Choice Based Credit System

Maharaja Ganga Singh University

M.Sc.(Computer Science)

(Semester System)

2024-25

Postgraduate Programme

(Effective from Academic Year 2024-25)

SYLLABUS
SCHEME OF EXAMINATION AND
COURSES OF STUDY

Table of Contents

Background

Considering the curricular reforms as instrumental for desired learning outcomes, all the academic departments of Maharaja Ganga Singh University Bikaner, made a rigorous attempt to revise the curriculum of postgraduate programs in alignment with National Education Policy-2020 and UGC Quality Mandate for Higher Education Institutions-2021. The process of revising the curriculum could be prompted with the adoption of the "Comprehensive Roadmap for Implementation of NEP-2020". The Roadmap identified the key features of the Policy and elucidated the Action Plan with well-defined responsibilities and an indicative timeline for major academic reforms.

The process of revamping the curriculum started with a series of webinars and discussions conducted by the University to orient the teachers about the key features of the Policy, enabling them to revise the curriculum in sync with the Policy. Proper orientation of the faculty about the vision and provisions of NEP-2020 made it easier for them to appreciate and incorporate the vital aspects of the Policy in the revised curriculum focused on creating holistic thoughtful, creative, and well-rounded individuals equipped with the key 21st-century skills 'for the development of an enlightened, socially conscious, knowledgeable, and skilled nation'.

With NEP-2020 in the background, the revised curricula articulate the spirit of the Policy by emphasising upon - an integrated approach to learning; innovative pedagogies and assessment strategies; multidisciplinary and cross-disciplinary education; creative and critical thinking; ethical and Constitutional values through value-based courses; 21st century capabilities across the range of disciplines through life skills, entrepreneurial and professional skills; community and constructive public engagement; social, moral, and environmental awareness; Organic Living and Global Citizenship Education (GCED); holistic, inquiry-based, discovery-based , discussion-based and analysis-based learning; exposure to Indian knowledge system, cultural traditions and literature through relevant courses offering "Knowledge of India, fine blend of modern pedagogies with indigenous and traditional ways of learning; flexibility in course choices, student-centric participatory learning; imaginative and flexible curricular structures to enable creative combinations of disciplines for study; offering multiple entry and exit points, alignment of Vocational courses with the International Standard Classification of Occupations maintained by the International Labor Organization; breaking the silos of disciplines; integration of extra-curricular and curricular aspects, exploring internships with local industry, businesses and artists and craft persons; closer collaboration between industry and higher education institutions for technical, vocational, and science programs, and formative assessment tools to be aligned with the learning outcomes, capabilities, and dispositions as specified for each course. The university has also developed a consensus on Blended Learning with 10% component of online teaching and 60% face-to-face classes for each program.

The revised curricula of various programs could be devised with concerted efforts of the faculty, Heads of the Departments, and the Deans of Schools of Study. The draft prepared by each department was discussed in a series of discussion sessions conducted at the Department, School, and University level. The leadership of the University has been a driving force behind the entire exercise of developing the uniform template and structure for the revised curriculum. The Vice-Chancellor of the University conducted series of meetings with Heads and Deans to deliberate upon the vital parameters of the revised curriculum to

formulate a uniform template featuring Background, Programme Outcomes, Programme Specific Outcomes, Postgraduate Attributes, Structure of Masters Course, Learning Outcome Index, Semester-wise Courses and Credit Distribution, Course-level Learning Outcomes, Teaching-Learning Process, Blended Learning, Assessment and Evaluation, Keywords, References, and Appendices. The experts of various Board of Studies and School Boards contributed to a large extent in giving the final shape to the revised curriculum of each program.

To ensure the implementation of curricular reforms envisioned in NEP-2020, the University has decided to implement various provisions in a phased manner. Therefore, the curriculum may be reviewed annually so as to gradually include all relevant provisions of NEP-2020.

Program Outcomes

On completing Masters in the Faculty of Science, the students shall be able to realize the following outcomes:

PO	Description
PO1	Acquired knowledge with facts and figures related to various subjects in pure sciences such as Physics, Chemistry, Botany, Zoology, Mathematics, etc.
PO2	Understood the basic concepts, fundamental principles, and scientific theories related to various scientific phenomena and their relevance in day-to-day life.
PO3	Acquired the skills in handling scientific instruments, planning, and performing laboratory experiments The skills of observations and drawing logical inferences from the scientific experiments.
PO4	Analyzed the given scientific data critically and systematically and the ability to draw objective conclusions.
PO5	Been able to think creatively (divergent and convergent) to propose novel ideas in explaining facts and figures or providing new solutions to problems.
PO6	Realized how developments in any science subject help develop other science subjects and vice-versa and how interdisciplinary approach helps provide better solutions and new ideas for sustainable outcomes.
PO7	Developed a scientific outlook concerning science subjects and all aspects related to life.
PO8	Realized that knowledge of subjects in other faculties such as humanities, performing arts, social sciences, etc., can have greatly and effectively influence, which inspires in evolving new scientific theories and inventions.
PO9	Imbibed ethical, moral, and social values in personal and social life, leading to a highly cultured and civilized personality.
PO10	Developed various communication skills such as reading, listening, speaking, etc., which will help express ideas and views clearly and effectively.
PO11	Realized that pursuit of knowledge is a lifelong activity and in combination with untiring efforts and positive attitude and other necessary qualities leads towards a successful life.

Program Specific Outcomes (PSO)

On completing Masters in the M.Sc. in Computer Science, the students shall be able to realize the following outcomes:

PSO	Description
PSO1	Communicate computer science concepts, designs, and solutions effectively and professionally
PSO2	Apply knowledge of computing to produce effective designs and solutions for specific problems
PSO3	Use software development tools, software systems, and modern computing platforms
PSO4	To have the knowledge and the ability to develop creative solutions
PSO5	To develop skills to learn new technology
PSO6	To develop critical reasoning
PSO7	To apply computer science theory and software development concepts to construct computing-based solutions
PSO8	To design and develop computer programs/computer-based systems in the area related to algorithms, networking, web design, cloud computing, Artificial Intelligence, Mobile applications
PSO9	The ability to understand, analyse and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity
PSO10	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success, real-world problems, and meet the challenges of the future
PSO11	The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, lifelong learning and a zest for higher studies and also to act as a good citizen by inculcating in them moral values & ethics

Postgraduate Attributes

- Disciplinary Knowledge
- Creative & Critical Thinking
- Reasoning and Analytical abilities
- Logic/Discrete Mathematics knowledge
- Logical Thinking
- Problem analysis and solving abilities
- Life Skills
- Moral & Ethical Values
- Research Skills

Structure of Masters' Programme

Scheme for
M.Sc. Computer Science (Semester I)
Session 2024-25
Examination Dec 2024

Semester I										
Course Code	**Course Title**	**Code**	**Max. Marks**		**Total Marks**	**Min. Passing Marks (%)**	**L**	**T**	**P ***	**Credits**
			Int. Marks	**Ext. Marks**						
MCS6.5AECT101	Fundamentals of Computer Science	AEC				Non-CGPA S/NS*	2	0	0	2
MCS6.5DCCT102	Mathematics for Computer Science	DCC	30	120	150	36%	5	1	0	6
MCS6.5DCCT103	Computer Organization	DCC	30	80	150	36%	3	1	0	4
MCS6.5DCCP103	Computer Organization Lab			40		36%	0	0	2	2
MCS6.5DCCT104	Internet Programming	DCC	30	80	150	36%	3	1	0	4
MCS6.5DCCP104	Internet Programming Lab	DCC		40		36%	0	0	2	2
MCS6.5DCCT105	C++ Programming	DCC	30	80	150	36%	3	1	0	4
MCS6.5DCCP105	C++ Programming Lab	DCC		40		36%	0	0	2	2
Total CREDITS Semester I						26				
Total MARKS Semester I						600				

- DCC: Discipline-centric compulsory course. AEC: Ability Enhancement course.
- **S/NS*=Satisfactory or Not satisfactory.
- A candidate shall be required to obtain 36% marks to pass in theory, practical, and internals separately
- For Internal Evaluation of 30 Marks (15 Marks theory paper + 5 marks *suggestive + 10 Marks practical paper)
- *Suggestive: Please include assignment/seminar, Logical thinking/application of knowledge, attentiveness, and skills in internal assessment).
- L=Lecture (1 credit = 1 hrs; T=Tutorial (1 credit = 1 hrs); P=Practical(1 credit = 1.5 hrs)

Scheme for
M.Sc. Computer Science (Semester II)
Session 2024-25
Examination June 2025

Semester II										
Course Code	**Course Title**	**Code**	**Max. Marks**		**Total Marks**	**Min. Marks**	**L**	**T**	**P***	**Total Credits**
			Int. Marks	**Ext. Marks**						
MCS6.5VACT201	National and Human Values	VAC				Non-CGPA S/NS*	2	0	0	2
MCS6.5DCCT202	Data Communication and Networking	DCC	30	120	150	36%	5	1	0	6
MCS6.5DCCT203	Database Management System	DCC	30	80	150	36%	3	1	0	4
MCS6.5DCCP203	Database Management System Lab			40		36%	0	0	2	2
MCS6.5DCCT204	Operating System	DCC	30	80	150	36%	3	1	0	4
MCS6.5DCCP204	Operating System Lab			40		36%	0	0	2	2
MCS6.5DCCT205	PHP	DCC	30	80	150	36%	3	1	0	4
MCS6.5DCCP205	PHP Lab			40		36%	0	0	2	2
Total CREDITS Semester II							26			
Total MARKS Semester II							600			

