and organize information to reduce information overload
4	**How to create a winning CV:** Designing an Impressive CV, Defining the objective, Customizing the CV for each job,

	Identifying and Highlighting the right set of strengths, Presentation of academic and professional achievements, Formatting Styles, Do's and Don'ts and common mistakes, Examples and Exercises
5	**How to prepare for Interview:** Introspection: Knowing yourself, your comfortable areas or subjects, Companies, sectors, functions, Employer Research, Skill set and competency mapping, Attire and Etiquette : Greetings, posture, handshakes, manners and actions, Common Interview blunders, Frequently asked questions for Freshers and Experienced professionals, Simulated Interview Situations, Do's and Don'ts before an Interview, Common formats of Company Interview assessments, What to speak?, Latest developments about the specific sector for last 5 years, Study of regulators for sectors.
6	**Preparing for Group discussion and aptitude test:** Structure and Format of a GD, Difference between a Discussion & an Argument, Observing, Reflecting and designing responses within a group, The art of being assertive and persuasive, Defending your turf, Defining the correct Body Language and posture, Deconstructing Topics, Common Do's and Don'ts, Practice and Exercise
7	**Fear Factor: Removing Stage Fear** Presentation Skills, Public Speaking skills, Importance of Eye Contact, Audience engagement, Forms of speech, Content Preparation, Debating, Extempore, Do's and Don'ts, Sample Exercises

SEMESTER II

Course Number	Course Name	L-T-P- Credits	Year of Introduction
201	Data Structures and Algorithms	3L + 1T+ 0P= 4C	2018-19

Course Objective :
- To make familiar with linear & non linear data structures
- To develop skills to analyze the problem given and to design & develop an efficient solution to given problem
- To develop capability to choose appropriate data structures for given problems
- To imbibe programming skills & thereby making industry ready

Syllabus Broad Units :

Expected Outcome : After undergoing this course, student will
1. Have thorough knowledge about   data structures
2. Ability to design& develop program using linear data structures& non linear data structures for solving problems
3. Ability to choose appropriate data structures for problem solving
4. Ability to use combination of these data structures for problem solving.

References (Books, Websites etc) :
1. Behrouz A. Forouzan and Richard F. Gilberg , 2nd Edition, Thomson, 2003, **Computer Science A Structured Programming Approach Using C**

2. Basavraj S Anami, ShanmukhappaAngadi, Sunil Kumar S Manvi, PHI Publications, 2010. A Holistic approach to learning C.

3. Andrew Tenanbaum, Thomson, 2005, Data Structures with C.Robert Kruse & Bruce Leung, Data Structures & Program Design in C, Pearson Education,

Pre-requisites

Any programming language

Suggested MOOC :
Data structures and Algorithms, Prof. SudarshanIyengar, IITRopar, 8 weeks, Rerun Feb 05, 2018
https://onlinecourses.nptel.ac.in/noc16_cs06 at NEPTEL

Course Plan	
Unit	**Contents**
1	**Elementary Data Structures** - Basic concepts such as data object, array, and record; Operations and relations on data objects; definition of data structure; Built-in data types as examples of data structures; concept of abstract data type; notation to specify an abstract data type; concepts of pre-conditions and post-conditions; Implementation of an ADT in a language; Specification and implementation of simple data structures such as Integer, Rational, Currency, Date, Temperature, distance, Pay, Marks, Grade_card etc.
2	**Linear Data Structures** (Representation in Memory and operations like insertion, deletion and traversal) – one and multidimensional array, Sparse Matrics, Pointer arrays, single link list,

