

SOPHIA GIRLS' COLLEGE, AJMER (AUTONOMOUS)



**Scheme of Examination
And**

SYLLABUS

2020-21 (Batch)

FOR

Integrated M.Sc. Computer Science

**Under
Choice Based Credit System**

Semester - I to VIII

Integrated M.Sc. Programme

Eligibility for admission in First Year of IMSC is 10+2 examination of any board with at least 50% marks. As regards admission on reserved category seats government rules will be applicable.

SCHEME OF EXAMINATION

The number of paper and the maximum marks for each paper together with the minimum marks required for a pass are shown against each subject separately. It will be necessary for a candidate to pass in the theory part as well as the practical part of a subject/paper, wherever prescribed, separately.

Classification of successful candidates shall be as follows:

First Division	60%	} of the aggregate marks prescribed at Part I Examination, Part II Examination, Part III Examination, taken together
Second Division	50%	
All the rest shall be declared to have passed the examination.		

- ▲ For passing a candidate shall have to secure at least 40% marks in each course (Theory and practical separately).
- ▲ No division shall be awarded at the Part -I &Part- II examination.
- ▲ Due paper(s) will be held along with the examination of the next semester. The chance of due paper(s) will be given only 4 times.
- ▲ Whenever a candidate appears at for a due paper examination she will do so according to the syllabus in force.

Continuous Internal Assessment Examination Pattern (Passed in College Academic Council)

Maximum Marks : 30

Continuous Internal Assessment (CIA)	- 20 Marks
Class Performance (CP)	- 10 Marks

Continuous Internal Assessment (CIA) Pattern

CIA will be taken from Unit – I & II only.

Section A

5 * 2 = 10 marks

Contains 8 Questions of 2 marks each from which 5 questions to do.

Section B

2*3 = 6 marks

Contains 2 questions with internal choice (Two questions from each unit).

Each Question carries 3 marks.

Student has to do 2 questions and at least one question from each unit.

Section C

1 * 4 = 4 marks

Contains 1 questions with internal choice (One questions from each unit).

Question carries 4 marks.

Student has to do 1 question from the internal choice given.

Internal Practical Examination Pattern

1. A Laboratory Exercise File should be prepared by each student for each practical paper and should be submitted during practical examinations.
2. One internal examiner shall conduct two practical exams, in a day, of a batch of 60 students.
3. Duration of internal practical examination is 1 hours.
4. Internal Practical of 15 marks distribution is as under:
 - a. 10 marks for Viva-voce / Practical examination exercise of 2 questions.
 - b. 5 marks for Laboratory Exercise File.

External Examination Pattern

Maximum Marks : 70

Duration: 2½Hrs.

Section A

10 * 1 = 10 marks

Contains 10 Questions of 1 mark each & all are compulsory to do.

Three questions from each unit (but 4 questions from one unit)

3 + 3 + 4 = 10 Questions

Section B

3*5 = 15 marks

Contains 3 questions with internal choice (Two questions from each unit).

Each Question carries 5 marks.

Student has to do 3 questions and at least one question from each unit.

Section C

3 * 15 = 45 marks

Contains 3 questions with internal choice (Two questions from each unit).

Each Question carries 15 marks.

Student has to do 3 questions and at least one question from each unit.

External Practical Examination Pattern

1. A Laboratory Exercise File should be prepared by each student for each practical paper and should be submitted during practical examinations.
2. One internal and one external examiner shall conduct two practical exams, in a day, of a batch of 60 students.
3. Duration of external practical examination is 3 hours.
4. External Practical of 35 marks distribution is as under:
 - a. 15 marks for practical examination exercise for 3 questions.
 - b. 10 marks for Viva-voce
 - c. 10 marks for Laboratory Exercise File.

Course Structure in Semester I

Compulsory

Paper Code	Paper Title	Credits	Total Marks		Max. Marks	Min. Marks	Duration
			CIA	ESE			
GEN-101	General English	02	15	35	50	20	1 Hr

Optional

Paper Code	Nomenclature of the Paper	Contact Hours Per Week	Credits	Total Marks		Max. Marks	Min. Marks	Exam. Duration
				CIA	ESE			
IMSC– 101	Computer Fundamentals	04	04	30	70	100	40	2 ½ Hr.
IMSC– 102	Communication Skills	04	04	30	70	100	40	2 ½ Hr.
IMSC– 103	Fundamentals of ‘C’ Programming	04	04	30	70	100	40	2 ½ Hr.
IMSC– 104	Multimedia Basic	04	04	30	70	100	40	2 ½ Hr.
IMSC– 105	Prac.: PC Software lab	04	02	15	35	50	20	3 Hr.
IMSC– 106	Prac.: Commu. Skills Language Lab	04	02	15	35	50	20	3 Hr.
IMSC– 107	Prac.: ‘C’ Programming Lab	04	02	15	35	50	20	3 Hr.
IMSC– 108	Prac.: Multimedia–Flash & Photoshop Lab	04	02	15	35	50	20	3 Hr.
Semester Total						600	240	

GEN 101 – General English

Max. Marks: 50

Credit: 2

Learning Outcome:

After the successful completion of the course, the students will be able to

1. Have knowledge regarding with the different concepts of Grammar.
2. Enhance the reading and writing skills of the students.
3. Develop a practice of using idioms and phrasal verbs in everyday conversations.
4. Have a cutting edge in the competitive and professional world.

Unit I

SVOCA (Subject, Verb, Object, Complement, Adverbial), Transformation of sentence (Active Passive and Direct Indirect), Modals, Tense usage, Homophones and Homonyms,

• IDIOMS

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. A penny for your thoughts 2. Actions speak louder than words 3. At the drop of a hat 4. Ball is in your court 5. Barking up the wrong tree 6. Beat around the bush 7. Best of both worlds 8. Bite off more than you can chew 9. Blessing in disguise 10. Burn the midnight oil 11. Can't judge a book by its cover 12. Cross that bridge when you come to it 13. Cry over spilt milk 14. Curiosity killed the cat | <ol style="list-style-type: none"> 15. Don't count your chickens before the eggs have hatched 16. Don't put all your eggs in one basket 17. Every cloud has a silver lining 18. Feel a bit under the weather 19. Give the benefit of the doubt 20. Hear it on the grapevine 21. Hit the nail on the head 22. In the heat of the moment 23. Kill two birds with one stone 24. Last straw 25. Let sleeping dogs lie 26. Let the cat out of the bag 27. Make a long story short |
|---|---|

28. Miss the boat
29. Off one's rocker
30. Once in a blue moon
31. Piece of cake
32. Put wool over other people's eyes
33. See eye to eye
34. Sit on the fence

35. Speak of the devil!
36. Take with a grain of salt
37. Taste of your own medicine
38. To hear something straight from the horse's mouth
39. A Picture paints a thousand words
40. Method to my madness

Phrasal verbs

- Break: Break away, Break down, Break off, Break up
- Bring: Bring about, Bring in, Bring up, Bring down
- Come: Come by, Come across, Come upon
- Carry: Carry out, Carry on, Carry off, Carry over
- Call: Call on, Call off, Call at
- Get: Get Along, Get Away, Get By, Get Through, Get Over
- Give: Give up, Give away, Give in
- Hard: Hard up, Hard of hearing, Hard to please
- Look: look after, look into, look forward to, look up to
- Put: put out, put off, put up, put up with
- Run: run after, run down, run over, run out of
- Take: take after, take up, take to

Unit II

Comprehension, Précis writing

Unit III

Formal and Informal Letters- Job Application, Resume and Cover letter, Composition, Report Writing

Reference Books:

- A Practical English Grammar (Oxford Paper Back) : A.J. Thomson
- Intermediate English Practice Book (Orient Longman) : S.Pit Corder :
- Strengthen Your English (OUP 1973) :Bhaskaran and Hordburgh
- The English Errors Of Indian Students (OUP) :T.l.h. Smith – Pearce
- A Practical Course of English (Ramesh Book Depot, Jaipur) :I.K. Sharma and V.D. Singh

IMSC– 101 Computer Fundamentals

Max. Marks : 70

Credits:04

Learning Outcome:

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

1. Describe the computer system and identify its types.
2. Illustrate the use of different input devices.
3. Categorize different output devices on the basis on operation.
4. Design, development and analysis of software and hardware used to solve problems in a variety of business, scientific and social contexts.

Unit - I

Introduction to Computer: Definition, Characteristics, Classifications of computer on the basis of size and speed, Generation of computers, Applications of Computer.

Input Devices: keyboard, mouse, track ball, touch pad, joystick, touch sensitive screens, pen based systems, digitizer, data scanning devices, bar code readers, optical mark readers, flatbed scanner

Unit – II

Output Devices: Hard copy devices: Printer (impact printers) dot matrix printer, (non-impact printers) inkjet, laser printer, Computer Display:Introduction to CRT Monitor, Plasma display, Projection display.

Introduction to memory:memory hierarchy volatile memory, non-volatile memory, random-access memory, read-only memory, secondary memory, the cache memory, registers, flash memory.

Storage device: magnetic tape, magnetic disk, hard disks, CD, DVD

Unit - III

Computer Viruses: Introduction, types of computer viruses

Introduction to Internet: Network, Client and Server, Introduction of World Wide Web (www), Hypertext transfer protocol (http), Uniform Resource Locator (URL), Domain Name System (DNS), Internet Service Provider (ISP), web Browsers and email.

E-learning: Online learning, Massively Open Online Courses (MOOCs), Asynchronous learning, Synchronous learning, Learning management systems, Online credentials.

Reference Books:

- Pradeep K. Sinha, Priti Sinha, "Computer Fundamentals". BPB Publications.
- Rajaraman, V., "Fundamental of Computers". Prentice Hall India, New Delhi.
- Fundamentals Of Information Technology, 2E , Alexis Leon & Mathews Leon, Vikas Publishing

IMSC– 102 Communication Skills

Max. Marks : 70

Credits: 04

Min. Marks: 28

Duration: 2½ hrs

Learning Outcome:

On successful completion of the course, the students will be able to

1. Understand the importance of the different types of communication
2. Develop their writing skills
3. Use their communication and writing skills in organizational structure
4. Develops important life skills such as Critical thinking, problem solving, conflict resolution, team building and public speaking.

Unit - I

Communication—Definition, Types of Communications – oral and written communication; formal and informal Communication; Upward and Downward Communication; One way and Two way Communication. Process of Communication. Barriers in Communication.