• DCC: Discipline-centric compulsory course. AEVAC: Value added course
• **S/NS*=Satisfactory or Not satisfactory.
• A candidate shall be required to obtain 36% marks to pass in theory, practical, and internals separately
• For Internal Evaluation of 30 Marks (15 Marks theory paper + 5 marks *suggestive + 10 Marks practical paper)
• *Suggestive: Please include assignment/seminar, Logical thinking/application of knowledge, attentiveness, and skills in internal assessment).
• L=Lecture (1 credit = 1 hrs; T=Tutorial (1 credit = 1 hrs); P=Practical(1 credit = 1.5 hrs)

Scheme for
M.Sc. Computer Science (Semester III)
Session 2025-26
Examination Dec 2025

Semester III										
Course Code	**Course Title**	**Code**	**Max. Marks**		**Total Marks**	**Min. Marks**	**L**	**T**	**P ***	**Total Credits**
			Int. Marks	**Ext. Marks**						
MCS6.5SDC301	Basic Communication Skills or Seminar + Academic Writing	SDC				Non-CGPA S/NS*	2	0	0	2
MCS6.5DCCT302	Data Structures	DCC	30	80	150	36%	3	1	0	4
MCS6.5DCCP302	Data Structures			40		36%	0	0	2	2
MCS6.5DCCT303	Java	DCC	30	80	150	36%	3	1	0	4
MCS6.5DCCP303	Java Lab			40		36%	0	0	2	2
MCS6.5DSET304	a) Software Engineering & Research Methodology b) Artificial Intelligence c) Big Data & Data Mining	DSE	30	120	150	36%	5	1	0	6
MCS6.5DSET305	a) Data Analysis Using R b) Introduction to LaTeX c) Python Programming	DSE	30	80	150	36%	3	1	0	4
MCS6.5DSEP305	a) Data Analysis Using R Lab b) Introduction to LaTeX Lab c) Python Programming Lab			40		36%	0	0	2	2
Total CREDITS Semester III							26			
Total MARKS Semester III							600			

• DCC: Discipline-centric compulsory course. DSE: Discipline Specific Elective. SDC Skill Development Course
• **S/NS*=Satisfactory or Not satisfactory.

• A candidate shall be required to obtain 36% marks to pass in theory, practical, and internals separately
• For Internal Evaluation of 30 Marks (15 Marks theory paper + 5 marks *suggestive + 10 marks practical paper)
• *Suggestive: Please include assignment/seminar, Logical thinking/application of knowledge, attentiveness, and skills in internal assessment).
• L=Lecture (1 credit = 1 hrs; T=Tutorial (1 credit = 1 hrs); P=Practical(1 credit = 1.5 hrs)

Scheme for
M.Sc. Computer Science (Semester IV)
Session 2025 -26
Examination June 2026

Semester IV										
Course Code	**Course Title**	**Code**	**Max. Marks**		**Total Marks**	**Min. Marks**	**L**	**T**	**P***	**Credits**
			Int. Marks	**Ext. Marks**						
MCS6.5AECT401	General Health and Hygiene	AEC				Non-CGPA S/NS	2	0	0	2
MCS6.5DSET402	a) Machine Learning b) Computer Graphics & Multimedia c) Natural Language Proccesing	DSE	30	80	150	36%	3	1	0	4
MCS6.5DSEP402	a) Machine Learning b) Computer Graphics & Multimedia c) Natural Language Processing			40		36%	0	0	2	2
MCS6.5DSET403	a) Cloud Computing b) Internet of Things c) Android Programming	DSE	30	80	150	36%	3	1	0	4
MCS6.5DSEP403	a) Cloud Computing b) Internet of Things c) Android Programming			40		36%	0	0	2	2
MCS6.5DPRRT404(a) or MCS6.5DOJT404(b) or MCS6.5RCCT404(c)	a) Dissertation/Project/Field Study (DPR) b) Internship c) On-Job Experience (OJT)	DPR or OJT or RCC	60	240	300	36%	0	0	12	12

	d) Research Credit Course (RCC)									
Total CREDITS Semester IV								26		
Total MARKS Semester IV								600		
Total CREDITS (Semester I + Semester II+ Semester III + Semester IV)								104		
Total MARKS (Semester I + Semester II+ Semester III + Semester IV)								2400		

• DCC: Discipline-centric compulsory course. DSE: Discipline Specific Elective. SDC Skill Development Course
• **S/NS*=Satisfactory or Not satisfactory.
• A candidate shall be required to obtain 36% marks to pass in theory, practical, and internals separately
• For Internal Evaluation of 30 Marks (15 Marks theory paper + 5 marks *suggestive + 10 marks practical paper)
• *Suggestive: Please include assignment/seminar, Logical thinking/application of knowledge, attentiveness, and skills in internal assessment).
• L=Lecture (1 credit = 1 hrs; T=Tutorial (1 credit = 1 hrs); P=Practical(1 credit = 1.5 hrs)

Learning Outcome Index

Learning Outcomes are statements of knowledge, skills, and abilities a student should possess and demonstrate upon completion of learning experiences.

I. Programme Outcomes(PO) and Programme Specific Outcomes (PSO)

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10	PSO11
PO1	x	x	x	x	x	x	x	x		x	x
PO2	x		x		x	x	x	x	x	x	x
PO3	x	x	x		x	x	x	x	x	x	x
PO4	x	x	x	x	x	x		x	x	x	x
PO5	x	x	x	x	x	x	x	x	x	x	x
PO6	x	x	x	x	x	x	x			x	x
PO7				x	x		x		x	x	x
PO8		x		x		x	x	x			x
PO9	x	x		x	x		x	x			x
PO10	x	x	x		x				x		x
PO11	x	x	x		x	x	x	x	x	x	x

II. Programme Specific Outcomes (PSO) and Core Courses (CC)

	MCS 101	MCS102	MCS 103	MCS 104	MCS 201	MCS 202	MCS 203	MCS 204	MCS 301	MCS 302	MCS 401	MCS 402
PSO1	x	x	x	x	x	x	x	x	x	x	x	x
PSO2	x	x	x	x	x	x	x	x	x	x	x	x
PSO3		x		x	x			x	x	x		x
PSO4	x	x	x	x	x	x	x	x	x	x	x	x
PSO5	x	x	x	x	x	x	x	x	x	x	x	x
PSO6	x		x		x	x	x				x	
PSO7	x	x	x	x	x	x	x	x	x	x	x	x
PSO8		x		x	x			x	x	x		x
PSO9		x	x	x	x			x	x	x	x	x
PSO10	x	x	x	x	x	x	x	x	x	x	x	x
PSO11	x	x	x	x	x	x	x	x	x	x	x	x

III. Programme Specific Outcomes (PSO) and Core Elective Courses (CEC)

	MCS 303a	MCS 303b	MCS 303c	MCS 303d	MCS 403a	MCS 403b	MCS 403c	MCS 403d
PSO1	x	x	x	x	x	x	x	x
PSO2	x	x	x	x	x	x	x	x
PSO3	x		x		x		x	
PSO4	x	x	x	x	x	x	x	x
PSO5	x	x	x	x	x	x	x	x
PSO6		x		x		x		x
PSO7	x	x	x	x	x	x	x	x
PSO8	x		x		x		x	
PSO9	x	x	x	x	x	x	x	x
PSO 10	x	x	x	x	x	x	x	x
PSO 11	x	x	x	x	x	x	x	x

IV. Programme Specific Outcomes (PSO) and Open Elective Courses (OEC)

	MCS 305a	MCS 305b	MCS 405a	MCS 405b
PSO1	x	x	x	x
PSO2	x	x	x	x
PSO3	x		x	
PSO4	x	x	x	x
PSO5	x	x	x	x
PSO6		x		x
PSO7	x	x	x	x
PSO8	x		x	
PSO9	x	x	x	x
PSO 10	x	x	x	x
PSO 11	x	x	x	x

Objectives, Course-level Learning Outcomes, Contents, and Suggested Readings

Semester I

Paper Code: MCS6.5AECT101
Paper Name: Fundamentals of Computer Science
(See Scheme of Examination)

Course Objectives:

CO1. To understand the characteristics of computers
CO2. To know about the generations of computers
CO3. To have knowledge about computer languages
CO4. To understand the basics of an operating system
CO5. To be acquaint with word processor, spreadsheet, and presentation
CO6. To understand and apply the concept of algorithms and algorithm analysis
CO7. To know about some unsolved problems of computer science

Learning Outcomes:

After completion of this course, the student will be able to-
LO1. Understanding of the characteristics of computers
LO2. Know about the generations of computers
LO3. Having knowledge of computer languages
LO4. Understanding of the basics of operating system
LO5. Acquaintance with word processor, spreadsheet, and presentation
LO6. Understanding and ability to design algorithms
LO7. Know about some unsolved problems of computer science

Unit I

Basics: Block Diagram, characteristics, generations of computers, classification of computers; Binary number system, Limitations of Computers, Primary and secondary memory, Input and output devices; Computer languages: Machine language, assembly language, higher-level language, 4GL. Introduction to Compiler, Interpreter, Assembler, System Softwares, Application Softwares.Operating System: Features of Windows, Linux, Macintosh, Android. Open-source software: concept and examples.