	circular link list, double link list, applications of Linked list,: Sparse Matrix Manipulation, Polynomial Representation, Dynamic storage Management
3	**Particular Linear Data Structures**(Representation in Memory and operations like insertion, deletion and traversal) **-** Stacks: Applications: Evaluation of Arithmetic Expression, implementation of recursion, factorial calculation, Quick Sort, Tower of Hanoi Problem, queues, circular queue, deques; Application of queues abstract data types; Array and linked list implementations of stacks, queues, and deques;
4	File Handling: Creation, reading writing in a file. Pattern Matching and Extraction of data from a file. Reading and writing from files.
5	**Hierarchical data structures** - General trees and related concepts; depth first and breadth first traversal of trees; n-ary trees and important properties of n-ary trees; binary trees and their properties; binary tree traversal algorithms. Applications of Trees. B Trees : B Tree indexing, Operations on a B Tree, SETS: Representation of Sets, Operations on Sets, Applications of Sets
6	**The problem of search** – linear and binary search algorithms and their efficiency; binary search trees and operations on binary search trees; Improving the efficiency of search through Balanced trees – AVL trees and Red-black trees, concepts of rotation. Hash tables and related concepts in detail.
7	**The problem of sorting** – The standard sort algorithms and their efficiencies; Merge sort and quick sort algorithms and their efficiencies. The binary heaps, their array implementation; Operations on heaps and heap sort algorithm.

Course Number	Course Name	L-T-P- Credits	Year of Introduction
202	Operating Systems	3+1+0 = 4C	2018-19

Course Objective:

The overall aim of this course is to provide a general understanding of how a computer works. This includes aspects of the underlying hardware as well as the structure and key functions of the operating system. Case studies will be used to illustrate and reinforce fundamental concepts.

Syllabus Broad Units : 7

Expected Outcome :

At the end of this course, student should be able to

- Explain the concepts of process, address space, and file
- Compare and contrast various CPU scheduling algorithms
- Understand the differences between segmented and paged memories, and be able to describe the advantages and disadvantages of each
- Compare and contrast polled, interrupt-driven and DMA-based access to I/O devices
- Understand functioning and working of Windows as well as Unix operating system.

References (Books, Websites etc) :

1. Operating systems design and implementation by Andrew Tanenbaum and Albert Woodhull
2. Operating systems concept and design   by Milan Milenkovic

Suggested MOOC :
Please refer these websites for MOOCS:
www. edx.com
www.coursera.com
www.alison.com

Course Plan	
Unit	**Contents**
1	**Unit1: Introduction to Operating system:** Definition, Importance and functions of operating systems, Types: Batch, Timesharing, Multitasking, multiprogramming, multiprocessing, Online operating system, Real time, distributed operating systems. Various Views: Command language users view, system call users view. Operating system concept: Processes, Files, The shell. Structures: Monolithic system, layered system, Virtual Machine, Client server model.
2	**Processes:** Process concept, Implicit and explicit tasking, process relationship (cooperation and competitions). Operating systems view of processes OS services for process management. Scheduling and types of Schedulers, Scheduling algorithms: First come first served, shortest remaining time next, Time slice scheduling, Priority based preemptive scheduling, multiple level queues, multiple level queues with feedback, Guaranteed scheduling, Lottery

	scheduling. Performance Evolution.
3	**Memory Management:** Basic Memory Management, monoprogramming without paging or swapping, multiprogramming with fixed partitions. Swapping: Memory Management with bit maps, and linked list. Virtual Memory, Page replacement algorithms: Optimal Page replacement algorithm, Not recently Page replacement algorithm, First in first out Page replacement algorithms, second chance Page replacement algorithms, clock Page replacement algorithms, least recently Page replacement algorithms, simulating LRU in software. Design issues for paging. Segmentation: Implementation of pure segmentation, segmentation with paging with example.
4	**Interprocess communication and Synchronization:** Need, Mutual Exclusion, Semaphore definition, Busy- wait implementation, characteristics of Semaphore. Queuing implementation of semaphore, Producer consumer problem. Critical region and conditional critical region, what are monitors? Need of it, format of monitor with example. Messages: Basics, issues in message implementation, naming, copying, Synchronous vs asynchronous message exchange, message length, ICS with messages, interrupt signaling via messages.
5	**Deadlocks:** Conditions to occurs the deadlock, Reusable and consumable resources, deadlock prevention, Deadlock Avoidance, resource request, resource release, detection and recovery,
6	**File systems:** Files- naming, structure, types, access, attributes, operation. Directories- system, path and operations. Implementing file and directories, disk space management, file system reliability and performance. Environment, Security flaws, Security attacks, principles for Security, user authentication. Protection domains, access control lists, capabilities.
7	**Input/ output:** Principles of I/O hardware: I/O devices, device controller, DMA, Principles of I/O software : goals, interrupt handler, device drivers, Device independent I/O software. RAM Disk Hardware and software, DISK Hardware and software.