Unit – II

Business letters – Types and Writing of Business Letters (Sales and Purchase, Complaint and Suggestion, Promotional and Advertising).

Applying for a job- Resume, Curriculum Vitae and Application Writing.

Unit – III

Report writing – definition and types of report, sections of a report, determining the purpose of reports, planning for the report and collecting information, developing an outline, final writing of the report. Drafting circulars, notices, agenda and minutes of meetings.

Reference Books:

- Communication Skills –Richard S ,Hazelden
- Effective Technical Communication –M Ashraf RizviTata Mcgraw Hill
- Business Communication- K.K. Sinha, Jain book Depot
- Communication Skills for Technical Students -T. M. Farhatullah, Orient Blackswan

IMSC– 103 Fundamentals of ‘C’ Programming

Max. Marks : 70

Credits:04

Min. Marks: 28

Duration: 2½ hrs

Learning Outcome:

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

1. Understand basic concepts of programming language
2. Choose the loops and decision making statements to solve the problem
3. Implement different operations on array
4. Design, implement, test and debug programs that use different data types, such as simple variables, arrays, and structures

Unit - I

‘C’ Language: Character Set, Keywords, Constants, Variables, Data Types, Type Conversion, **Instruction & its types:** Input Output Instructions, Operators & Expressions: Arithmetic, Relational, Logical, Conditional, Arithmetic Instructions.

Control Instructions: Decision Control (if, if-else, if else ladder, nested if, switch case), Loop Control (while, for, do-while, Nesting Loops), Jump statements (break, continue, goto)

Unit – II

Arrays:- Concept of Arrays, One dimensional array & Two dimensional array, Storage strategy, Array Initialization, Operations on Arrays (traversing, addition, subtraction, transpose), Search – linear & binary. Sorting - bubble sort & selection sort.

Functions:- Declaration, Calling (Call by value, Call by reference) & Definition of functions, Recursion, Storage Class (auto, static, register, extern), Scope rules (Local, Global).

Unit – III

Pointers:- Pointers and addresses, Pointers as Function arguments, Pointers and Arrays, Address Arithmetic. Character Pointers, String handling and String functions (strlen, strcat, strcmp, strcmpi, strrev, strcpy).

Structure and Union: Basics, Structures and Functions, Arrays of Structures, structure pointer variables. Union definition and its use.

Reference Books:

- Let Us ‘C’ -Yashavant P Kanetkar, BPB Publications
- Programming in Ansi ‘C’ – Balaguruswami – TMH.
- ‘C’ Programmiung Language – Kernighan & Ritchie - PHI
- ‘C’ How to Program – Dietel & Dietel - PHI
- ‘C’ Programmiung - Dr. Neeraj Bhargava & Dr. Ritu Bhargava, AlkaPublicationas

IMSC– 104 Multimedia Basics

Max. Marks : 70

Credits:04

Learning Outcome:

On successful completion of the course, the students will be able to

1. Identify terminology associated with the concepts, techniques, and processes used throughout the multimedia environment.
2. Compare different image types and compression
3. Study laws of multimedia and design environment
4. Design basic animations and gif images using flash
5. Graphic design principles that relates to web design and learn how to develop website.

Unit – I

Introduction to Multimedia Technology – Application areas of Multimedia, Advantages and disadvantages of Multimedia, Media Elements(text, sound, image, video & animation), user interface and its types, importance and features of user interface, MM hardware & software requirements(Image, Video, Audio, Sound editing software's), Images: Raster and Vector image

Unit – II

Image compression: Lossy and Lossless Compression, advantages and disadvantages of image compression, audio compression, audio synthesis, speech recognition and Speech Synthesis,Jpeg image compression, mpeg video compression(P,B, I frames).

Developing Applications using multimedia, methodology and design, Various multimedia laws: Patent law, Trademark Law, Trade secret Law, Copyright Law.

Unit – III

Flash: Introduction, Features, Advantages, Concepts of Frame Rate and Resolution, Exploring The Flash Interface, The Flash stage, Timeline- Play head/Frames/Key Frames/ Blank frames, Menus, Tools of Flash (Pen, Pencil, Paint Bucket Tool, spray brush, Text, 3D rotation, deco tool), Custom colors and gradients, Drawing object in flash (line, curve, oval, Rectangle, Polystar tool), stroke and fill, Layers and its types in flash, Key frames, symbols-how to create and reuse it, Object based animation, motion tween, classic tween and shape tween, adding sound.

Reference Books

- Fundamental of multimedia, Ritu Bhargava, AlkaPublicationas

- Fundamental of multimedia “Drew, Feurun, 2004.
- Adobe Flash CS4: Illustrated [Barbara M. Waxer](#)

Course Structure in Semester II

Compulsory

Paper Code	Paper Title	Credits	Total Marks		Max. Marks	Min. Marks	Duration
			CIA	ESE			
GEN-102	General Hindi	02	15	35	50	20	1 Hr

Optional

Paper Code	Nomenclature of the Paper	Contact Hours Per Week	Credits	Total Marks		Max. Marks	Min. Marks	Exam. Duration
				CIA	ESE			
IMSC– 201	Digital Computer Fundamentals	04	04	30	70	100	40	2 ½ Hr.
IMSC– 202	Management and Accounting	04	04	30	70	100	40	2 ½ Hr.
IMSC– 203	Object Oriented Programming with C++	04	04	30	70	100	40	2 ½ Hr.
IMSC– 204	Data Structure & Algorithm	04	04	30	70	100	40	2 ½ Hr.
IMSC– 205	Prac : Digital Lab.	04	02	15	35	50	20	3 Hr.
IMSC– 206	Prac.: Manaement & Accounting (Tally) Lab	04	02	15	35	50	20	3 Hr.
IMSC– 207	Prac.: ‘C++’ Programming Lab	04	02	15	35	50	20	3 Hr.
IMSC– 208	Prac.: Data Structure Through ‘C’ Lang. Lab	04	02	15	35	50	20	3 Hr.
Semester Total						600	240	

GEN-102: सामान्य हिंदी

पूर्णांक-50

क्रेडिट : 02

अध्ययन के परिणाम :

पाठ्यक्रम पूर्ण होने के बाद विद्यार्थी योग्य होंगे –

1. विद्यार्थियों में हिंदी व्याकरणिक ज्ञान का विकास होना ।

व्याकरण – भाग

इकाई-1

- संज्ञा,सर्वनाम,विशेषण,क्रिया,
- क्रिया विशेषण ,संधि, समास, विलोम शब्द

अंक योजना

-10 अंक

-10 अंक

इकाई-2

- शुद्धीकरण [शब्द शुद्धि ,वाक्यशुद्धि], पारिभाषिक शब्दावली-[अंग्रेजी शब्दों के हिंदी समानार्थक शब्द] (कोविड -19 से भी सम्बन्धित शब्दावली)

-5 अंक

शब्द युग्म- अर्थ भेद , पर्यायवाची शब्द , उपसर्ग , प्रत्यय,

-5 अंक

इकाई-3

- निबन्ध लेखन (कोविड -19 से भी सम्बन्धित विषय) -10 अंक
- पत्र लेखन –आवेदन पत्र, बधाई पत्र, प्रार्थना पत्र (कोविड -19 से भी सम्बन्धित विषय) - 5 अंक
- अपठित गद्यांश (कोविड -19 से भी सम्बन्धित विषय) - 5 अंक

सहायक पुस्तकें-

- हिंदी व्याकरण –डॉ. इंदिरा अशोक
- हिंदी व्याकरण कोश –डॉ. दिनेशचंद्रशर्मा, श्रीमती पुष्पा शर्मा
- हिंदी व्याकरण –डॉ. हरिचरण शर्मा
- हिंदी व्याकरण –डॉ. राजेश्वर प्रसाद चतुर्वेदी
- हिन्दी व्याकरण - भोलानाथ तिवारी

Note:

1. The paper will be objective type containing fifty questions of one mark each
2. Marks of this paper will not be included in Total

IMSC– 201 Digital Computer Fundamentals

Max. Marks : 70

Credits:04

Learning Outcome:

On successful completion of the course, the students will be able to

1. To make students understand the basic structure and operation of digital computer.
2. To understand and examine the structure of various number systems and its application in digital design.
3. Explains the simplification of logical statements with using Boolean rules and De-Morgan theorems.
4. The ability to understand, analyze and design various combinational and sequential circuits
5. Knowledge in concepts associated with digital logic and circuit design, it starts with an introduction to number systems and its applications in computers and familiarizes students with the Boolean algebra, logic gates, and combinational and sequential circuit's concepts and its real world implementation.

Unit I

Fundamentals of Computer Architecture: Major components of Digital Computer, Flynn's classification of Computer.

Computer Arithmetic: Number systems: Decimal numbers, Binary numbers, Octal numbers, hexadecimal numbers and their mutual conversions, Binary arithmetic: Addition, subtraction, multiplication and division of binary numbers, 1's and 2's complement, BCD numbers, BCD addition, BCD subtraction, Gray code: Binary to Gray code conversion, Gray to Binary conversion

Unit II

Boolean algebra:

Boolean operations and expressions, Laws and rules of Boolean algebra, Demorgan's Theorem, Boolean expressions, Simplification of Boolean expression.

Logic Gates:

AND gate, OR gate, NOT gate, NAND gate, NOR gate, X-OR gate, X-NOR gate, the universal property of NAND gate and NOR gate, Boolean expression for logic circuits, Karnaugh map simplification: SOP and POS with examples, don't care condition.

Unit III

Combinational Circuits: Half adder, Full adder, Half subtractor, Full subtractor Decoders, Encoder, Multiplexer, Demultiplexer.

Sequential Circuits: Latches: SR latch, Clocked flip-flops: SR flip-flop, D flip-flop, JK flip-flop.

Registers: General purpose and special purpose registers, Shift registers: SISO, SIPO, PISO, PIPO.

Reference Books:

- Computer Fundamentals-Pradeep K. Sinha, Priti Sinha, BPB Publications.
- Fundamental of Computers-V Rajaraman, Prentice Hall India, New Delhi.

- Computer Fundamentals: Architecture and Organization- B.Ram New Age Publications

IMSC– 202 Management and Accounting

Max. Marks : 70

Credits:04

Learning Outcome:

On successful completion of the course the students will be able to:-

1. Interpret the concept of management, leadership and motivation
2. Understand and apply the basic concepts of accounting.
3. Prepare the final accounts of business.
4. Summarize the process of accounting.
5. Develop skill in the area of accounting software.