Unit II

Word Processing software: different formats for saving a word document, creating, editing documents and related operations, formatting features and related operations, spelling and grammar checker, headers and footers, creating and managing tables; printing, macros, mail merge, equation editor.

Unit III

Spreadsheet Software: Workbook, worksheets, data types, operators, cell formats, freeze panes, editing features, formatting features, creating formulas, using formulas, cell references.

Unit IV

Presentation Graphics Software: Templates, views, formatting slides, slides with graphs, animation, using special features, presenting slide shows.

Unit V

Computer Problem Solving: Algorithms, Efficiency, and analysis of algorithms Writing algorithms for simple problems like factorial computation, generation of the Fibonacci sequence, and checking for prime number; Examples of unsolved problems in Computer Science.

Scheme of Examination
Internal (Non-CGPA)

Recommended Readings

1. P.K Sinha, Computer Fundamentals, BPB Publications.
2. Rajaraman, Fundamentals of Computers, Fourth Edition, Prentice-Hall India Pvt. Limited.

Suggested Readings

3. Peter Norton, Introduction to Computers, 4th Edition, TMH Ltd, New Delhi.
4. R.G. Dromey, How to solve it by Computers, Pearson Publishers, New Delhi.

5. Dorothy House, Microsoft Word, Excel, and PowerPoint: Just for Beginners.

Web resources:

1. https://documentation.libreoffice.org/en/english-documentation/getting-started-guide/
2. https://www.coursera.org/learn/creative-problem-solving
3. http://web.mit.edu/rsi/www/pdfs/new-LaTeX.pdf
4. https://www.LaTeX-project.org/help/books/
5. https://support.google.com/docs/?hl=en#topic=1382883
6. https://en.wikipedia.org/wiki/List_of_unsolved_problems_in_computer_science
7. https://www.claymath.org/millennium-problems

Paper Code:MCS6.5DCCT102
Paper Name: Mathematics for Computer Science
(See Scheme of Examination)

Course Objectives:

CO1. To learn to evaluate mathematical arguments revolving around computation
CO2. To understand the basics of Combinations and Permutations
CO3. To acquire the ability to represent relations matrices and digraphs
CO4. To acquire and apply the knowledge on Graphs and Trees to real-world applications
CO5. To have the ability to Demonstrate the working of Grammars and Languages

Learning Outcomes:

After completion of this course, the student will be able to-
LO1. Comprehend and evaluate mathematical arguments revolving around computation.
LO2. Understand the basics of Combinations and Permutations.
LO3. Represent relations matrices and digraphs.
LO4. Apply the knowledge on Graphs and Trees to real-world applications.
LO5. Demonstrate the working of Grammars and Languages.

Note: Non-Scientific Calculator may be allowed in the end-semester examination.

Course Description

Unit – I

Sets: different types of sets, set operations; Basic Counting Principles, Pigeonhole Principle, Binomial Coefficients, Binomial Theorem, Permutations, Combinations; Matrices: addition, multiplication; Vectors: position vector, addition, subtraction and products of vectors.

Unit - II

Mathematical Induction, **Logic**: Propositions and logical operations, Conditional statements, Tautologies and Contradictions, Logical Equivalence, quantifiers, Propositional logic and Predicate logic.

Unit III

Basic computability theory: Chomsky Hierarchy, the concept of models of computation, the concept of types of languages and grammars.

Unit - IV

Relations: Representation of Relations, Properties of relations, transitive closure; Ordered Sets: poset, Properties, Hasse Diagram, Extremal elements of posets.

Unit V

Functions: Types of Functions, Asymptotic notations; Coordinate Systems: representation of points, straight lines, standard equation of circles.

Instructions for Examination (Theory)

Maximum Marks: 150 (120 External + 30 Internal)
Duration: 3 Hrs
Minimum Passing Marks: 36%

External

A course will contain 5 units. The question paper shall contain three sections. Section A (20 marks) shall contain 10 questions two from each Unit. Each question shall be of 2 marks. All the questions are compulsory. Section A will be prepared such that questions i through v are multiple-choice questions, while questions vi through x will be fill-in-the-blank questions. Section B (40 marks) shall contain 5 questions (two from each unit with internal choice). Each question shall be of 8 marks. The candidate is required to answer all 5 questions. The answers should not exceed 150 words. Section C (60 marks) shall contain 5 questions, one from each Unit. Each question shall be of 20 marks. The candidate is required to answer any three questions by selecting these three questions from different units. The answers should not exceed 400 words.

Internal
Internal exam shall comprise Theory Exam (15 marks), Seminar Presentation (10 marks) and Class Performance (5 marks).

Recommended Readings

1. K.H. Rosen, Discrete Mathematics and its applications, seventh edition
2. Kolman, Busby and Ross, Discrete Mathematical Structures, Sixth Edition, PHI.

Suggested Readings

3. Schaum's Outline Of Theory and Problems of DiscreteMathematics, Third Edition.
4. C L Liu, Elements of Discrete Mathematics, TMH,
5. John Vince, Foundation Mathematics for Computer Science: A Visual Approach, Springer
6. George B. Thomas and Ross L. Finney, Calculus and Analytic Geometry, Addison Wesley
7. J. Ullman and J. Hopcroft , Introduction to Automata Theory, Languages, and Computation, Pearson Education
8. Daniel I.A. Cohen, Introduction to Computer Theory, 2ed, Wiley.
9. Peter Linz, An Introduction to Formal Languages and Automata, Sixth edition.

Paper Code: MCS6.5DCCT103
Paper Name: Computer Organization
(See Scheme of Examination)

Course Objectives:

CO1: To understand the structure, function, and characteristics of computer systems.
CO2: To understand the design of the various functional units and components of computers.
CO3: To Identify the elements of modern instruction sets and their impact on processor design.
CO4: To acquire the ability to explain the function of each element of a memory hierarchy,
CO5: To identify and compare different methods for computer I/O

Learning Outcomes:

After completion of this course, the student will be able to-
LO1: Understand the structure, function, and characteristics of computer systems.
LO2: Understand the design of the various functional units and components of computers.
LO3: Identify the elements of modern instruction sets and their impact on processor design.
LO4: Explain the function of each element of a memory hierarchy,
LO5: Identify and compare different methods for computer I/O.

Unit I

Components of a Computer: Processor, Memory, Input-Output Unit, Difference between Organization and Architecture, Hardware-Software Interaction. **Number System:** Concept of Bit and Byte, types, and conversion. **Complements:** 1's complement, 2's complement.

Unit II

Binary Arithmetic: Addition, overflow, subtraction, multiplication (booth's algorithm), and division algorithm. **Logic gates:** Boolean Algebra, Map Simplification.

Unit III

Combinational circuits: Half Adder, Full Adder, Decoders, Multiplexers. **Sequential circuits:** Flip Flops- SR, JK, D, T Flip-Flop, Excitation Tables, State Diagram, State Table, Registers, Counters.

Unit IV

Input-Output Organization: Peripheral devices, I/O Interface, Asynchronous Data Transfer, Modes of Data Transfer, Priority Interrupt, Direct Memory Access, I/O Processor.
Memory Organization: Types and capacity of Memory, Memory Hierarchy, Associative Memory, Buffer, Cache Memory, Virtual Memory.

Unit V

Intel 8085 Microprocessor: Introduction, ALU, Timing and Control Unit, Register Set, Data and Address Bus, Addressing modes, Complete Intel 8085 Instruction set, Instruction format, Opcode and Operand, Word Size, Instruction Cycle, Pin Configuration, Intel 8085 programs.

Instructions for Examination (Theory)

Maximum Marks: 100 (80 External + 20 Internal)
Duration: 3 Hrs
Minimum Passing Marks: 36%

External

A course will contain 5 units. The question paper shall contain three sections. Section A (10 marks) shall contain 10 questions two from each Unit. Each question shall be of 1 mark. All the questions are compulsory. Section A will be prepared such that questions i through v are multiple-choice questions, while questions vi through x will be fill-in-the-blank questions. Section B (25 marks) shall contain 5 questions (two from each unit with internal choice). Each question shall be of 5 marks. The candidate is required to answer all 5 questions. The answers should not exceed 150 words. Section C (45 marks) shall contain 5 questions, one from each Unit. Each question shall be of 15 marks. The candidate is required to answer any three questions by selecting these three questions from different units. The answers should not exceed 400 words.

Internal

Internal exam shall comprise Theory Exam (10 marks), Seminar Presentation (6 marks) and Class Performance (4 marks).

Recommended Readings

1. M. Morris Mano, Computer System Architecture, Pearson, Prentice Hall.
2. J.P. Hayes, Computer Architecture & Organization, Tata McGraw Hill

Suggested Readings

3. Malvino Leach and Jerald A. Brown, Digital Computer Electronics, McGraw Hill.
4. Ramesh Gaonkar, Microprocessor Architecture, Programming, and Application With the 8085, PENRAM.