Course Number	Course Name	L-T-P- Credits	Year of Introduction
203	Software Engineering	3L + 1T +0P= 4C	2018-19

Course Objective:
To introduce the current methodologies involved in the design and development of Software over its entire life cycle.

Expected Outcome :
At the end of this course, student should be able to:
- Understand life cycle models, Requirement elicitation techniques, understand the concept of Analysis and Design of software.
- Implement software engineering concepts in software development to develop quality software which can work on any real machine.

References (Books, Websites etc):
- SOFTWARE ENGINEERING A PRACTITIONERS APPROACH seventh edition BY Roger S. Pressman McGraw Hill International Edition.
- Software Engineering by Sommerville, Pearson Education, 7th edition
- Software Engineering by K.K. Aggarwal&Yogesh Singh, New Age International Publishers.

	Course Plan
Unit	**Contents**
1.	**Introduction to Software Engineering** Software, software characteristics, Difference between software engineering and software programming, Members involved in software development. Need of Feasibility study, types of Feasibility study, Cost Benefit Analysis. General software development life cycle with all phases. Overview of software models (Waterfall, Prototyping, Spiral and Rapid Application Development model). Agile Software Development methodologies.
2.	**Requirement Engineering Concepts and Methods** What is Requirement Engineering, Types of requirements, Requirement elicitation techniques- Traditional methods and Modern methods, Verification and validation process. Principles of Requirement Specification, Software Requirement Specification document Outline Characteristics of good SRS: - correct, complete, unambiguous, consistent, modifiable, traceable, Understandable Case study on DFD and ERD mechanism.
3.	**Design Concept and Methods** Software Design and software Engineering. Software Design process and principles, Design concepts: Abstraction, Refinement, Modularity, Architecture, Control hierarchy, Structural partitioning, Data structure, Procedure and Data hiding Modular design: Functional independence, Cohesion and Coupling concepts Architectural design process: Transform flow and Transaction flow User Interface design: - Elements of good design, design issues, Features of modern GUI,

		Guidelines for interface design
		Procedural design: - Structured Programming, Program Design Language
		Report Design
4.	**Software Quality Assurance**	
	Quality concept: (quality, quality control, quality assurance, cost of quality), SQA activities,	
	SQA plan.	
	Formal Technical review: Review meeting, review reporting and review guidelines	
	Software Configuration Management: - What is configuration management, Baseline, Software Configuration items.	
	SCM process- Identification of objects, Version control and Change control	
5	**Software Testing and Testing Strategies**	
	Software Testing Fundamentals:-Testing Objectives and Testing Principles.	
	White Box Testing, Black Box Testing: - Graph Based Testing Methods, Equivalence Partitioning, Boundary Value Analysis.	
	Testing Strategies for Conventional Software: - Unit Testing, Integration Testing (Top-down and Bottom-up Integration)	
	Validation Testing: - Validation Test Criteria, Configuration Review, Alpha and Beta Testing	
	System Testing: - Recovery Testing, Security Testing, Stress Testing, Performance Testing, Deployment Testing	
	The Art of Debugging – The Debugging Process.	
6	**Maintenance and Reengineering**	
	Software maintenance: - Importance and types of maintenance, Concept of Re-engineering, Software reengineering process model Reverse engineering: - to understand process, data and user interfaces	
	Restructuring: Code and Data restructuring	
	Forward engineering: - for client server architecture and user interfaces	
7	**Computer Aided Software Engineering**	
	What is CASE? Importance of CASE tools	
	Various Tools: -	
	1) Information engineering	
	2) Project planning tools	
	3) Risk analysis tools	
	4) Project management and testing tools	
	5) Tools for Quality assurance	
	6) Software Configuration Management	
	7) Analysis and design	
	8) Database management	
	9) Interface design and programming tools	

Course Number	Course Name	L-T-P- Credits	Year of Introduction
204	Statistical Techniques	2+1+0 = 3C	2018-19

Course Objective:

The main objective of this course is to acquaint students with some basic concepts in Statistics. They will be introduced to some elementary statistical methods of analysis of data.

Syllabus Broad Units :

Expected Outcome :

(i) To compute various measures of central tendency, dispersion, skewness and kurtosis.