Min. Marks: 28

Duration:2½ hrs

Unit – I

Introduction to Management Meaning, Definition, Nature, Characteristics, Principles (Fayol's), Functions, skills of a manager. Overview of Management functions, Planning : meaning, features, process, advantages & disadvantages, types of plans, Leadership (Meaning, Importance, Nature, Styles (Motivational, Power Centered, Supervisory Style), Qualities of a Successful Leader.

Unit - II

Motivation: meaning, nature, importance, Theories of motivation: Maslow's need hierarchy, Herzberg's two factor, MC Gregor's theory.

Accounting: Definition, concepts, basic accounting, entries.

Unit - III

Ledger, Trial Balance

Understanding of final accounts:- Trading, P&L Balance sheet with Adjustment entries

Introduction to Tally: Company Creation, Groups & Ledger Creation, Voucher Entries (Purchase, Sales, Receipt, Payment, Contra & Journal) **Reports:** Profit & Loss A/C, Balance Sheet, **Display:** Trial Balance, Day Book, Accounts Book (Cash/Bank Book, Ledger, Purchase Register, Sales Register, Journal Register), Receipt & Payment.

Reference Books :

- Management – G.S. Sudha RBSA Publication
- Philip, Marketing Management 9th Edition- Kotler, PHI
- An Introduction to Accountancy 5th Edition- S. N Maheshwari and S. K. Maheshwari, Vikas Publication House
- Advanced Financial Accounting- R.L. Gupta, Sultan Chand & Company

IMSC– 203 Object Oriented Programming with C++

Max. Marks : 70

Credits: 04

Learning Outcome:

On successful completion of the course, the students will be able to

1. Understand and apply OOP's features and C++ concepts
2. Construct class and object using constructors
3. Apply the concept of polymorphism and inheritance
4. Implement with an attempt to develop different types of practical skills so that students can acquire the competencies.

Unit - I

Introduction: to OOP's, Evolution of OOP, Advantages of OOP, Features of OOPS-Objects, Classes, Data Abstraction & Encapsulation, Inheritance, Polymorphism. Comparison between Functional Programming and OOPS (Difference between structure and Class)

C++: Character set, Keywords, Constant, Variables, Data types (Built-in, User Defined), Operators & Expressions. Instructions: Input output, Arithmetic, Control (Decision, Case, Loop) and nesting.

Unit – II

Classes: data member, member functions, objects, Access specifiers (private, public, protected) arrays of class objects, pointers and classes, constructors (default, parameterized, copy), constructor overloading, destructor, static class member, friend functions.

Dynamic memory allocation: New & Delete operator.

Unit – III

Inheritance: types of inheritance, member access control, abstract class

Polymorphism: Binding, Function overloading, Function overriding, Virtual functions, Operator overloading (as a member function & as a friend function)

File Handling: ofstream, ifstream, fstream, opening, closing, writing & reading from the file.

Reference Books:

- Object Oriented Programming with C++, E. Balagurusamy, Tata McGraw Hill.
- OOPS with C++, N P Bhavre,
- OOPS with ANSI C++, A N Kamthane
- “Object-Oriented Programming in C++”, Robert Lafore, Galgotia Publications.
- “Object-Oriented Programming using C++”, B. Chandra, Narosa Publications.

IMSC– 204 Data Structure and Algorithms

Max. Marks : 70

Credits: 04

Learning Outcome:

On successful completion of the course, the students will be able to

1. Explain fundamental concepts of data structure and array operations
2. Apply appropriate searching and sorting techniques on given data structure
3. Design stack and queue data structure
4. Skills in implementations and applications of data structures such as stacks, queues and trees and helps students to implement algorithms and data structures in various real-life software problems.

Unit I

Data Structures and its Types: Primitive and Composite Data Types ,

Arrays: - Concept of Arrays, Single dimensional array, Two dimensional array. Operations on Arrays with Algorithms (Insertion, deletion).

Searching : (Linear and Binary), Concept of sorting, Sorting algorithms (Bubble Sort, Insertion Sort, Selection Sort). **Recursion:** Factorial, Fibonacci, Tower of Hanoi.

Unit II

Linked Lists:- Introduction to linked list and double linked list, Representation of linked lists in Memory, Traversing a linked list, Searching linked list, Insertion and deletion into linked list, Doubly linked lists, Traversing a doubly linked lists.

Stacks and Queues: Representation of stacks, Implementation of stacks using Array & Link List, Uses of stacks, evaluating expression.

Introduction to queues, Implementation of queues by using array and Link lists

Unit III

Trees: Definition & Basic concepts, linked tree representation, Introduction to Binary Tree, Traversing Binary Trees (Pre order, Post order and In-order), Concept of Binary search tree, algorithm of Searching, inserting and deleting in binary search trees.

Graph: Introduction to graphs, types of graphs (complete, weak and strong, simple), Representation of Graph: adjacency Matrix, Graph Traversal: Breadth first search, Depth first search.

Reference Books:

- Data Structure Through C - Y.P. Kanetkar – BPB Publication
- Data Structure Using C - E Balagurusamy – McGraw Hill
- Data Structures And Algorithm Analysis In C – Mark Allen Weiss – Pearson Education

Course Structure in Semester III**Compulsory**

Paper Code	Paper Title	Credits	Total Marks		Max. Marks	Min. Marks	Duration
			CIA	ESE			
GEN-103	Environmental studies	02	15	35	50	20	1 Hr

Optional

Paper Code	Nomenclature of the Paper	Contact Hours Per Week	Credits	Total Marks		Max. Marks	Min. Marks	Exam. Duration
				CIA	ESE			
IMSC– 301	Discrete Mathematics	04	04	30	70	100	40	2 ½ Hr.
IMSC– 302	Database Management Systems	04	04	30	70	100	40	2 ½ Hr.
IMSC– 303	Java Programming	04	04	30	70	100	40	2 ½ Hr.
IMSC– 304	Computer Graphics	04	04	30	70	100	40	2 ½ Hr.
IMSC– 305	Prac.: Discrete Maths Lab	04	02	15	35	50	20	3 Hr.
IMSC– 306	Prac.: DBMS (SQL) Lab	04	02	15	35	50	20	3 Hr.
IMSC– 307	Prac.: Java Programming Lab	04	02	15	35	50	20	3 Hr.
IMSC– 308	Prac.: Comp. Graph. Lab	04	02	15	35	50	20	3 Hr.
Semester Total						600	240	

GEN-103: Environmental Studies**Max. Marks: 50****Credit: 02****Min. Marks: 20****Duration : 1 Hrs****Unit I: Natural Resources****Renewable and Non Renewable resources:**

- Natural resources and associated problems
 - a. Forest resources: Use and over exploitation, deforestations, case studies Timber extraction, mining , dams and their effects on forests and tribal people.
 - b. Water resources: Use and over utilization of surface and groundwater, floods, drought, conflict over water, dams – benefits and problems
 - c. Mineral resources: Use and exploitation , environmental effects of extracting and using mineral resources.
 - d. Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources.
 - e. Land resources: Land as a resource, Land degradation, man induced landslides, soil erosion and desertification.
- Role of an individual in conservation of natural resources
- Equitable use of resources for sustainable lifestyles.

Unit II: Ecosystem

- Concept of Ecosystem
- Structure and function of an ecosystem
- Producers, consumers and decomposers,
- Energy flow in the eco system
- Ecological succession
- Food chains, food webs and ecological pyramids.

- Virus - COVID
- HIV / Aids – causes and precaution
- Climate change, global warming, Acid Rain, Ozone layer depletion
- Photochemical smog

Unit III: Biodiversity and its conservation

- Introduction – Definition: genetics, species and ecosystem diversity
- Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values
- Hot spots of biodiversity
- Threats to biodiversity: habitats loss, poaching of wildlife, man-wildlife conflicts
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity

Environmental Pollution

- Causes , effects and control measures of:
 - a. Air pollution
 - b. Water pollution
 - c. Soil pollution
 - d. Noise pollution

GEN-103 : पर्यावरण विज्ञान

पूर्णांक : 50
क्रेडिट : 02

न्यूनतम : 20
अवधि : 1 घंटे

इकाई I - प्राकृतिक संसाधन

नवीनकरण एवं अनवीनीकरण संसाधन : प्राकृतिक संसाधन एवं उससे संबंधित समस्याएँ

- **वन संसाधन** : उपयोग एवं अतिशोषण , वनोन्मूलन केस अध्ययन , टिम्बर निष्कर्षण, खनन एवं उनके वनों एवं जन जातियों पर प्रभाव
- **जलसंसाधन** : सतही एवं भूजल का उपयोग एवं अतिउपभोग , बाढ़ , सूखा, जल विवाद, बांधों की समस्याएँ एवं लाभ ।
- **खनिज संसाधन** : उपयोग एवं अतिशोषण , खनिज संसाधन के उपयोग एवं निष्कर्ष के पर्यावरणीय प्रभाव, केस अध्ययन ।
- **ऊर्जा संसाधन** : बढ़ती हुई ऊर्जा आवश्यकताएँ, नवीनीकरण एवं अनवीनीकरण ऊर्जा संसाधन , ऊर्जा संसाधनों का वैकल्पिक उपयोग केस अध्ययन ।
- **भूसंसाधन** : भूमि एक संसाधन , भूअपघटन , मानवजनित भूस्खलन मृदा अपरदन एवं मरुस्थलीकरण , प्राकृतिक संसाधनों के संरक्षण में व्यक्तित्व भूमिका सतत जीवनचर्या के लिए संसाधनों का उपयुक्त उपयोग ।

इकाई II – पारिस्थितिकी तंत्र

- पारिस्थितिकी तंत्र की अवधारणा ।
- पारिस्थितिकी तंत्र की संरचना एवं कार्यप्रणाली ।
- उत्पादक , उपभोक्ता, अपघटक ।
- पारिस्थितिकी तंत्र में ऊर्जा प्रवाह ।
- पारिस्थितिकी अनुक्रमण ।
- खाद्य श्रृंखला , खाद्यजाल, एवं पारिस्थितिकी स्तूप ।

विषाणु- COVID

- एच आई वी/ एड्स (कारण और पूर्वाधान)
- जलवायु परिवर्तन, वैश्विक ताप वृद्धि, अम्लवर्षा, ओजोनपरत क्षरण
- फोटोकेमिकल स्मॉग ।

इकाई प्रथम III – जैव विविधता एवं संरक्षण

- परिचय – परिभाषा, जीनीय, प्रजातीय एवं पारिस्थितिकी विविधता ।
- जैवविविधता का महत्व , उपभोगीय उपयोगिता, उत्पादकीय उपयोगिता, सामाजिक नैतिक सौन्दर्य बोध एवं वैकल्पिक मूल्य ।
- जैवविविधता के तप्तस्थल ।
- जैवविविधता के खतरे : आवासक्षय, वन्यप्राणीयों का शिकार , मानव वन्यप्राणियों के बीच विरोधाभास ।
- भारत की विलुप्तप्राय एवं स्थानिक प्रजातियाँ ।
- जैव विविधता का संरक्षण : स्व स्थानीय एवं पूर्व स्थानी संरक्षण ।
- परिभाषा, कारण, प्रभाव एवं नियंत्रण उपाय ।
 - वायु प्रदूषण
 - जल प्रदूषण
 - मृदा प्रदूषण
 - ध्वनी प्रदूषण

IMSC– 301 Discrete Mathematics

Max. Marks : 70

Credits:04

Learning Outcome:

On successful completion of the course, the students will be able to

1. Apply set operations to solve applied problems
2. Examine the validity of argument by using Propositional Calculus
3. Understand different graphs and matrix operations.
4. Upon completion of the course, the student will be able to use logical notation.