B.Ram, Fundamentals of Microprocessor and Microcomputers, Danpat Rai Publications.

Paper Code: MCS6.5DCCT104
Paper Name: Internet Programming
(See Scheme of Examination)

Course Objectives -

CO1. To gain knowledge of how the client-server model of Internet programming works
CO2. To learn design and development of interactive, client-side, executable web applications
CO3. To acquire the ability to demonstrate how Internet programming tasks are accomplished
CO3: To know how to build tools that assist in automating data transfer over the Internet.
CO4: To understand the advantages and disadvantages of the core Internet protocols

Learning Outcomes:

After completion of this course, the student will be able to-
LO1: Explain how the client-server model of Internet programming works
LO2: Design and develop interactive, client-side, executable web applications
LO3: Demonstrate how Internet programming tasks are accomplished
LO3: Build tools that assist in automating data transfer over the Internet
LO4: Compare the advantages and disadvantages of the core Internet protocols

Course Description

Unit I

Internet Basics: Evolution of the Internet, Basic internet terms and applications, ISP, Anatomy of an e-mail Message, basics of sending and receiving, E-mail Protocol, Mailing List- Subscribing & Unsubscribing, Introduction to World Wide Web and its work, Web Browsers, Search Engine, Downloading, HyperText Transfer Protocol (HTTP), URL, Web Servers, FTP, Web publishing- Domain Name Registration, Space on Host Server for Web Site, Maintain and Updating Website.

Unit - II

HTML: Elements of HTML & Syntax, Comments, Headings, Paragraph, Span, Pre Tags, Backgrounds, Formatting tags, Images, Hyperlinks, div tag, List Type and its Tags, Table Layout, Use of Forms in Web Pages.

Unity III

CSS**:** Introduction to Cascading Style Sheets, Types of Style Sheets (Inline, Internal and External), using Id and classes, CSS properties: Background Properties, Box Model Properties, Margin, Padding, List Properties, Border Properties, Positioning Properties.

Unit - IV

Java Script: Introduction to Client-Side Scripting, Introduction to JavaScript, Comments, Variables in JS, Data types, Operators in JS, Conditions Statements (If, If Else, Switch), JavaScript Loops (For Loop, While Loop, Do While Loop), JS Popup Boxes (Alert, Prompt, Confirm),

Unit V

JS Events, Onload, Onunload, Onsubmit, OnFocus, Onchange Event, Onblur Event, Onmouseover, Onclick, Ondbclick Events, JS Arrays, Working with Arrays, JS Objects, Window object, Document object, JS Functions, getElementById, innerHTML property, inner Text property, form validation, email validation.

Instructions for Examination (Theory)

Maximum Marks: 100 (80 External + 20 Internal)
Duration: 3 Hrs
Minimum Passing Marks: 36%

External

A course will contain 5 units. The question paper shall contain three sections. Section A (10 marks) shall contain 10 questions two from each Unit. Each question shall be of 1 mark. All the questions are compulsory. Section A will be prepared such that questions i through v are multiple-choice questions, while questions vi through x will be fill-in-the-blank questions. Section B (25 marks) shall contain 5 questions (two from each unit with internal choice). Each question shall be of 5 marks. The candidate is required to answer all 5 questions. The answers should not exceed 150 words. Section C (45 marks) shall contain 5 questions, one from each Unit. Each question shall be of 15 marks. The candidate is required to answer any three questions by selecting these three questions from different units. The answers should not exceed 400 words.

Internal

Internal exam shall comprise Theory Exam (10 marks), Seminar Presentation (6 marks) and Class Performance (4 marks).

Recommended Readings

1. Thomas A. Powell, HTML: The Complete Reference, Osborne/McGraw-Hill
2. Deitel, Deitel and Nieto, Internet & WWW. How to program, 2nd Edition, Pearson Education Asia.

Suggested Readings

3. E Stephen Mack, Janan Platt, HTML 4.0, No Experience Required, 1998, BPB Publications.
4. Sybex, HTML Complete, BPB Publications.
5. V.K Jain, Internet and Web Page Designing, BPB Publications.
6. Ivan Bayross, Web Enabled Commercial Application Development Using HTML, DHTML, java script, Perl CGI, BPB publications.

Paper Code: MCS6.5DCCT105
Paper Name : C++ Programming
(See Scheme of Examination)

Course Objectives:

CO1. To declare, initialize and process variables, constants, and arrays
CO2. To read and print values from the keyboard
CO3. To create statements for decisions and loops
CO4. To define functions and return values
CO5. To create classes, objects, and constructors
CO6. To understand and apply OO design concepts

Learning Outcomes:

After completion of this course, the student will be able to-
LO1. Declare, initialize and process variables, constants, and arrays
LO2. Read and print values from the keyboard
LO3. Create statements for decisions and loops
LO4. Define functions and return values.
LO5. Create classes, objects, and constructors.
LO6. Understand and apply OO design concepts.

UNIT I

Object-Oriented System Object-Oriented Paradigm: need, characteristics, applications. Basics of C++, branching, looping, and jump statements.

UNIT II

Functions: need, types, passing arguments by value and reference, recursive function, pointers, and functions. **Arrays**: need, types, array and function, array and pointers.

UNIT III

Class: Basics, static data members, Inline Function, Constructors and Destructors: need, types, usage, **Inheritance** - need, usage, types, `compile-time and run-time polymorphism, overloading and overriding, virtual function, friend function, abstract class.

UNIT IV

Operator overloading: need, rules, through member function and through friend function. String handling, String class, Templates, Additional Features for C++ 11, C++14 and C++17 Searching and Sorting:

UNIT V

Searching: Linear Search, Binary Search. **Sorting:** Insertion Sort, Selection Sort, Quick Sort, Bubble Sort, Heap Sort, Shell Sort, Merge sort, Radix Sort, Counting Sort, Bucket Sort.

Instructions for Examination (Theory)

Maximum Marks: 100 (80 External + 20 Internal)
Duration: 3 Hrs
Minimum Passing Marks: 36%

External

A course will contain 5 units. The question paper shall contain three sections. Section A (10 marks) shall contain 10 questions two from each Unit. Each question shall be of 1 mark. All

the questions are compulsory. Section A will be prepared such that questions i through v are multiple-choice questions, while questions vi through x will be fill-in-the-blank questions. Section B (25 marks) shall contain 5 questions (two from each unit with internal choice). Each question shall be of 5 marks. The candidate is required to answer all 5 questions. The answers should not exceed 150 words. Section C (45 marks) shall contain 5 questions, one from each Unit. Each question shall be of 15 marks. The candidate is required to answer any three questions by selecting these three questions from different units. The answers should not exceed 400 words.

Internal

Internal exam shall comprise Theory Exam (10 marks), Seminar Presentation (6 marks) and Class Performance (4 marks).

Recommended Readings

1. E. Balagurusamy, Object-Oriented Programming With C++ , Tata Mcgraw Hill.
2. Herbert Schildt, C++ The Complete Reference, Tata Mcgraw Hill.

Suggested Readings

3. Schaum Series, Object Oriented Programming With C++, Tata Mcgraw Hill.
4. Paul J. Deitel and Harvey M. Deitel, C++11 for Programmers (Deitel Developer), Prentice Hall; 2nd edition.
5. Marc Gregoire, Nicholas A. Solter and Scott J.Kleper, Professional C++, Goodreads Publications.
5. Bjarne Stroustrup, A Tour of C++.
6. Bartłomiej Filipek, C++17 in Detail.

Semester II

Paper Code: MCS6.5VACT201
Paper Name: National and Human Values
(See Scheme of Examination)

Course Objectives:

1. To inculcate national and human values in the Students.
2. To enable the students imbibe the Indian cultural ethos.
3. To inculcate the spirit of Patriotism so that the Students develop a sense of strong bond with the nation.
4. To enable the Students grow into a citizen possessing civic sense.

Course Outcomes:

1. On the completion of the course the students shall be able to Attain the civic skills enabling him/her to become a well-behaved citizen of the country.
2. Imbibe and spread the feelings of devotion and dedication.

Unit-I

1. NCC – Introduction, Aims, NCC Flag, NCC Song, NCC Administration, Raising of NCC in Schools/Colleges, NCC: Rank, Honours and Awards, NCC Training, NCC Camps, NCC Examinations, Incentive and Scholarship for Cadets.
2. Importance of Discipline in life, Aims and Merits of Discipline, Problems related to Indiscipline and Solutions.
3. Drill – Definition, Principles of Drill, Bad habits in drill, Words of Command, Drill Movements, Arms Drill, Squad Drill, Guard of Honour, Ceremonial Drill, Guard Mounting.
4. Contribution of NCC in Nation Building.

Unit-II

1. Armed Forces – Control Command, Organization of Armed Forces, Weapons of Army, Navy and Air Force, Training institutes, Honours and Awards, Recipients of Param Veer Chakra, Badges of Ranks.
2. Commission in Armed Forces – Recruitment in Armed Forces, Commission in Technical, Non-Technical and Territorial Forces.
3. Weapon Training – 0.22 Rifle, 7.62 Rifle, 7.62 SLR (Self Loading Rifle), 5.56 MM I.N.S.A.S. Rifle, L.M.G. (Light Machine Gun), Stan Machine Carbine, 2" Mortar, Grenade, Pistol, Various types of Firing, Range Procedure and Range Drill.
4. Military History and Geography, Field Craft, Field Engineering, Battle Craft.