(ii) To analyze data pertaining to attributes and to interpret the results.

(iii)Tto compute the correlation coefficient for bivariate data and interpret it.

(iv) To fit linear, quadratic and exponential curves to the bivariate data to investigate relation between two variables.

 (v) To fit linear regression model to the bivariate data

(vi)They are able to construct predicate model.

Reference Books:

Fundamentals of Statistics , S.C.Gupta, Seventh Edition ,Himalaya Publishing House

Suggested MOOC :

Please refer these websites for MOOCS:

NPTEL / Swayam

www. edx.com

www.coursera.com

Course Plan

Unit	Contents
1	**Introduction to Statistics**: Meaning of Statistics as a Science, Importance of Statistics Scope of Statistics, Statistical organizations in India and their functions: CSO, ISI, NSS, IIPS (Devnar,Mumbai), Bureau of Economics and statistics,Types of data: Primary data, Secondary data , Cross-sectional data, time series data, directional data, Classification: Raw data and its classification, ungrouped frequency distribution,, grouped frequency distribution, cumulative frequency distribution, and relative frequency distribution.
2	**Measures of Central Tendency** Concept of central tendency of statistical data, Statistical averages, characteristics of a good statistical average. Arithmetic Mean (A.M.): Definition, effect of change of origin and scale, combined mean of a number of groups, merits and demerits, trimmed arithmetic mean. Mode and Median: Definition, formulae (for ungrouped and grouped data), merits and demerits, Quartiles, Deciles and Percentiles (for ungrouped and grouped data), Geometric Mean (G.M.): Definition, formula, merits and demerits. Harmonic Mean (H.M.): Definition. Formula, merits and demerits. mean Weighted Mean: weighted A.M., G.M. and H.M. Measures of Dispersion :Concept of dispersion, characteristics of good measure of dispersion. Range, Quartile deviation Mean deviation: Definition, merits and demerits, Variance and standard deviation

3	**Moments, Skewness and Kurtosis**
	Raw moments (m'r) for ungrouped and grouped data. , Central moments (mr) for ungrouped and grouped data, Concept of skewness of frequency distribution, positive skewness, negative skewness, symmetric frequency distribution, Karl Pearson's coefficient of skewness, Measures of skewness based on moments (β_1,γ_1) Concepts of kurtosis, Measures of kurtosis based on moments (β_2,γ_2).
4	**Theory of Attributes**
	Attributes: Concept of a Likert scale, classification, notion of manifold classification, dichotomy, class- frequency, order of a class, positive class frequency, negative class frequency, ultimate class frequency, relationship among different class frequencies (up to three attributes), and dot operator to find the relation between frequencies, fundamental set of class frequencies. Consistency of data upto 2 attributes. Concepts of independence and association of two attributes. Yule's coefficient of association (Q),
5	**Correlation:**
	Bivariate data, Scatter diagram and interpretation., Concept of correlation between two variables, positive correlation, negative correlation, no correlation. variance between two variables , Karl Pearson's coefficient of correlation (r) , Spearman's rank correlation coefficient, compute Karl Pearson's correlation coefficient between ranks
6	**Regression:** Meaning of regression, difference between correlation and regression, Concept of error in regression, error modeled as a continuous random variable. Simple linear regression model Estimation of a, b by the method of least squares. Interpretation of parameters.
7	**Times Series**
	Introduction, Component of a time series, Analysis of time series, Mathematical models for time series, Measurement of Seasonal Variations, Measurement of Cyclical Variations ,Measurement of Irregular Variations.

Course Number	Course Name	L-T-P- Credits	Year of Introduction
205	Financial Accounting	2L+1T+0P=3C	2018-19

Course Objective :
1. To impart basic accounting knowledge
2. To enable the students to understand basic accounting principles, practice and its applications in modern business.

Prerequisite :
Students should know the basic principles of accounts and concepts .