Unit I

Basic terminology of Graph Theory –Vertices, Edges, Loop, Path, degree, **Types-** Undirected- Directed, weighted-Un-weighted, Simple-Multigraph, Labelled, Null, Di-graph, Subgraph, Connected-disconnected, Cyclic-Acyclic, Dijkstra's shortest path algorithm, Minimum Cost spanning Tree Algorithm (Prim's and Kruskal's).

Sets: Elements of a set, methods of describing a set, types of sets, Operations on sets-- union, intersection and difference of sets, Associative Laws, Distributive laws, DeMorgan's laws(proofs) Venn Diagrams, Cartesian product of two sets.

Unit II

Relation: Basic definition of relation and types of relations (reflexive, irreflexive, symmetric, A-symmetric, transitive, anti symmetric, equivalence), Binary relations, domain, range, inverse and composite.

Language of Logic: Proposition, Compound Proposition, Conjunction, Disjunction, Implication, Converse, Inverse & Contra positive, Biconditional Statements, tautology, Contradiction & Contingency, Logical Equivalences, Universal and existential quantifiers .

Unit III

Matrices: Definition of a matrix, types of matrices, Basic operations(Addition, subtraction and Multiplication), Transpose, Determinant of a square Matrix, Minor and Co-factors , Adjoint of a square Matrix, Inverse of a matrix, Solution to System of Linear equations- Matrix Inverse method and Cramer's method.

Reference Books:

- Keneth H. Rosen, "Discrete Mathematics and Its Applications", TMH
- C.L. Liu, "Elements of Discrete Mathematics", TMH.
- Kolman, Busby & Ross, "Discrete Mathematical Structures", PHI.
- Narsingh Deo, "Graph Theory With Application to Engineering and Computer Science", PHI.

IMSC– 302 Database Management Systems**Max. Marks : 70****Credits:04****Min. Marks: 28****Duration:2½ hrs****Learning Outcome:**

On successful completion of the course, the students will be able to

1. Understand key concepts of database system
2. Apply the ER concept and ER mapping to relational Model.
3. Differentiate file organizations, relational algebra operations
4. Design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS using Oracle Software.

Unit – I

Overview and History of DBMS, Basic DBMS terminology, File Processing System v/s DBMS, advantages and disadvantages of DBMS, DBA and his responsibilities, Data Abstraction, physical and logical data independence, architecture of DBMS: Client /Server architecture, 2 Tier & 3 Tier. Overview of hierarchical, network and relational models, comparison of network, hierarchical and relational models. Entity Relationship model: Overview of Data Design Entities, Attributes and Entity Sets, degree of relationship, Weak & Strong entities

Unit – II

Enhanced ER Model: Generalization, Specialization, Aggregation.

Implementation of sequential, random & indexed sequential file organization. Types of Keys.

E.F.Codd's rules, Relational Algebra

Normalization: Functional dependencies, Fully Functional dependency, Transitive dependency, Normal forms: first, second, third normal forms, BCNF

Database integrity: entity integrity, domain integrity, referential integrity

Unit – III

Introduction to SQL: Characteristics and Components of SQL, SQL data types and literals, Types of SQL commands, SQL operators. Table Constraints: Null Constraint, Primary Key, Unique key constraint, Foreign Key constraint, domain key constraint, Check Constraints, & Not Null.

Searching, Matching & Basic Oracle Functions: String, Numeric, and Aggregate Functions.

Queries based on group by clause, order by clause, having clause, Unions, Intersection, Minus SQL, Sub queries & joins. Introduction of views and indexes.

Reference Books:

- Fundamentals of Database Systems- Elmasri And Navathe Benjamin/Cummings Publishing
- SQL Complete Reference- Leon and Leon, Tata McGraw Hill
- SQL, PL/SQL Programming Language- Ivan Bayross, BPB Publications
- Database Management System- Korth, Tata McGraw Hill

IMSC– 303 Java Programming**Max. Marks : 70****Credits:04****Min. Marks: 28****Duration:2½ hrs****Learning Outcome:**

On successful completion of the course, the students will be able to

1. Describe the features of Java
2. Develop programs with basic programming constructs.
3. Experiment with branching & Looping and Arrange data in Arrays.
4. Formalize the OOP concept and validate its real world implementation
5. An integrated development environment to write, compile, run, and test simple object-oriented Java programs.

Unit – I

JAVA: Introduction to Object Orientated Programming, Abstraction, Object Oriented Programming Principles, Features of JAVA, Introduction to JAVA byte code, Program elements; Primitive data types, variables, Input Output in Java, operators: arithmetic, assignment, logical, relational , Boolean logical operators, operator precedence.

Control statements: Java's Selection Statements, if statement, switch statement, Iteration statements, while, do-while, for-each, Nested loop, Jump Statement, using break, continue, return. Arrays, One & Two Dimensional Array

Unit – II

Object and Classes: Objects, constructors, returning and passing objects as parameter. Inheritance: Definition & its Types, Extended class, usage of Super, Overloading and overriding methods, Abstract classes, using final with inheritance.

String Handling: String constructors, special string operation, character extraction, searching and comparing string, string Buffer class.

Package and Interfaces: Defining package, access modifiers, importing package, Defining and implementing interfaces.

Unit – III

Exception handling: Exception handling fundamentals, Exception types, try, catch and multiple catch statements. Usage of throw, throws and finally.

Threading: Multithreading, multiprocessing, life cycle of thread, Garbage collection.

Applet: applet Fundamentals, applet life cycle, using paint method and drawing polygon.

Reference Books:-

- Introduction to Java Programming, Y. Daniel Liang, PHI.
- Java Complete Reference, Patrick Naughton, Tata McGraw Hill.
- The Java Handbook, Patrick Naughton, Tata McGraw Hill.
- Introduction to Java Programming, E Balaguruswamy, PHI.

IMSC– 304 Computer Graphics

Max. Marks : 70

Credits:04

Learning Outcome

After learning the course the students should be able to:

1. To understand the various computer graphics hardware and display technologies.
2. 2D and 3D viewing technologies
3. Various 2D and 3D objects transformation techniques.
4. Interpret the mathematical foundation of the concepts of computer graphics.

Min. Marks: 28

Duration:2½ hrs

Unit – I

Introduction: Elements of graphics workstation. Video Display Devices. Color model, Raster Scan Systems. Random Scan systems. Input devices. Graphics Software Coordinate Representations, Fundamental Problems in Geometry. Algorithms: Line drawing algorithms- DDA Algorithm. Bresenham's Line Algorithm. Frame buffers. Circle and Eclipse generating algorithms.

Shape fill Algorithm. Character generation. Attributes of lines, curves, filling, characters.

Unit – II

Graphics Primitives: Primitive Operations, The display file interpreter-Normalized Device Coordinates. Display- File structure. Display – file algorithm. Display control and Polygons, polygon representation. Text attributes.

Geometric Transformations: Matrices. Scaling Transformations. Sin and Cos Rotation. Homogeneous Co-ordinates and Translation. Co-ordinate Translations. Rotation about an arbitrary point. Inverse Transformations, Transformations Routines. 2-D Viewing- The viewing pipeline. Viewing co-ordinate, Reference Frame. Windows to view ports. Co-ordinate transformation.

Unit – III

Clipping Techniques: Clipping in Raster, point clipping, Line clipping, Cohen-Sutherland Line clipping Algorithm, Cyrus-Beck Line clipping Algorithm

Computer Animation: Design of Animation Sequences. General Computer Animation Functions-Raster Animations. Key Frame Systems. Morphing Simulating Accelerations. Motion Specifications. Kinematics and Dynamics.

Reference Books:

- Computer Graphics- Principles and Practice- J. Foley, A. Van Dam, S. Feiner Hughes:Pearson
- Principles of Interactive Computer Graphics-Newman and Sproull, Tata McGraw Hill

- Computer Graphics, Hern & Becker, Pearson Publication
- Computer Graphics, Cornel Pokorny, BPB Publications.

Course Structure in Semester IV

Paper Code	Nomenclature of the Paper	Contact Hours Per Week	Credits	Total Marks		Max. Marks	Min. Marks	Exam. Duration
				CIA	ESE			
IMSC– 401	E Commerce	04	04	30	70	100	40	2 ½ Hr.
IMSC– 402	Advance Database Management System	04	04	30	70	100	40	2 ½ Hr.
IMSC– 403	Python Programming	04	04	30	70	100	40	2 ½ Hr.
IMSC– 404	Operating System	04	04	30	70	100	40	2 ½ Hr.
IMSC– 405	Prac.: HTML Lab	04	02	15	35	50	20	3 Hr.
IMSC– 406	Prac.: ADBMS (PLSQL) Lab	04	02	15	35	50	20	3 Hr.
IMSC– 407	Prac.: Python Programming Lab	04	02	15	35	50	20	3 Hr.
IMSC– 408	Prac.: Operating System Lab. using Simulator	04	02	15	35	50	20	3 Hr.
Semester Total						600	240	

IMSC– 401 E Commerce

Max. Marks : 70

Credits:04

Learning Outcome:

On successful completion of the course, the students will be able to

1. Define E-commerce and its impact in different areas.
2. Understand different Business Models
3. Handle electronic transactions in secure way
4. Understand the basic concepts and technologies used in the field of management information systems.