Unit III

1. Obstacle Training. Adventure Training, Self Defence, Physical Posture Training.
2. Social Service, Disaster Management, Health and Hygiene, First Aid.
3. Leadership, Personality Development, Decision Making, Motivation, Duty and Discipline, Morale.

Unit IV

1. Value system – The role of culture and civilization-Holistic living

2. Balancing the outer and inner – Body, Mind and Intellectual level- Duties and responsibilities
3. Salient values for life- Truth, commitment, honesty and integrity, forgiveness and love, empathy and ability to sacrifice, care, unity, and inclusiveness
4. Self-esteem and self confidence
5. punctuality – Time, task and resource management, Team work
6. Positive and creative thinking.

Unit V

1. Universal Declaration of Human Rights
2. Human Rights violations
3. National Integration – Peace and non-violence (in context of Gandhi, Vivekanad)
4. Social Values and Welfare of the citizen
5. The role of media in value building
6. Fundamental Duties
7. Environment and Ecological balance – interdependence of all beings – living and non-living.

Scheme of Examination
Internal (Non-CGPA)

Assessment and Evaluation:

The Students shall be assessed and evaluated as per the schedule given below –
1. Project Report / Case Study (in 5000-7000 words) – 75%
2. Viva-voce - 25%

The topics for the Project Report / Case Study shall be allotted by the Nodal Department (decided jointly with NSS wing under the supervision or IQAC) in consultation with the Department concerned. The Candidate shall submit the Report by the date fixed for the said purpose. It shall then be followed by a Viva-voce Examination. The whole evaluation shall be done by the Departmental Internal Faculty in consultation with the Nodal Department. It is a non-creditable Paper. The Student will have to score simply a qualifying score/grade as specified in the CBCS rules.

The candidate will have to qualify the paper by the time He / She qualifies for the Programme. He/She can avail maximum 3 chances along with the Semester Examinations.

Books Recommended:

1. Hand Book of NCC : Major R C Mishra & Sanjay Kumar Mishra
2. National Security: K. Subramanyam
3. ASEAN Security: Air Comdr. Jasjit Singh
4. Indian Political System, Dr . Pukhraj Jain & Dr. Kuldeep Fadiya
5. NCERT, Education in Values, New Delhi, 1992.
6. M.G.Chitakra: Education and Human Values, A.P.H. Publishing Corporation, New Delhi,2003.
7. Chakravarthy, S.K.: Values and ethics for Organizations: Theory and Practice, Oxford University Press, New Delhi, 1999.
8. Satchidananda, M.K.: Ethics, Education, Indian Unity and Culture, Ajantha Publications,Delhi, 1991.

9. Das, M.S. & Gupta, V.K.: Social Values among Young adults: A changing Scenario, M.D.Publications, New Delhi, 1995.
10. Bandiste, D.D.: Humanist Values: A Source Book, B.R. Publishing Corporation, Delhi,1999.
11. Ruhela, S.P. : Human Values and education, Sterling Publications, New Delhi, 1986.
12. Kaul, G.N.: Values and Education in Independent Indian, Associated Publishers, Mumbai,1975.
13. Swami Budhananda (1983) How to Build Character A Primer : Ramakrishna Mission, NewDelhi.
14. A Cultural Heritage of India (4 Vols.), Bharatiya Vidya Bhavan, Bombay. (SelectedChapters only) For Life, For the future : Reserves and Remains –UNESCO Publication.
15. Values, A Vedanta Kesari Presentation, Sri Ramakrishna Math, Chennai, 1996.
16. Swami Vivekananda, Youth and Modern India, Ramakrishna Mission, Chennai.
17. Swami Vivekananda, Call to the Youth for Nation Building, Advaita Ashrama, Calcutta.
18. Awakening Indians to India, Chinmayananda Mission, 2003.

Paper Code:MCS6.5DCCT202
Paper Name: Data Communication and Networking
(See Scheme of Examination)

Course Objectives:

After completion of this course the student will be able to-

CO1. To gain the ability to create a new protocol and test its efficiency
CO2. To design a new network architecture using protocols and interfaces
CO3. To create a hybrid topology using the existing topologies, and check inefficiency
CO4. To apply different encoding and decoding mechanisms involved in various types of transmission media and measure the transmission impairments
CO5. To design a model internet with various categories of networks and test the transmission rate
CO6. To understand the basics of data communication, networking, the internet, and their importance
CO7. To analyze the services and features of various protocol layers in data networks
CO8. To differentiate wired and wireless computer networks
CO9. To analyze TCP/IP and their protocols
CO10. To recognize the different internet devices and their functions
CO11. To identify the primary security threats of a network

Learning Outcomes:

After completion of this course the student will be able to-

LO1. Create a new protocol and test its efficiency.
LO2. Design a new network architecture using protocols and interfaces.
LO3. Create a hybrid topology using the existing topologies, and check inefficiency.
LO4. Apply different encoding and decoding mechanisms involved in various types of transmission media and measure the transmission impairments.
LO5. Design a model internet with various categories of networks and test the transmission rate.
LO6. Understand the basics of data communication, networking, the internet, and their importance.
LO7. Analyze the services and features of various protocol layers in data networks.
LO8. Differentiate wired and wireless computer networks.
LO9. Analyze TCP/IP and their protocols.
LO10. Recognize the different internet devices and their functions.
LO11. Identify the primary security threats of a network.

Unit - I

Data Communication and Networking- Overview, Network Types, LAN Technologies, Topologies, Models- OSI Model, TCP/IP Stack, Security.
Physical Layer- Introduction, Impairments, Performance, Digital Transmission, modes.

Unit II

Digital to digital, analog to digital, Analog Transmission, digital to analog, analog to analog, Transmission media, Wireless Transmission, Multiplexing, FDM, TDM, CDM, WDM. Switching techniques- Circuit Switching, Packet switching, Datagram, Virtual circuit, and Permanent Virtual Circuit, Connectionless and connection-oriented communication, Message switching,

Unit - III

Data Link Layer- Introduction, Error Detection, and Correction. Data Link Control- Line Discipline- Enq/Ack, Poll/Select, Flow Control- Stop And Wait, Sliding Window. Error Control- ARQ, Stop and Wait ARQ, Sliding Window ARQ.

Unit IV

Network Layer- Introduction, Network Addressing, Routing, Internetworking, Tunneling, Packet Fragmentation, Network Layer Protocols, ARP, ICMP, IPv4, IPv6.
Transport Layer- Introduction, Function, End to end communication, Transmission Control Protocol, User Datagram Protocol.
Application Layer- Introduction, Client-Server Model, Application Protocols, Network Services.

Unit - V

Cyber Security- definition, cybercrime and information security, cybercriminals, classification of cybercrime. Cyber offenses- categories of cybercrime.
Tools and methods used in cybercrime- phishing, types of phishing, types, and techniques of ID theft, password cracking, keyloggers and spyware, backdoors, steganography, DoS, SQL Injection.
Cybercrime on mobile and wireless devices- attacks on wireless networks, Authentication security service, attacks on mobile phones. Cyber Law, Digital Signatures, Anti-Cybercrime Strategies, Cyberterrorism, Indian ITA 2000.

Instructions for Examination (Theory)

Maximum Marks: 150 (120 External + 30 Internal)
Duration: 3 Hrs
Minimum Passing Marks: 36%

External

A course will contain 5 units. The question paper shall contain three sections. Section A (20 marks) shall contain 10 questions two from each Unit. Each question shall be of 2 marks. All the questions are compulsory. Section A will be prepared such that questions i through v are multiple-choice questions, while questions vi through x will be fill-in-the-blank questions. Section B (40 marks) shall contain 5 questions (two from each unit with internal choice). Each question shall be of 8 marks. The candidate is required to answer all 5 questions. The answers should not exceed 150 words. Section C (60 marks) shall contain 5 questions, one from each Unit. Each question shall be of 20 marks. The candidate is required to answer any three questions by selecting these three questions from different units. The answers should not exceed 400 words.

Internal

Internal exam shall comprise Theory Exam (15 marks), Seminar Presentation (10 marks) and Class Performance (5 marks).

Recommended Readings

1. Nina Godbole & Sunit Belapur, Cyber Security.
2. Forozan, Data Communication and Networking, Tata McGraw Hill.

Suggested Readings

3. Dr. Madhulika Jain, Satish Jain, Data Communication And Computer Networks, BPB publications.
4. William Stallings, Data and Computer Communications, Pearson Education.
5. A. S. Tanenbaum, Computer Networks, Fourth Edition, Pearson Education.