Expected Outcome :
1) The knowledge of accounting and its principles at basic level.
2) Practical's in Tally and Excel for Financial Accounting assignments

References (Books, Websites etc) :
1. Anil Chowdhry , Fundamentals of Accounting & Financial Analysis (PearsonEducation)
2. M.E.ThukaramRao, Accounting for Managers.(New Age International Publishers)
3. M.G.Patkar, Book-Keeping &Accountancy.Std XI(FYJC) Commerce
4. Dr. S. N. Maheshwari , Financial Accounting For Management: (Vikas Publishing House)
5. Robert Anthony, David Hawkins , Business Accounting. (Tata McGraw –Hill)

Suggested MOOC :
Please refer these websites for MOOCS:
NPTEL / Swayam
www. edx.com
www.coursera.com

Course Plan

Unit	Contents
1	**Unit 1**: **Introduction:** Need for Accounting, Financial Accounting-definition, Scope and objectives. Accounting v/s Book Keeping. Limitations of Financial Accounting, End users of financial statements. Accounting Concepts and Conventions, Branches of accounting. Accounting Standard-Scope and Functions.
2	**Unit 2: Journal and Ledger:** Journal-importance and utility, classification of accounts, journalizing of transactions. Ledger- meaning and utility, posting and balancing of account, Trial Balance- meaning and purpose, preparation of a trial balance.
3	**Unit 3: Preparation final accounts:** Preparation of Trading and Profit & Loss Account and Balance Sheet of sole proprietary business.
4	**Unit 4: Depreciation:** Meaning, need & importance of depreciation, methods of charging depreciation.(WDV & SLM)
5	**Unit 5: Introduction to International Accounting Standards:** Need for International Financial Reporting Standards (IFRS), Disclosure of Accounting Policies, reporting needs of emerging economies, IFRS for Small and Medium Enterprises(SMEs).

6	**Unit 6:Computerized Accounting:** Computers and Financial application, Accounting Software packages. (Orientation level)
7	**Unit-7: Practical Applications** on Tally package for accounting and its Implementation . Accounting formulas in Excel and its implementation for practical assignments

Course Number	Course Name	L-T-P- Credits	Year of Introduction
206	Database Management Systems Lab	2L+0T+2P=4C	2018-19

Course Objective :
- The main objective is to teach the concepts related to database its techniques and Operations.
- SQL (Structured Query Language) is introduced in this subject.
- This helps to create strong foundation for application of database design.

Pre-requisites:
- Concept of Database Management Systems,
- Familiarity with data processing concepts and applications.

Expected Outcome :
At the end of this course, students should be able to:
- Understand the theoretical and physical aspect of a relational database.
- Implementation of RDBMS concepts through Oracle.
- Construct Simple and complex queries on sample datasets
- Writing PL/SQL blocks

References (Books, Websites etc.):1. IvanBayross SQL,PL/SQLTheProgramming LanguageofOracle 3rd Revised Edition   BPB Publications.

Suggested MOOC :
Please refer these websites for MOOCS:
NPTEL / Swayam
www. edx.com
www.coursera.com

Course Plan	
Unit	**Contents**
1	**Introduction to Oracle and SQL:** History, Features, Versions of Oracle, Database Structure: Logical Structure and Physical Structure, Oracle Architecture: System Global Area Processes: Server Processes, Background Processes, Tools of Oracle: SQL * Plus, PL/SQL, Forms, Reports, Pre Compilers:SQL Loader, Import, Export. **Introduction to SQL:** Keywords, Delimiters, Literals, Data Types, Components of SQL: **DDL Commands** – Defining a database in SQL, Creating table, changing table definition, removing table, Creating Tables with constraints on row level and column level, primary key, foreign key, check. Altering Constraints. **DML Commands**- Inserting, updating, deleting data, **DQL Commands**: Select Statement with all options. Renaming table, Describe Command, Distinct Clause, Sorting Data in a Table, Creating table from a table, Inserting data from other table, Table alias, and Column alias. **DCL commands**- Granting and Revoking Permissions
2	**Operators and Functions:** **Operators:** Arithmetic, Logical, Relational, Range Searching, Pattern Matching, IN & NOT IN