Min. Marks: 28

Duration:2½ hrs

Unit – I

E-Commerce -Introduction, Advantage, Disadvantages, Traditional commerce Vs. E-Commerce, Partial Vs Pure E-commerce. Impact of E-Commerce in different areas, The anatomy of E-commerce,

EDI: Introduction, Types of EDI, EDI Security and Privacy Issues, Application of EDI in business, Electronic-Catalogs, Digital Libraries.

Unit – II

Framework of E-commerce, Business Models based on the relationship of Transaction Parties Business - to - Business (B2B), Business - to - Consumer (B2C), Consumer - to - Consumer (C2C), Consumer - to - Business (C2B), Business - to - Government (B2G), Government - to - Business (G2B), Government - to - Citizen (G2C), Intra- Business Organizational.

What is E-Governance: Objectives, Benefits, Developmental stages of E-governance, Prerequisites for E-governance, E-governance models.

Business Models based on the relationship of Transaction types: Brokerage model, Aggregator and Advertising model.

Unit – III

Electronic Payment Systems: Introduction, Features, Types (E-Cash, E-cheque, credit card, Smart Card, Electronic Purses), Electronic Payments and Protocols E-Customer Relationship Management, Security Threats (Active, Malicious, Server side).

Ethical, Social, and Political issues in E-commerce: Understanding ethical, social, and political issues in E-commerce, Privacy and information rights, Intellectual property rights, Governance, Public safety and welfare.

Reference Books:-

- The Complete E Commerce Book – Janice Reynolds – CRC Press
- E Commerce A Beginners Guide - Daniel D'Apollonio – Google Books
- HTML Black Book – Steven Holzner – DreamTech

IMSC– 402 Advance Database Management System

Max. Marks : 70

Credits:04

Min. Marks: 28

Duration:2½ hrs

Learning Outcome:

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

1. Compare and Contrast between different types of databases.
2. Optimize the operations
3. Implement basic operations of database language
4. Handle the events occurring on database and explicit error handling
5. Execute various advance SQL and PL/SQL queries related to Transaction Processing & Locking using concept of Concurrency control.

Unit – I

Transaction Processing: ACID Properties, Transaction State, Concurrent Executions, Need of Serializability, Conflict vs. View Serializability, Testing for Serializability.

Concurrency Control: Implementation of Concurrency: Lock-based protocols, Timestamp-based protocols, Deadlock handling.

Database Failure and Recovery: Database Failures, Recovery Schemes: Shadow Paging and Log-based Recovery.

Query optimization & processing: Introduction, Algorithm for external sorting, select & join operation, project & set operations.

UNIT - II

Parallel Databases : I/O Parallelism, Interquery Parallelism, Intraquery Parallelism.

Distributed Databases: Replication and Fragmentation, Distributed Transactions, Commit protocol, Concurrency Control in Distributed Databases.

UNIT - III

Introduction to PL/SQL and its advantages over SQL, PL/SQL block structure, variables and constants, attributes, character set, data types, control structures, conditional control.

Sequential control, Introduction to Cursor (Implicit & Explicit), Error handling in PL/SQL, creating function & procedure, package functions, package procedures, Oracle transactions

Database Triggers: Introduction, Use & type of database Triggers, Triggers Vs. Declarative Integrity Constraints, BEFORE Vs. AFTER Trigger Combinations, Creating a Trigger, Dropping a Trigger.

Reference Books:-

- SQL Complete Reference, Leon and Leon, Tata McGraw Hill
- SQL, PL/SQL Programming Language, Ivan Bayross, BPB Publications
- DB2 Developer's Guide, Mullins, BPB Publications
- Data Base Management System, Navathe, Pearson Education Asia.

IMSC- 403 Python Programming

Max. Marks : 70

Credits:04

Min. Marks: 28

Duration:2½ hrs

Learning Outcome:-

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

1. Improve programming skills
2. Hands on Regular Expression

3. Ability to Text Processing scripts
4. Develop Problem solving and programming capability.

Unit- I

Python Basics: IDLE, Editors, Keywords, Identifiers, Indents, Input Output Basic Syntax, Variable, Dynamic Typing, Data Types (Mutable and Immutable), Built-in Conversion Methods.

Operator: Arithmetic, Comparison, Logical, Identity, Membership.

Control Statements: Conditional (If , If- else, Elself, Nested if-else), Looping (While, For, Nested loops), Break, Continue, Pass.

Array: Introduction, Creation, Traverse, Insertion, Deletion, Search, Update.

Unit- II

String: Introduction, Types, Escape Sequences, Formatting, Operators, Built-in Methods (Capitalize, Upper, Lower, Title, Find, Count, Isalpha, Isdigit, Islower, Isupper), Basic Operations (Accessing, Updating, Concatenation).

List & Tuple: Introduction, Accessing, Operators, Built-in Methods (Len, Max, Min, Append, Insert, Remove, Pop, Reverse, Sort, List), Basic Operations (Updating, Delete, Concatenation, Indexing, Slicing).

Set: Introduction, Accessing, Built-in Methods (Add, Update, Clear, Copy, Discard, Remove), Operations (Union, Intersection, Difference).

Dictionary: (Single Dimensional) Introduction, Accessing, Updating, Deleting, Viewing values in dictionaries, Built-in Methods (Len, Max, Min, Pop, Clear, Items, Keys, Values, Update).

Unit- III

Function: Defining, Calling, Function Arguments (Required, Keyword, Default, Variable Length) Anonymous Functions, Global and Local Variables.

Modules: Introduction, Importing Module, Built-in Modules (Math, Statistics, Random).

Package: Creating, Installing, Importing Modules from the Package.

Errors & Exception: Error Types, Exception Handling - Introduction, Try, Except, Else, Finally.

File Input-Output: Opening and Closing files, Reading and Writing files.

Reference Books:

- Let Us Python – Yashavant Kanetkar, BPB Publications.
- Python The Complete Reference – Martin C. Brown, McGraw Hill
- Core Python Programming – R. Nageswara Rao, Dreamtech Press.

IMSC– 404 Operating System

Max. Marks : 70

Credits:04

Learning Outcome:

On successful completion of the course, the students will be able to

1. Understand the structure and functionalities of an OS
2. Apply scheduling algorithms
3. Apply different page replacement algorithms
4. Understand concept of memory management and to handle deadlock
5. The course will cover an introduction on the policies for scheduling, deadlocks, memory management, synchronization, system calls.

Unit I

Introduction to Operating Systems, goals of OS, Operations of OS, Classes of OS, batch processing, resident monitor, job control language, buffering, spooling, multiprogramming. Multi-processing, time sharing, distributed, real time systems, system calls, structure of OS, layer design of DOS, Unix structure.

Unit II

Process Management: Process concept, Process scheduling, Cooperating processes, Threads, Inter-process communication, Process scheduling, fundamental of scheduling, scheduling criteria, long medium short term scheduling, Preemptive and non-preemptive scheduling , CPU scheduling algorithms: FCFS, SJF, Priority, Round Robin

Process Synchronization and Deadlocks: The Critical-Section problem, Semaphores, Monitors

Unit III

Min. Marks: 28

Duration:2½ hrs

Storage management: Memory Management-Logical versus physical address, swapping, contiguous allocation, fragmentation, Compactation, paging, segmentation, page replacement algorithm, virtual memory, virtual memory with paging, demand paging. Thrashing.

Deadlocks-System model, Characterization, Deadlock prevention, Avoidance and Detection, Combined approach to deadlock handling.

Reference:

- Operating System Concepts, Galvin, Addison Wesley
- Operating Systems, Ritchie, BPB Publications.

Course Structure in Semester V

Paper Code	Nomenclature of the Paper	Contact Hours Per Week	Credits	Total Marks		Max. Marks	Min. Marks	Exam. Duration
				CIA	ESE			
IMSC– 501	Computer Communication & Networking	04	04	30	70	100	40	2 ½ Hr.
IMSC– 502	Open Source Operating System	04	04	30	70	100	40	2 ½ Hr.
IMSC– 503	VB. Net Programming	04	04	30	70	100	40	2 ½ Hr.
IMSC– 504	A. Mobile Computing OR B. Mobile Application Development	04	04	30	70	100	40	2 ½ Hr.
IMSC– 505	Prac.: CCN Lab using Network Simulator	04	02	15	35	50	20	3 Hr.
IMSC– 506	Prac.: OSOS (Linux) Lab	04	02	15	35	50	20	3 Hr.
IMSC– 507	Prac.: VB.Net Programming Lab	04	02	15	35	50	20	3 Hr.
IMSC– 508	A. Prac.: WML Lab OR B. Prac.: Android Programming Lab.	04	02	15	35	50	20	3 Hr.
Semester Total						600	240	

IMSC- 501 Computer Communication and Networking

Max. Marks : 70

Credits:04

Min. Marks: 28

Duration:2½ hrs

Learning Outcome

1. Study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model.
2. Acquire knowledge of Transmission Media and Error checking and correction method
3. Gain core knowledge of Asynchronous transmission Mode
4. Include learning about computer network organization and implementation, obtaining theoretical understanding of data communication and computer networks.

Unit I

Networking Basics: Introduction to digital communications, Types of network: LAN, WAN, MAN,

Types of network terminal: Client (Thin, Fat, Hybrid), Server (File, Mail, Application, Communication, Database, Print), Client Server Model

Topology: Bus, Ring, Star, Tree/Snowflake, Mesh, Combined/ Hybrid

Concepts of: Amplitude, Frequency, Phase, Bit rate, Baud rate, Bandwidth.

Signal types: Analog signals, Digital signals, Periodic, Aperiodic

Unit II

Transmission Media: Guided, Unguided, **Transmission Mode:** Parallel, Serial

Networking Devices: Router, Hub, Switch, Bridge, Gateway

Switching: Introduction, Types (circuit, packet, message)

Multiplexing: Frequency division, Wavelength division, Time Division, Demultiplexing

Unit III

Protocol: Standards, Architecture, OSI Model, TCP/IP Model, HDLC

Asynchronous transfer mode: Introduction, Protocol architecture, ATM cells, ATM layers,

Point to Point Protocol: point-to-point layers, link control protocol, network control protocol.