Paper Code:MCS6.5DCCT203
Paper Name: Database Management System
(See Scheme of Examination)

Course Objectives:

CO1: To understand the need for a DB approach and understand the components and roles of DBMS

CO2: To know how to write SQL queries for the given problem statement

CO3: To apply DB system development life cycle to business problems

CO4. To develop ER diagram for representing the conceptual data model

CO5: To convert ER diagram into a set of relations representing the logical data model

CO6: To implement a collection of ties in the chosen DBMS product, such as ORACLE

CO7: To have a broad understanding of database concepts and database management system software

CO8: To have a high-level experience of major DBMS components and their function

CO9: To be able to model an application's data requirements using conceptual modeling tools like ER diagrams and design database schemas based on the conceptual model.

CO10: To be able to write SQL commands to create tables and indexes, insert/update/delete data, and query data in a relational DBMS.

CO11: To understand detailed architecture, define objects, load data, query data, and performance tune SQL databases.

CO12: To be able to handle large volumes of structured, semi-structured, and unstructured data using database technologies.

Learning Outcomes:

After completion of this course, the student will be able to-

LO1: Appreciate the need for a DB approach and understand the components and roles of DBMS

LO2: Write SQL queries for the given problem statement

LO3: Apply DB system development life cycle to business problems

LO4. Develop ER diagram for representing the conceptual data model

LO5: Convert ER diagram into a set of relations representing the logical data model

LO6: Implement a collection of ties in the chosen DBMS product, such as ORACLE

LO7: Have a broad understanding of database concepts and database management system software

LO8: have a high-level experience of major DBMS components and their function

LO9: be able to model an application's data requirements using conceptual modeling tools like ER diagrams and design database schemas based on the conceptual model.

LO10: be able to write SQL commands to create tables and indexes, insert/update/delete data, and query data in a relational DBMS.

LO11: To understand detailed architecture, define objects, load data, query data, and performance tune SQL databases.

LO12: Able to handle large volumes of structured, semi-structured, and unstructured data using database technologies.

Unit I

Introduction: Characteristics of database approach, Advantages, Database system architecture, Overview of different types of Data Models and data independence, Schemas and instances, Database languages and interfaces; **E-R Model**: Entities, Attributes, keys, Relationships, Roles, Dependencies, E-R Diagram.

Unit II

Normalization: Definition, Functional dependencies and inference rules, 1NF, 2NF, 3NF, and BCNF. **Introduction to Relational model**, Constraints: Domain, Key, Entity integrity, Referential integrity; Keys: Primary, Super, Candidate, Foreign; **Relational algebra**: select, project, union, intersection, minus, cross product, different types of join, division operations; aggregate functions and grouping.

Unit III

SQL: Data Types, statements: select, insert, update, delete, create, alter, drop; views, SQL algebraic operations, nested queries; Stored procedures: Advantages, Variables, creating and calling procedures, if and case statements, loops, Cursors, Functions, Triggers.

Unit IV

Transactions processing: Definition, desirable properties of transactions, serial and non-serial schedules, the concept of serializability, conflict-serializable schedules.

Unit V

Concurrency Control: Two-phase locking techniques, dealing with Deadlock and starvation, deadlock prevention protocols, basic timestamp ordering algorithm; Overview of database recovery techniques; the concept of data warehousing.

Instructions for Examination (Theory)

Maximum Marks: 100 (80 External + 20 Internal)
Duration: 3 Hrs
Minimum Passing Marks: 36%

External

A course will contain 5 units. The question paper shall contain three sections. Section A (10 marks) shall contain 10 questions two from each Unit. Each question shall be of 1 mark. All the questions are compulsory. Section A will be prepared such that questions i through v are multiple-choice questions, while questions vi through x will be fill-in-the-blank questions. Section B (25 marks) shall contain 5 questions (two from each unit with internal choice). Each question shall be of 5 marks. The candidate is required to answer all 5 questions. The answers should not exceed 150 words. Section C (45 marks) shall contain 5 questions, one from each Unit. Each question shall be of 15 marks. The candidate is required to answer any three questions by selecting these three questions from different units. The answers should not exceed 400 words.

Internal

Internal exam shall comprise Theory Exam (10 marks), Seminar Presentation (6 marks) and Class Performance (4 marks).

Recommended Readings

1. Ramez A. Elmasri, Shamkant Navathe, Fundamentals of Database Systems, 5th Ed, Pearson Publications.
2.Korth, Silberschatz, Sudarshan, Database System Concepts, Mcgraw Hill.

Suggested Readings

3. Bipin C. Desai, An Introduction to Database Systems, Galgotia Publication.
4. Ivan Bayross, SQL, PL/SQL Programming, BPB publications.
5. Ivan Bayross, Commercial Application Development Using Oracle Developer 2000, BPB publications.

Web Resources

1. http://www.mysqltutorial.org/mysql-stored-procedure-tutorial.aspx

Paper Code: MCS6.5DCCT204
Paper Name: Operating System
(See Scheme of Examination)

Course Objectives:

CO1. To be able to design and understand the following OS components: System calls, Schedulers, Memory management systems, Virtual Memory, and Paging systems.
CO2. To be able to evaluate, and compare OS components through instrumentation for performance analysis.
CO3. To analyze the various device and resource management techniques for time-sharing and distributed systems
CO4. To develop and analyze simple concurrent programs using transactional memory and message passing, and understand the trade-offs and implementation decisions

Learning Outcome:

After completion of this course, the student will be able to-

LO1. Allocate Main Memory based on various memory management techniques
LO2. Compare Memory allocation using Best fit, Worst fit, and first hold policies
LO3. Apply page replacement policies for dynamic memory management
LO4. Schedule CPU time using scheduling algorithm for processors
LO5. Compare various device scheduling algorithms. serve

Unit I

Introduction to Operating System, layered Structure, Functions, Types; Process: Concept, Process States, PCB; Threads, System calls; Process Scheduling: types of schedulers, context switch, CPU Scheduling, Preemptive Scheduling, Scheduling Criteria- CPU Utilization, Throughput, Turnaround Time, Waiting Time, Response Time.

Unit II

Scheduling Algorithms- FCFS, SJF, Priority Scheduling, Round Robin Scheduling, MLQ Scheduling. Synchronization: Critical Section Problem, Requirements for a solution to the critical section problem; Semaphores, simple solution to Readers-Writers Problem.

Unit III

Deadlock: Characterization, Prevention, Avoidance, Banker's Algorithm, Recovery from Deadlock. Memory Management: Physical and virtual address space, Paging, Overview of Segmentation; Virtual Memory Management: Concept, Page Replacement techniques- FIFO, LRU, Optimal.

Unit IV

Linux: features of Linux, steps of Installation, Shell and kernel, Directory structure, Users and groups, file permissions, commands- ls, cat, cd, pwd, chmod, mkdir, rm, rmdir, mv, cp, man, apt, cal, uname, history etc.; Installing packages.

Unit V

Shell scripts: writing and executing a shell script, shell variables, read and expr, decision making (if-else, case), for and while loops.

Instructions for Examination (Theory)

Maximum Marks: 100 (80 External + 20 Internal)
Duration: 3 Hrs
Minimum Passing Marks: 36%

External
A course will contain 5 units. The question paper shall contain three sections. Section A (10 marks) shall contain 10 questions two from each Unit. Each question shall be of 1 mark. All the questions are compulsory. Section A will be prepared such that questions i through v are multiple-choice questions, while questions vi through x will be fill-in-the-blank questions. Section B (25 marks) shall contain 5 questions (two from each unit with internal choice). Each question shall be of 5 marks. The candidate is required to answer all 5 questions. The answers should not exceed 150 words. Section C (45 marks) shall contain 5 questions, one from each Unit. Each question shall be of 15 marks. The candidate is required to answer any three questions by selecting these three questions from different units. The answers should not exceed 400 words.

Internal
Internal exam shall comprise Theory Exam (10 marks), Seminar Presentation (6 marks) and Class Performance (4 marks).

Recommended Readings

1. Abraham Silberschatz, Peter Baer Galvin, Operating System Principles, John Wiley And Sons Inc.
2. Milan Milen Kovic, Operating System Concepts And Design, Tata Mcgraw Hill.

Suggested Readings

3. Andrew S. Tanenbaum, Herbert Bos, Modern Operating System.
4. Mike McGrath, Linux in easy steps.
5. Sumitabha Das, Unix concepts and applications, TMH.

Paper Code:MCS6.5DCCT205
Paper Name: PHP
(See Scheme of Examination)

Course Objectives:

CO1. To introduce the importance of PHP in web page design.
CO2. To understand the features like functions, forms in PHP.
CO3. To understand Files, OOPs concepts , Cookies, Sessions and Data base
CO4. Explain the difference between a programming language and a scripting language
CO5. Create an error-free simple PHP program
CO6. Fundamental concepts of PHP scripting language
CO7. The basic structure of a web application
CO8. Basics of MySQL database
CO9. The relationship between the client-side and server-side scripts

Learning Outcome:

After completion of this course, the student will be able to-
LO1. Understand the basic structure of a web application
LO2. Understand the use of PHP with HTML
LO3. Develop and deploy enterprise web applications
LO4. Develop database connectivity using MySQL
LO5. Demonstrate how to debug PHP scripts
LO6. Creating functional websites and web apps in PHP

Unit – I

PHP: Installation of PHP. Building Blocks of PHP: Variables, data types, Operators & Expressions, Constants, Switching, Flow, Loops. Functions: Meaning, Calling, Defining a function. Return value from user defined function.