	Predicate, all, % any, exists, not exists clauses, Set Operations: Union, Union All, Minus, Intersect, Grouping data. **Functions:** Aggregate Functions, Numeric Functions, String Functions , Date Functions, Conversion Functions, Miscellaneous Sub queries
3	**Joins:** Relating data through join concept. Simple join, equi join, non equi join, Self join, Outer join
4	**Database Objects:** **Views:** Introduction, Creating a View, Selecting data from a view, Updateable views, Views on multiple tables, Destroying a View. **Sequences:** Introduction, Creating a Sequence, Altering a Sequence, Referencing a Sequence, Dropping a Sequence. **Index:** Introduction, Creating Index, Simple Index, Unique Index, Reverse Key Index, Dropping Index.
5	**Introduction To PL/SQL:** Introduction, Advantages, PL/SQL Block, PL/SQL Execution Environment, PL/SQL Character set, Literals, Data types, PL/SQL Block: Attributes %type, %rowtype,Variables, Constants, Displaying User Message on screen, Conditional Control in PL/SQL, Iterative Control Structure: While Loop, For Loop, Goto Statement, Commit, Rollback, Savepoint
6.	**Cursor Management and Triggers:** **Cursor**: Explicit & Implicit Cursor, Declaring Cursor Variables, Constrained & Unconstrained Cursor Variables, Opening Cursor, Fetching Cursor into Variables, Closing Cursor, Cursor For Loops, Parametric Cursors. **Triggers:** Definition, Syntax,Parts of triggers:statement, body, restricted, Types of triggers: Enabling & disabling triggers.
7	**Stored Procedures / Functions and Exception Handling:** Introduction, How oracle executes procedures/ functions, Advantages, How to createProcedures & Functions, Examples. **Error Handling in PL/SQL:** Exception Handling & Oracle Engine, Oracles Named Exception Handlers, User NamedException Handlers.

Course Number	Course Name	L-T-P- Credits	Year of Introduction
207	Data Structures Lab	0L+0T+4P =2C	2018-19

Course Objective :

This is companion course of Data Structures and Algorithm

Syllabus Broad Units:
This Companion course of Data Structure and algorithm. Algorithms to use different data structures are covered in theory. Students will implement C Programs for these data structures.

Expected Outcome :

The students will develop adequate programming skills with respect to following

1. Implement a real world problem using appropriate data structure.
2. Implement data structures like array, stack, queue, linklist and applications of these data structures.
3. Use files for reading, writing and manipulation.
4. Make use of appropriate searching and sorting techniques appropriately.

References (Books, Websites etc) :
1. Data Structures using C - Y.Kanetkar, BPB Publications4. YashawantKanetkar, BPB Publication
2. Behrouz A. Forouzan and Richard F. Gilberg , 2nd Edition, Thomson, 2003, Computer Science A Structured Programming Approach Using C
3. Basavraj S Anami, ShanmukhappaAngadi, Sunil Kumar S Manvi, PHI Publications, 2010. A Holistic approach to learning C.
4. Andrew Tenanbaum, Thomson, 2005, Data Structures with C.Robert Kruse & Bruce Leung, Data Structures & Program Design in C, Pearson Education,

Suggested MOOC :
Please refer these websites for MOOCS:
NPTEL / Swayam
www. edx.com
www.coursera.com

DS Lab Outline

Sr. No	Programming Exercises
1	Specification and implementation of simple data structures such as Integer, Rational, Currency, Date, Temperature, distance, Pay, Marks, Grade_card etc. Use Linux environment to execute C Programme. Note :*Algorithm of every program should be written. Properly document the programs using comments. Author name and date, purpose of each variable and constructs like loop and functions should be indicated/ documented.* *gcc or an equivalent compiler is assumed*.

2	Program to demonstrate the following: - insertion, deletion and traversal in one and multidimensional array, single link list, circular link list, double link list, Addition of Polynomial using array/ link list
3	insertion, deletion and traversal in Stacks, queues, circular queue, deques, : Programs to demonstrate: - Evaluation of Arithmetic Expression, - implementation of recursion like factorial calculation, Quick Sort, Tower of Hanoi Problem - linked list implementations of stacks, queues, and deques;
4	Programs to demonstrate: - Creation, reading writing in a file. - Pattern Matching and Extraction of data from a file. - Reading and writing from files.
5	Programs to demonstrate: - binary tree traversal - depth first and breadth first traversal of trees
6	Programs to demonstrate: - linear and binary search algorithms and their efficiency; - The standard sort algorithms (bubble,selection,insertion) and their efficiencies; - Merge sort and quick sort algorithms and their efficiencies.