Error classification: Types of errors (Single Bit Error, Burst Error).

Reference:

- Data and Computer communications, William Stallings, PHI
- Data communication and networking, Behrouz A. Forouzan
- Data communication and networking, A S Godbole, Tata McGrawhill
- Network concepts and Architecture, Hancock, BPB Publications

IMSC– 502 Open Source Operating System

Max. Marks : 70

Credits:04

Min. Marks: 28

Duration:2½ hrs

Learning Outcome:

On successful completion of the course, the students will be able to

1. Understand open source software's utilities
2. Execute shell commands
3. Understand user and editors in Linux
4. Understanding the basic set of commands and utilities in Linux systems. To learn to develop software for Linux systems

UNIT – I

Introduction of Open Source Software, Need of Open Source, comparison with closed source / Proprietary software. Linux Architecture, Linux Virtual File System, Linux file system (Boot Block, Inode, Super block, Boot Block), Mounting and Unmounting, Types of File system (EX2, EX3, EXT4, NTFS)

Kernel: Architecture of kernel, types of Linux Kernel, Process Management in Linux. Signals and System calls in Linux.

UNIT – II

Shell Commands: user access commands, directory commands, file manipulation commands, security and protection commands, inter user and inter-machine communication, information commands, process management commands, program development and debugging commands, system administration commands, I/O Redirection and Piping, Relation and Absolute path, hard link and soft link, Ownership and Access Permissions, Linux Directory types, User and its Home Directory Vi editor.

UNIT – III

Shell Programming – Introduction to Shell, Various Shell of Linux, Shell Variables, Shell keywords, Positional Parameters, Control statements- if-then-else, case-switch, While, Until, Find, Shell Metacharacters.

Bootting and Shutting down BootLoaders: LILO, GRUB, Bootstrapping, init Process.

References Books:

- A practical Guide to Linux, Sobell, Pearson.
- A Practical Guide to Linux Commands, Editors, and Shell Programming, Sobell, Pearson.
- A Practical Guide to Fedora and Red Hat Enterprise Linux, Sobell, 5e, Pearson.
- Redhat Linux 6.0 Administration Wiley

IMSC– 503 VB. Net Programming

Max. Marks : 70

Min. Marks: 28

Credits:04

Learning Outcome:

On successful completion of the course, the students will be able to

1. Understand the .net Framework
2. Know the use of variables and operators
3. Design user interface and apply looping and decision making .
4. Connect with database
5. Understand and implement string manipulation, events, and exception handling within. NET application environment

Unit - I

Overview of .NET Framework

What is .NET framework, Origins of .NET, Architecture & Components, Common Language Runtime, Common Type System, Common Language Specification, MSIL, Framework Base Classes & Namespaces, IDE, .NET Languages.

Visual Basic Language Features:

Introduction to VB.NET, Program Structure and Code Conventions, Data Types & Variables, Constants & Enumerations, Operators,

Unit – II

Decision making & Looping, Arrays & Strings, Date & Time, Procedures in VB.

Building a User Interface:

The Visual Basic Environment, Event-Driven Programming, Building Forms: The Basics & Advanced Techniques, Working with Traditional Controls: Label Control, Text Box, Creating Buttons, Option Buttons, List Box, Combo Box.

Unit – III

Using Advanced Controls: Creating Timers, Dialog Boxes, Picture Box, List View Control, Tree View Control, Menus and Toolbars.

Working with Database:

Introduction to ADO.NET, Connecting to a database, Data Tables, DataRow, Navigating records, Adding, editing, and deleting records.

Reference Books:

- The Complete Reference Visual Basic .NET, Jeffery R Shapiro (McGraw-Hill/Osborne)
- Application of .NET Technology, Module- 4.1-R4 By Prof. Satish Jain (BPB Publications)

IMSC– 504 (A) Mobile Computing

Max. Marks : 70

Credits:04

Learning Outcome:

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

1. Define Mobile Communication and Mobile IP.
2. Simulate the process of routing.
3. Outline the support for mobility.
4. Create a general purpose implementation model of mobility in networks.
5. Understand fundamentals of wireless communications. Analyze security, energy efficiency, mobility, scalability, and their unique characteristics in wireless networks

Unit I

Wireless Communication: History and Generations. Applications of Wireless Communication - Vehicles, Emergency, Business, Location dependent service, Infotainment.

Mobile Communication: Introduction, Features - High capacity load balancing, Scalability, Network Management System, Role based access control, Switching. Advantages of Mobile Communication, Mobile and Wireless devices. Simplified Reference Model of Communication.

Mobile IP - Goals, assumptions and requirements, Entities and terminology, IP packet delivery, Agent discovery, Registration, Tunneling and encapsulation, Optimizations, Reverse tunneling, IPv6.

Unit II

Mobile Network Layer: Dynamic host configuration protocol, Mobile ad-hoc networks, Routing, Destination sequence distance vector, Dynamic source routing, Alternative metrics.

Mobile Transport Layer: Traditional TCP - Congestion control, Slow start, Fast retransmit/fast recovery, Implications of mobility. Classical TCP improvements - Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit / fast recovery, Transmission/time-out freezing, Selective retransmission, Transaction-oriented TCP.

Unit III

Support for Mobility: File systems - Consistency, Coda, Little work, Ficus, Mlo-NFS, Rover. World wide web - Hypertext Transfer Protocol (HTTPS), Hypertext markup language, System architecture.

Wireless Application Protocol: Architecture, Wireless datagram protocol, Wireless transport layer security, Wireless transaction protocol, Wireless session protocol, Wireless application environment, Wireless markup language, WMLScript.

Wireless telephony application, Push architecture, Push/pull services.

Reference Books:-

- Mobile Communications, Second Edition, Jochen Schiller. Addison- Wesley.
- Wireless Communication & Networking Made Simple, Prof. Satish Jain, Vineeta Pillai, BPB Publications.

IMSC– 504 (B) Mobile Application Development

Max. Marks : 70

Credits:04

Min. Marks: 28

Duration:2½ hrs

Learning Outcome:

On successful completion of the course, the students will be able to

1. Define Android OS and its architecture.
2. Simulate the process of application life cycle.
3. Outline the Application development in Android.
4. Create a general purpose application for android OS.
5. Design and develop user Interfaces for the Android platform.

Unit I

Android Introduction: Definition, History and Versions, Features, Applications, Categories, API Level.

Android Architecture: Linux kernel, Native Libraries, Android Runtime, Android Framework, Applications

Environment Setup: Set-up Java Development Kit (JDK), Android IDEs

Core Building Blocks: Activity, View, Intent, Service, Content Provider, Fragment, AndroidManifest.xml, Android Virtual Device (AVD), Dalvik VM.

Unit II

Resource files: Strings, Colors, Dimensions.

User Interface: Constraint Layout, Linear Layout, TextView, EditText, Button, CheckBox, ToggleButton, RadioButton, Toast, Spinner, ListView, RatingBar, DatePicker, TimePicker, ProgressBar.

Activity Lifecycle: Activity Lifecycle methods - onCreate, onStart, onResume, onPause, onRestart, onDestroy.

Unit III

Broadcast Receivers: Creating the Broadcast Receiver, Registering Broadcast Receiver, Event Constant & Description. Android Intent, Types of Android Intents - Implicit Intent, Explicit Intent, StartActivityForResult, Share App Data.

Android Menu: Option Menu, Context Menu, Popup Menu.

Android Fragments, Fragment Lifecycle, Methods.

Reference Books:-

- Android Application Development, Rick Rogers, O'Reilly.
- Starting with Android, M.M. Sharma-Rashmi Aggarwal, BPB Publications.

Course Structure in Semester VI

Paper Code	Nomenclature of the Paper	Contact Hours Per Week	Credits	Total Marks		Max. Marks	Min. Marks	Exam. Duration
				CIA	ESE			
IMSC– 601	Software Engineering	04	04	30	70	100	40	2 ½ Hr.
IMSC– 602	Information Protection & Security	04	04	30	70	100	40	2 ½ Hr.
IMSC– 603	C # Programming	04	04	30	70	100	40	2 ½ Hr.
IMSC– 604	A. Website Development OR B. Server Administration	04	04	30	70	100	40	2 ½ Hr.
IMSC– 605	Prac.: Project	04	02	15	35	50	20	3 Hr.
IMSC– 606	Prac.: Inf. Protection Security Lab	04	02	15	35	50	20	3 Hr.
IMSC– 607	Prac.: C# Programming Lab	04	02	15	35	50	20	3 Hr.
IMSC– 608	A. Prac.: Website Devp. using PHP Lab. OR B. Prac.: Configuring Linux Server	04	02	15	35	50	20	3 Hr.
Semester Total						600	240	

IMSC– 601 Software Engineering

Max. Marks : 70

Credits: 04

Learning Outcome:

On successful completion of the course, the students will be able to

1. Understand basic concepts of software engineering.
2. Compare different software engineering process models
3. Create architectural design for a given project and apply different testing techniques
4. Basic knowledge and understanding of the analysis and design of complex systems and ability to apply software engineering principles and techniques.

Unit – I

Software Engineering : Concept, Software Characteristics, Software myths, Software Applications, Software Engineering Definitions, System Development Life Cycle (SDLC) ,

Software Process Model: Water fall Model, Incremental Model, Prototype. Spiral model.

Software Requirements, Functional and non-functional requirements, User requirements, System requirements.

Unit – II

Software Metrics: Role of Metrics and Measurement, Process and Product Metrics, Size metric. COCOMO Model

Planning and Software Project:

Project Scheduling and its goal, Work breakdown structure, Project Scheduling and its techniques: Gantt Chart, PERT and CPM.

Design: Introduction, Objective , Modularity (Cohesion & Coupling)

Unit – III

Coding: Introduction and Clean room Approach

Testing: Introduction, Objective, Characteristics, Principles, Testability

Software Testing Strategies: Unit Testing, Integration Testing, Validation Testing (Alpha and Beta Testing), Verification, System Testing (Recovery, Security, Stress, Performance),

Black Box Testing and White Box Testing: Introduction and Comparison.