Unit - II

Arrays: Creating arrays, Array related functions. Working with String, Date & Time: Formatting String with PHP, Using Date and time Functions with PHP. Working with file and Directories.

Unit III

OOPs in PHP. Forms: Creating simple input Form. Accessing Form input with user defined arrays-GET/POST, HTML and PHP Code on a single page. Working with File Upload. Uploading & Downloading.

Unit IV

State management: Using query string(URL rewriting), Using Hidden field, Using cookies, Using session. Exception Handling: Understanding Exception and error, Try, catch, throw

Unit - V

Connecting to the MYSQL: Selecting a database, Adding data to a table, Displaying returned data on Web pages, Inserting data, Deleting data, Entering and updating data, Executing multiple queries, executing stored procedures.

Instructions for Examination (Theory)

Maximum Marks: 100 (80 External + 20 Internal)
Duration: 3 Hrs
Minimum Passing Marks: 36%

External

A course will contain 5 units. The question paper shall contain three sections. Section A (10 marks) shall contain 10 questions two from each Unit. Each question shall be of 1 mark. All the questions are compulsory. Section A will be prepared such that questions i through v are multiple-choice questions, while questions vi through x will be fill-in-the-blank questions. Section B (25 marks) shall contain 5 questions (two from each unit with internal choice). Each question shall be of 5 marks. The candidate is required to answer all 5 questions. The answers should not exceed 150 words. Section C (45 marks) shall contain 5 questions, one from each Unit. Each question shall be of 15 marks. The candidate is required to answer any three questions by selecting these three questions from different units. The answers should not exceed 400 words.

Internal

Internal exam shall comprise Theory Exam (10 marks), Seminar Presentation (6 marks) and Class Performance (4 marks).

Suggested Readings:

1. Teach Yourself PHP, MYSQL &Apache ByMeloni, Pearson Education.
2. Open Source Development with LAMP: Using Linux, Apache, MySQL, Perl & PHP By James Lee, Pearson Education.
3. PHP: A Beginner's Guide ByVaswani, Vikram Tata Mc-Graw Hill.

Semester III

Paper Code:MCS6.5DCCT302
Paper Name: Data Structures
(See Scheme of Examination)

Course Objectives:

CO1. To examine Python syntax and semantics and apply Python flow control and functions.
CO2. To create, run and manipulate Python Programs using core data structures like Lists,
CO3. To apply Dictionaries and use Regular Expressions.
CO4. To interpret the concepts of Object-Oriented Programming as used in Python.
CO5. To master object-oriented programming to create an entire python project using objects and classes

Learning Outcomes:

After completing this course, students will be able to:
LO1. Examine Python syntax and semantics and apply Python flow control and functions.
LO2. Create, run and manipulate Python Programs using core data structures like Lists,
LO3. Apply Dictionaries and use Regular Expressions.
LO4. Interpret the concepts of Object-Oriented Programming as used in Python.
LO5. Master object-oriented programming to create an entire python project using objects and classes

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Unit I

Concept of Dynamic arrays and its implementation. Linked Lists: Implementation of Singly Linked Lists, Doubly Linked Lists, Circular Linked Lists.

Unit II

Stacks: Overview of Stack, Implementation of Stack (List & Linked list), Applications of Stack

Unit III

Queues: Overview of Queue, Implementation of Queue(List & Linked list), Applications of Queues, Priority Queues.

Unit IV

Trees: Overview of Trees, Tree Terminology, Binary Trees: Introduction, Implementation, Applications. Tree Traversals, Binary Search Trees: Introduction, Implementation, AVL Trees: Introduction, Rotations, Implementation.

Unit V

Graphs: Introduction, Directed & Undirected Graphs, Weighted & Unweighted Graphs, Representations, Breadth First Search, Depth First Search.

Instructions for Examination (Theory)

Maximum Marks: 100 (80 External + 20 Internal)
Duration: 3 Hrs
Minimum Passing Marks: 36%

External

A course will contain 5 units. The question paper shall contain three sections. Section A (10 marks) shall contain 10 questions two from each Unit. Each question shall be of 1 mark. All

the questions are compulsory. Section A will be prepared such that questions i through v are multiple-choice questions, while questions vi through x will be fill-in-the-blank questions. Section B (25 marks) shall contain 5 questions (two from each unit with internal choice). Each question shall be of 5 marks. The candidate is required to answer all 5 questions. The answers should not exceed 150 words. Section C (45 marks) shall contain 5 questions, one from each Unit. Each question shall be of 15 marks. The candidate is required to answer any three questions by selecting these three questions from different units. The answers should not exceed 400 words.

Internal
Internal exam shall comprise Theory Exam (10 marks), Seminar Presentation (6 marks) and Class Performance (4 marks).

TEXTBOOKS:
1. Data structures and algorithms in python by Michael T. Goodrich
2. Data Structures and Algorithmic Thinking with Python by Narasimha Karumanchi

REFERENCE BOOKS:

1. Hands-On Data Structures and Algorithms with Python: Write complex and powerful code using the latest features of Python 3.7, 2nd Edition by Dr. Basant Agarwal, Benjamin Baka.
2. Data Structures and Algorithms with Python by Kent D. Lee and Steve Hubbard.
3. Problem Solving with Algorithms and Data Structures Using Python by Bradley N Miller and David L. Ranum.
4. Wes McKinney, Python for Data Analysis: Data Wrangling with Pandas, NumPy, and Ipython, O'Reilly Media.
5. John Shovic and Alan Simpson, Python All-in-One for Dummies, John Wiley & Sons, Inc.
6. Mark Summerfield, Programming in Python 3: A Complete Introduction to the Python Language, Pearson.
7. Swaroop, C. H. A Byte of Python. Python Tutorial.
8. John V. Guttag, Introduction to Computation and Programming Using Python, MIT Press.
9. Mark Lutz, David Ascher, Python, O'Reilly.
10. T. Budd, Exploring Python, TMH.
11. Core Python Programming -Second Edition,R. Nageswara Rao, Dreamtech Press

Web Resources

1. https://www.learnpython.org/
2. https://nptel.ac.in/courses/106106182
3. http://greenteapress.com/thinkpython/thinkpython.pdf
4. Python tutorial: https://docs.python.org/3/tutorial/index.html

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Paper Code:MCS6.5DCCT303
Paper Name: Java
(See Scheme of Examination)

Course Objectives:

CO1. To use an integrated development environment to write, compile, run, and test simple object-oriented Java programs.
CO2. To read and make elementary modifications to Java programs that solve real-world problems.
CO3. To validate input in a Java program.
CO4. To identify and fix defects and common security issues in code.
CO5. To document a Java program using Javadoc.
CO6. To use a version control system to track source code in a project.

Learning Outcomes:

After completing this course, students will be able to:
LO1. Use an integrated development environment to write, compile, run, and test simple object-oriented Java programs.
LO2. Read and make elementary modifications to Java programs that solve real-world problems.
LO3. Validate input in a Java program.
LO4. Identify and fix defects and common security issues in code.
LO5. Document a Java program using Javadoc.
LO6. Use a version control system to track source code in a project.

Unit I

Introduction to Java: evolution, features, comparison with C and C++; Java program structure; tokens, keywords, constants, variables, data types, typecasting, statements, Operators and Expression; Conditional Statements and Loop Statements.

Unit II

Class: syntax, instance variable, class variables, methods, constructors, overloading.

Inheritance: types of inheritance, use of super, method overriding, final class, abstract class, wrapper classes.

Unit III

Arrays, Strings and Vectors, Packages and Interfaces, visibility controls

Unit IV

Errors and Exceptions: Types of errors, Exception classes, Exception handling in java, use of try, catch, finally, throw and throws. Taking user input, Command line arguments.

Unit V

Multithreaded Programming: Creating Threads, the Life cycle of thread, Thread priority, Thread synchronization, Inter-thread communication, Implementing the Runnable Interface.

Instructions for Examination (Theory)

Maximum Marks: 100 (80 External + 20 Internal)
Duration: 3 Hrs
Minimum Passing Marks: 36%

External

A course will contain 5 units. The question paper shall contain three sections. Section A (10 marks) shall contain 10 questions two from each Unit. Each question shall be of 1 mark. All the questions are compulsory. Section A will be prepared such that questions i through v are multiple-choice questions, while questions vi through x will be fill-in-the-blank questions. Section B (25 marks) shall contain 5 questions (two from each unit with internal choice). Each question shall be of 5 marks. The candidate is required to answer all 5 questions. The answers should not exceed 150 words. Section C (45 marks) shall contain 5 questions, one from each Unit. Each question shall be of 15 marks. The candidate is required to answer any three questions by selecting these three questions from different units. The answers should not exceed 400 words.

Internal

Internal exam shall comprise Theory Exam (10 marks), Seminar Presentation (6 marks) and Class Performance (4 marks).

Recommended Readings

1. Herbert Schildt, The Complete reference Java Ninth Edition, Tata McGraw Hill
2. Burd, Beginning Programming with Java For Dummies , For Dummies; 3 edition

Suggested Readings

3. Herbert Schildt, Java: A Beginner's Guide, Sixth Edition: A Beginner's Guide, McGraw-Hill
4. E. Balagurusamy, Osborne MediaProgramming in JAVA, TMH.
5. Steven Holzner et al. JAVA 2 programming Black Book, Dreamtech Press.
6. E. Balagurusamy, Programming in JAVA, TMH.