Reference Books:-

- Roger S. Pressman, “Software Engineering – A Practitioner’s Approach “, Sixth Edition, McGraw
- R.E. Fairley, “Software Engineering Concepts”, Paperback Edition, McGraw Hill.
- Jalota, “An Integrated Approach to Software Engineering”, Narosa Publishing House

IMSC– 602 Information Security & Protection

Max. Marks : 100

Credits: 04

Learning Outcome:

On successful completion of the course, the students will be able to

1. Identify and classify computer and security threats and develop a security model to prevent, detect and recover from attacks
2. Understand the concept of encryption and analyze various symmetric & asymmetric encryption algorithm
3. Familiarize with network security designs
4. Evaluate and communicate the human role in security systems with an emphasis on ethics, social engineering vulnerabilities and training.

Unit – I

Introduction to the concepts of security: Need for security, Principles of Security, types of attacks, Malware: Viruses, Worms, Trojan horses, Cryptographic techniques: plain text and cipher text, substitution and transposition techniques: Caesar cipher, modified Caesar cipher, monoalphabetic cipher, Vigenere cipher, hill cipher, Vernam Cipher.

Steganography, key range and key size.

Unit-II

Computer based symmetric key cryptographic algorithm: Introduction, Diffie Hellman Key Exchange/ Agreement algorithm Algorithm types: stream cipher and block cipher and mode: ECB, CBC, CFB, OFB. An overview of symmetric key cryptography, Feistel Structure, concept of confusion and diffusion, basics of data encryption standard DES.

Computer based asymmetric cryptographic algorithm: Introduction of asymmetric key cryptography, an overview of asymmetric key cryptographic, and the RSA algorithm.

Unit- III

Public Key Infrastructure (PKI): Introduction, Digital Certificates, Private Key Management

Internet security protocols: basic concepts, secure socket layer SSL, Secure hypertext transfer protocol.

User authentication mechanism: passwords, certificate based authentication, biometrics authentication.

System Security: Intruders, Viruses, Firewall.

Reference Books:-

- Cryptography and Network Security - William Stallings – Pearson
- Behrouz A. Forouzan and D. Mukhopadhyay- Cryptography & Network Security, 2nd Edition - 1st reprint 2010, McGraw Hill, New Delhi.
- Wade Trappe, Lawrence C. Washington- Introduction to Cryptography with coding Theory, 2nd Edition pearson Education

IMSC– 604 C # Programming

Max. Marks : 70

Credits:04

Learning Outcome:

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

1. Understand and apply concept and features of C#
2. Know the concept of OO Features
3. Handle events and errors occurring in the system
4. After completion of the course the student will be able to use the features of Dot Net Framework along with the features of C#

Unit – I

C# : Evolution, History & Overview. **Fundamentals of C#:** Identifiers, Keywords, Literals, Punctuators, Operators. **Data Types :** Value Type & ReferenceType. **Expressions:** Implicit & Explicit Conversion

(Boxing & Unboxing). **Program Flow Controls:** Decision Control -(if, if – else, Nesting), Switch, Ternary. Loop – (while, do-while, for, foreach, Nesting). break, continue, goto statements.

User Defined Data Types: Arrays (Single, Multi & Jagged), Structure & Enum.

Unit – II

Class: Structure of Class, Objects, Class Modifiers (private, public, protected, internal, protected internal, abstract, sealed) Constructors (default, parameterized, Copy), Destructor. This reference, Static, Constant and Readonly members. **Methods:** Parameter Passing (Value, Reference, Params). **Inheritance, Polymorphism, Interfaces:** Concept, Types, Modifiers (Virtual, Override, New).

Unit – III

Method Overloading, Operator Overloading. Properties, Indexers, **Delegates:** Single Cast delegate, Multi Cast delegates, Passing delegate as parameter. **Events:** Concept & Declaration, Event Handlers. **Errors & Exceptions:** Types of Errors, Try-Catch, Nested Try blocks, Throwing own exceptions, **Multithreading:** Creating & Starting a Thread, Scheduling, Synchronization.

Reference Books:-

- Programming with C#, B.Rama Krishna Rao (PHI)
- Beginners Guide C#, Herbert Schildt (Mc Graw Hill)
- Let Us C# by Yashavant Kanetkar, Asang Dani (BPB Publications)

IMSC– 604 (A) Website Development

Max. Marks : 70

Credits:04

Learning Outcome

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

1. Impart knowledge server side programming using PHP
2. Develop the decision making statement logic under different concepts using XAMP server
3. Gain ability to develop web applications database connectivity using MYSQL Database
4. The student will discover how does web works really, what makes web sites work, how to and where to start research, planning for website & build excellent web sites

Unit – I

PHP – Introduction, Common Uses of PHP, Characteristics of PHP, PHP – Environment Setup (XAMPP), Installation on Windows, PHP – Syntax, Running PHP Script from Command Prompt PHP – Variable, Local Variables, Global Variables, Static Variables, Constants, Operator Types, Precedence of Operators

Unit – II

PHP: Decision Making: If...Else Statement, ElseIf Statement, Switch Statement, Loop Types:, while , do...while, for, for each, break, continue , Arrays : Numeric Array, Associative Arrays, Multidimensional Arrays, Strings function, Web Concepts, GET and POST, File Inclusion, File & I/O

Unit – III

PHP : Functions, Cookies, Sessions, Sending, File Uploading, Error and Exception Handling, PHP PHP and MySQL: Connecting to MySQL Database, Create MySQL Database Using PHP, Insert MySQL Database Using PHP, Delete Data to MySQL Database, Retrieving Data from MySQL Database

Reference Books:-

- PHP A Beginners Guide – Vikram Vaswani – McGraw Hill
- Programming PHP – Kevin Tatroe, Peter Macintyre – O'Reilly
- PHP & My SQL Web Development – Laura Thompson & Luke Welling – Addison Wesley

IMSC– 604 (B) Sever Administration

Max. Marks : 70

Credits:04

Learning Outcome:

On successful completion of the course, the students will be able to-

1. Familiar with a basic set of Linux Server commands and utilities.
2. Appreciate the importance of ethics in system administration, and to understand and apply a set of ethical rules in management of a computer system.

3. Know some basic security measures to take in system administration.
4. Provide knowledge to demonstrate an understanding of the principles, practices and goals of system administration.

Unit I

Open Source Server Settings (Linux Server) : System requirements, File locations, Starting the directory server management console, Managing directory server instances, Managing directory server administration server service, Enabling ldapi, Changing directory server port numbers, Using directory server plug-ins, Server configuration attributes.

Configuring directory databases: Creating and maintaining (suffixes, databases, database links), Configuring cascading chaining, Using referrals.

Managing directory entries: Using the command line and directory console.

Tracking modifications to directory entries: modifications to the database through update sequence numbers, entry modifications through operational attributes, bind dn for plug-in initiated updates, password change times

Unit II

Maintaining referential integrity: Working, Using with replication, Enabling and disabling referential integrity. Modifying the update interval, Modifying the attribute list, Configuring scope for the referential integrity.

Populating directory databases: Importing data, Exporting data, Backing up and restoring data.

Managing attributes and values: Enforcing attribute uniqueness, Assigning class of service, Linking attributes to manage attribute values, Assigning and managing unique numeric attribute values.

Organizing and grouping entries: Using groups, Using roles, Automatically creating dual entries, Using views.

Configuring secure connections: Requiring secure connections, Setting a minimum strength factor, Managing the nss database used by directory server, Enabling tls, Displaying the encryption protocols enabled in directory server, Setting the encryption protocol versions using hardware security modules, Using certificate-based client authentication, Setting up sasl identity mapping, Using kerberos gss-api with sasl, Setting sasl mechanisms, Using sasl with ldap clients

Unit III

Configuring attribute encryption: Encryption keys, Encryption ciphers, Configuring attribute encryption from the console, Configuring attribute encryption using the command line, Enabling attribute encryption for existing attribute values, General considerations after enabling attribute encryption, Exporting and importing an encrypted database, Updating the tls certificates used for attribute encryption

Managing fips mode support: Enabling fips mode support, Disabling fips mode support

Managing the directory schema: Overview of schema, Managing object identifiers, Directory server attribute syntaxes, Managing custom schema in the console. Managing schema using ldapmodify, Creating custom schema files, Dynamically reloading schema, Turning schema checking on and off, Using syntax validation

Reference Books:

- Linux: Powerful Server Administration, April 2017, Packt Publishing Ltd.
- An Introduction to Linux Server Administration, John Ostrowick, 2017
- Linux Apache Web Server Administration, Charles Aulds, 2002, Wiley Publication.
- Making Servers Work A Practical Guide to Linux System Administration, 2020, DigitalOcean

Course Structure in Semester-VII

Paper Code	Nomenclature of the Paper	Contact Hours		Credits	Total Marks		Max. Marks	Min. Marks	Exam. Duration
		Per Sem.	Per Week		Internal	External			
IMSC–701	Artificial Intelligence	45	03	04	30	70	100	40	2 ½ Hr.
IMSC–702	Cloud Computing	45	03	04	30	70	100	40	2 ½ Hr.
IMSC–703	Data Science Using R	45	03	04	30	70	100	40	2 ½ Hr.
IMSC–704	(a) Internet of Things	45	03	04	30	70	100	40	2 ½ Hr.
	(b) Image processing								
IMSC–705	Prac.: Artificial Intelligence	60	04	02	15	35	50	20	3 Hr.
IMSC–706	Prac.: Cloud Computing	60	04	02	15	35	50	20	3 Hr.
IMSC–707	Prac.: Data Science Using R	60	04	02	15	35	50	20	3 Hr.
IMSC-708	(a) Prac.: Internet of Things	60	04	02	15	35	50	20	3 Hr.
	(b)Prac.: Image Processing								
Semester Total							600	240	

IMSC-701 : ARTIFICIAL INTELLIGENCE

Max. Marks : 70
Credits: 04

Min. Marks: 28
Duration: 2½ hrs

Learning Outcome:

On successful completion of the course, the students will be able to

1. Understand basic principles and application of AI
2. Solve various problems by applying a suitable search method
3. Understand key concept of learning
4. Develop Skills to Plan an expert system for specific domain

Unit I

Definition of AI, Applications of AI, knowledge-based systems, representation of knowledge, organization and acquisition of knowledge.

State space, Production system and its components, problem characteristics, production system characteristic, Problems (8-Puzzle problem, Tower of Hanoi, Cannibals and Missionaries and Travelling Salesman Problem)

Search problems: DFS, BFS, Heuristics Search (Generate and test, Greedy or Best First search).

Unit II

Syntax, semantics of propositional logic, syntax and semantics of FOPL, conversion to clausal form. Inference rule, resolution principles.

Non-deductive inference methods, truth maintenance system, fuzzy logic, Bayesian probabilistic inference, associative networks, frame networks.

Unit III

Concept of learning: Inductive and deductive, rote learning, Components of Learning Model, Performance Measures, Types of Learning (Supervised, Unsupervised, Active & Reinforcement).

Concept of expert system, need for an expert system, Characteristics & features of an expert system, Components of an expert system, Stages in the development of an expert system, Application areas of Expert System.

Reference Books:

1. Introduction to AI & Expert System – Patterson - PHI
2. Artificial Intelligence - Elaine Rich & Kevin Knight – MGHill
3. Artificial Intelligence - Luger – Pearson

IMSC-702 : Cloud Computing

Max. Marks: 70

Credits: 04

Min. Marks: 28

Duration: 2½hrs

Learning Outcome:

On successful completion of the course, the students will be able to

1. Demonstrate various technologies related to IAAS.
2. Manage virtual infrastructure in distributed environment.
3. Employ PAAS platforms like Aneka and Comet Cloud.
4. Develop Skills to take appropriate measures for data security over cloud computing.

Unit – I

Introduction to Cloud Computing

Introduction, Layers and Types of Clouds, Desired Features of a Cloud, Cloud Infrastructure Management, Service Models: Infrastructure as a Service (IaaS), Platform as a Service Providers(PaaS), Software as a Service (SaaS), Data Security: Introduction, Cloud Computing and Data Security Risk, Digital Identity.

Unit – II

Infrastructure As A Service (IAAS)

Virtual Machines, Distributed Management of Virtual Infrastructures, Scheduling Techniques for Advance Reservation of Capacity, Cluster as a Service, Cloud Storage, Technologies for Data Security in Cloud Computing.

Unit – III

Platform As A Service (PAAS)

Technologies and Tools for Cloud Computing, Aneka Cloud Platform, Hybrid Cloud Implementation, Comet Cloud, Autonomic Behavior of Comet Cloud.

Software As A Service (SAAS)

Introduction of SAAS, Advantages & Disadvantages, Introduction of Microsoft office 365, Google Apps & CloudSim.

Reference Books:

1. Cloud Computing, A Practical Approach Paperback by Toby Velte, Anthony Velte, McGraw Hill Education.
2. Cloud Computing by Sandeep Bhowmik, Cambridge University Press.
3. Cloud Computing by Rao M.N., PHI Learning Pvt Ltd.

IMSC–703 : Data Science Using R**Max. Marks: 70****Credits: 04****Min. Marks: 28****Duration: 2½ hrs****Learning Outcome:**

On successful completion of the course, the students will be able to

1. Understand the basics in R programming in terms of constructs, control statements and understand the use of R for Data analytics
2. Obtain, clean and transform data, analyze and interpret data using a responsible approach.
3. Use appropriate models of analysis, assess the quality of input and derive insight from results.

UNIT-I

Introduction- Basic elements of R, data input and output, objects, attributes, number, vectors. Creating matrices – Matrix operations – Applying Functions to Matrix Rows and Columns – Adding and deleting rows and columns – Vector/Matrix Distinction – Avoiding Dimension Reduction

Higher Dimensional arrays – lists – Creating lists – General list operations – Accessing list components and values – applying functions to lists.

Reading data from files, controls statements, loops, functions, R scripts

UNIT –II

Data science overviews, data visualisation using graphics in R, Gplot 2, File format of graphics output.

Introduction to hypotheses, types of hypothesis.

Data sampling, confidence and significance level, hypothesis tests, parametric test, non-parametric test.

UNIT-III

Introduction to Regression Analysis, types of regression analysis, nonlinear regression, cross validation, principal component analysis, factor analysis, association rules, Apriori algorithm classification its types, logistics, support vector machine, k-nearest neighbour, Naïve Bayes classification, decision tree classification, random forest classification, evaluating classifier model, introduction clustering, clustering methods.

Reference Books:

1. The Art of R Programming: A Tour of Statistical Software Design, Norman Matloff -NoStarch Press.
2. R for Everyone: Advanced Analytics and Graphics, Jared P. Lander-Addison-Wesley Data, 2013
3. Beginning R – The Statistical Programming Language, Mark Gardener-Wiley, 2013
4. Introductory R: A Beginner's Guide to Data Visualisation, Statistical Analysis and Programming in R, Robert Knell-Amazon Digital South Asia Services Inc, 2013.

IMCS–704 (A) : Internet of Things**Max. Marks: 70****Credits: 04****Min. Marks: 28****Duration: 2½ hrs****Learning Outcome:**

1. Compare and contrast the deployment of smart objects and the technologies to connect them to network.
2. Appraise the role of IoT protocols for efficient network communication.
3. Elaborate the need for Data Analytics and Security in IoT.
4. Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in the Industry.

UNIT-I

Introduction to IoT: Definition, and characteristics of IoT, Genesis of IoT, IoT and Digitization, Design of IOT: Physical design of IOT, Logical Design of IOT- Functional Blocks, communication models, communication APIs, IOT enabling Technologies- Wireless Sensor Networks, Cloud computing, big data analytics, embedded systems. IOT Levels and deployment templates.

IoT Hardware and Software: Sensor and actuator, Humidity sensors, Ultrasonic sensor, Temperature Sensor, Arduino, Raspberry Pi, LiteOS, RIOTOS, Contiki OS, Tiny OS.

Architecture and Reference Model: Introduction, Reference Model and architecture, Representational State Transfer (REST), architectural style, Uniform Resource Identifiers (URIs).

UNIT-II

IP as the IoT Network Layer, The Business Case for IP, the need for Optimization, Optimizing IP for IoT, Profiles and Compliances, Application Protocols for IoT, The Transport Layer, IoT Application Transport Methods

Data and Analytics for IoT, An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT, A Brief History of OT Security, Common Challenges in OT Security, How IT and OT Security Practices and Systems Vary, Formal Risk Analysis Structures: OCTAVE and FAIR, The Phased Application of Security in an Operational Environment

UNIT-III

IoT Physical Devices and Endpoints - Arduino UNO: Introduction to Arduino, Arduino UNO, Installing the Software, Fundamentals of Arduino Programming IoT Physical Devices and Endpoints - IoT Physical Devices and Endpoints - RaspberryPi: Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout, Operating Systems on RaspberryPi, Configuring RaspberryPi, Programming RaspberryPi with Python, Wireless Temperature Monitoring System Using Pi, DS18B20 Temperature Sensor, Connecting Raspberry Pi via SSH, Accessing Temperature from DS18B20 sensors, Remote access to RaspberryPi, Smart and Connected Cities, An IoT Strategy for Smarter Cities, Smart City IoT Architecture.

Reference Books:

1. "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for IOT" by . David Hanes, Gonzalo Salgueiro, Pearson Education.
2. "Internet of Things" by Srinivasa K G, CENGAGE Learning India.
3. "Internet of Things (A Hands-on-Approach)" by . Vijay Madisetti and ArshdeepBahga, VPT.

IMCS-704 (B) : Image Processing

Max. Marks: 70

Credits: 04

Min. Marks: 28

Duration: 2½ hrs

Learning Outcomes

1. Apply knowledge of mathematics for image understanding and analysis.
2. Design and analysis of techniques / processes for image understanding.
3. Design, realize and troubleshoot various algorithms for image processing case studies.
4. Develop Skills to select the appropriate hardware and software tools (Contemporary) for image analysis.

Unit I

Introduction and Digital Image Fundamentals Digital Image Fundamentals, Human visual system, Image as a 2D data, Image representation – Gray scale and Color images, image sampling and quantization Image enhancement in Spatial domain: Basic gray level Transformations, Histogram Processing Techniques, Spatial Filtering, Low pass filtering, High pass filtering Filtering in the Frequency Domain: Preliminary Concepts, Extension to functions of two variables, Image Smoothing, Image Sharpening, Homomorphic filtering

Unit II

Image Restoration and Reconstruction: Noise Models, Noise Reduction, Inverse Filtering, MMSE (Wiener) Filtering

Color Image Processing: Color Fundamentals, Color Models, Pseudo color image processing

Image Compression: Fundamentals of redundancies, Basic Compression Methods: Huffman coding, Arithmetic coding, LZW coding, JPEG Compression standard

Unit III

Morphological Image Processing: Erosion, dilation, opening, closing, Basic Morphological Algorithms: 04 08 hole filling, connected components, thinning, skeletons

Object Recognition and Case studies Object Recognition- patterns and pattern classes, recognition based on decision – theoretic methods, structural methods, case studies – image analysis Application of Image processing in process industries

Reference Books:

1. Gonzalez & Woods, —Digital Image Processing, 3rd ed., Pearson education, 2008
2. Jain Anil K., —Fundamentals Digital Image Processing, Prentice Hall India, 2010
4. Rangaraj M. Rangayyan, —Biomedical Image Analysis, CRC Press, 2005
5. Pratt W.K, —Digital Image Processing, 3rd ed., John Wiley & Sons, 2007
6. Digital Image Processing, 3rd Edition, by Rafael C Gonzalez and Richard E Woods. Publisher: Pearson Education

SGCA

Course Structure in Semester-VIII

Paper Code	Nomenclature of the Paper	Contact Hours		Credits	Total Marks		Max. Marks	Min. Marks	Exam. Duration
		Per Sem.	Per Week		Internal	External			
IMSC-801	Industrial Training (Internship) - Project	180	12	16	120	280	400	160	-
IMSC-802	Project : Report Presentation	240	16	08	60	140	200	80	3 Hr.
Semester Total							600	240	

IMSC-801 : Industrial Training (Internship) – Project

Max. Marks : 400

Min. Marks: 160

Credits: 16

Learning Outcome:

On successful completion of the course, the students will be able to

1. Express technical and behavioral ideas and thoughts
2. Self learned new tools, algorithms and techniques that contribute to the software solution
3. Test and validate conformance of the developed prototype against the original requirements of the problem
 - **75 %** Attendance during the internship is compulsory.
 - Internship Duration 90 Days / (180 Hours)
 - The Project Report work shall be assessed by one internal and one external examiner only of a batch of 30 students in a day.
 - The project work should not be done in a group. Each student shall be allotted one project and 2 copies of the project report in the prescribed format should be submitted in the College.