Paper Code:MCS6.5DSET304(a)
Paper Name: Software Engineering & Research Methodology
(See Scheme of Examination)

Course Objectives:

CO1. To learn the phases of software development
CO2. To develop process models and process systems multiple collections, models
CO3. To gather, understand, analyze and specify requirements
CO4. To develop architectural diagram, and implement by following coding principles
CO5. To apply testing strategies and handle software product maintenance issues
CO6. To get a good knowledge of the issues and challenges faced while doing the Software project Management.
CO7. To understand why the majority of the software projects fail and how that failure probability can be reduced effectively.
CO8. To do the Project Scheduling, tracking, Risk analysis, Quality management, and Project Cost estimation using different techniques.
CO9. To identify and discuss the role and importance of research in the social sciences.
CO10. To identify and discuss the issues and concepts salient to the research process.
CO11. To identify and discuss the complex issues inherent in selecting a research problem, selecting an appropriate research design, and implementing a research project.
CO12. To identify and discuss the concepts and procedures of sampling, data collection, analysis, and reporting.

Learning Outcomes:

After completing this course, students will be able to:
LO1. Learn the phases of software development
LO2. Develop process models and process systems multiple collections, models
LO3. Gather, understand, analyze and specify requirements
LO4. Develop architectural diagram, and implement by following coding principles
LO5. Apply testing strategies and handle software product maintenance issues
LO6. Get a good knowledge of the issues and challenges faced while doing Software project Management.
LO7. To understand why the majority of the software projects fail and how that failure probability can be reduced effectively.
LO8. To do the Project Scheduling, tracking, Risk analysis, Quality management, and Project Cost estimation using different techniques.
LO9. Identify and discuss the role and importance of research in the social sciences.
LO10. Identify and discuss the issues and concepts salient to the research process.
LO11. Identify and discuss the complex issues inherent in selecting a research problem, selecting an appropriate research design, and implementing a research project.
LO12. identify and discuss the concepts and procedures of sampling, data collection, analysis, and reporting.

Unit I

Software: Software Characteristics, Software Process, Process Characteristics, **Software Process Model:** Linear Sequential Model, Prototyping Model, Spiral Model, Software Quality, McCall's Quality Factors

Unit II

Software Requirement Analysis and Specification (SRS): Need Characteristics and Components. **Planning a Software Project:** COCOMO Model, Project Monitoring Plan, and Risk Management.

Unit III

Design Principle: Abstraction, Modularity, Cohesion and Coupling, **Software Management**: Size Oriented Metrics, Function Oriented Metrics.

Unit IV

Testing: Testing Fundamental, Functional Testing (Black Box), Structural Testing (White Box), Alpha And Beta Testing, **Testing Process:** Comparison of Different Testing, Level of Testing.

Unit V

Research Methodology: Meaning of Research, Objective of Research, Types of Research, Research Approaches, Significance of research, Research Methods versus Methodology, Research Process, Criteria of Good Research, What is Research Problem, Selecting the problem, Necessity of defining the problem, Technique involved in defining a problem.

Instructions for Examination (Theory)

Maximum Marks: 150 (120 External + 30 Internal)
Duration: 3 Hrs
Minimum Passing Marks: 36%

External

A course will contain 5 units. The question paper shall contain three sections. Section A (20 marks) shall contain 10 questions two from each Unit. Each question shall be of 2 marks. All the questions are compulsory. Section A will be prepared such that questions i through v are multiple-choice questions, while questions vi through x will be fill-in-the-blank questions. Section B (40 marks) shall contain 5 questions (two from each unit with internal choice). Each question shall be of 8 marks. The candidate is required to answer all 5 questions. The answers should not exceed 150 words. Section C (60 marks) shall contain 5 questions, one from each Unit. Each question shall be of 20 marks. The candidate is required to answer any three questions by selecting these three questions from different units. The answers should not exceed 400 words.

Internal

Internal exam shall comprise Theory Exam (15 marks), Seminar Presentation (10 marks) and Class Performance (5 marks).

Recommended Readings

1. Roger S. Pressman, Software Engineering: A Practitioner's Approach, McGraw Hill.

Suggested Readings

2. Pankaj Jalote, Software Engineering: A Precise Approach, Wiley Precise textbook Series.
3. C. R. Kothari, Research Methodology Methods and Techniques, New Age International Publisher.

Paper Code:MCSDSET304(b)
Paper Name: Artificial Intelligence
(See Scheme of Examination)

Course Objectives:

CO1. To analyze and formalize the problem as a state space, graph, design heuristics
CO2. To have the ability to represent solutions for various real-life problem domains using logic-based techniques
CO3. To understand the numerous applications and huge possibilities in the field of AI
CO4. To ability to express ideas in AI research and programming language related to emerging technology.

Learning Outcomes:

After completing this course, students will be able to:
LO1. To analyze and formalize the problem as a state space, graph, design heuristics
LO2. Ability to represent solutions for various real-life problem domains using logic-based techniques
LO3. Understand the numerous applications and huge possibilities in the field of AI
LO4. Ability to express ideas in AI research and programming language related to emerging technology.

Unit I

Definition, History, Agents, and environment, Defining the problem as a state and space search, What is Intelligence? Types of Intelligence, Difference between Human and Machine Intelligence, The Structure of Intelligent Agents. Solving problems by searching: Uninformed search strategies- Brute-Force, Breadth-First, Uniform-cost search Depth-First, Depth-limited search,depth-first search, Bidirectional search.

Unit II

Informed (heuristic) search strategies- Greedy best-first search, A*, AO* Memory-bounded heuristic search. Heuristic functions, local search algorithms- Hill-climbing search, Simulated annealing, Local beam search. Knowledge-Based System: Knowledge, Procedure V/S Declarative Knowledge, Knowledge Representation: Using Procedural and Predicate Logic,

Unit III

Inference in First-order logic: Unification and Lifting, Forward Chaining, Backward Chaining, Resolution. Rule-based System, Frames, Frames, Scripts, and Semantic Nets.

Unit IV

Probabilistic Reasoning, Probability, and Bayes Theorem represent knowledge in the uncertain domain, Certainty factors, Bayesian Networks, Dempster–Shafer theory, introduction to Fuzzy logic. Learning: types of learning, decision trees.

Unit V

Expert System: types, architecture. Introduction to Artificial Neural Networks, Reinforcement Learning, Natural Language Processing, Pattern Recognition, and Perception.

Instructions for Examination (Theory)

Maximum Marks: 150 (120 External + 30 Internal)
Duration: 3 Hrs
Minimum Passing Marks: 36%

External

A course will contain 5 units. The question paper shall contain three sections. Section A (20 marks) shall contain 10 questions two from each Unit. Each question shall be of 2 marks. All the questions are compulsory. Section A will be prepared such that questions i through v are multiple-choice questions, while questions vi through x will be fill-in-the-blank questions. Section B (40 marks) shall contain 5 questions (two from each unit with internal choice). Each question shall be of 8 marks. The candidate is required to answer all 5 questions. The answers should not exceed 150 words. Section C (60 marks) shall contain 5 questions, one from each Unit. Each question shall be of 20 marks. The candidate is required to answer any three questions by selecting these three questions from different units. The answers should not exceed 400 words.

Internal
Internal exam shall comprise Theory Exam (15 marks), Seminar Presentation (10 marks) and Class Performance (5 marks).

Recommended Readings

1. Rich And Knight, Artificial Intelligence, Tata McGraw Hill

Suggested Readings

2. Patterson, Introduction to Artificial Intelligence and Expert Systems, Prentice-Hall India.
3. Russell and Norvig, Artificial Intelligence A Modern Approach, Prentice Hall.

Paper Code: MCS6.5DSET304(c)
Paper Name: Big Data & Data Mining
(See Scheme of Examination)

Course Objectives:

CO1. To explain characteristics and use cases and applications of Big Data
CO2. To develop MapReduce operation using Hadoop
CO3. To be able to understand the role of Virtualization Technologies
CO4. To design and implement systems for data mining.
CO5. To evaluate the performance of different data-mining algorithms.
CO6. To propose data-mining solutions for various applications.

Learning Outcomes:

After completing this course, students will be able to:
LO1. Explain characteristics and use cases and applications of Big Data
LO2. Develop MapReduce operation using Hadoop
LO3. Ability to understand the role of Virtualization Technologies
LO4.design and implement systems for data mining.
LO5. Evaluate the performance of different data-mining algorithms.
LO6. Propose data-mining solutions for various applications.

Unit I

Concept of Big data, Data mining : Data mining tasks, Data mining as a step of the Knowledge discovery process, Applications of Data mining Data objects and types of attributes, Recalling mean, median, mode, and weighted arithmetic mean, Data quality.

Unit II

An overview of data preprocessing. Classification analysis- definition, Overview of various classification techniques.

Unit III

Decision tree induction- working, examples, specifying attribute test conditions, Measures of node impurity, measures for selecting best split; Evaluating the performance of a classifier- Holdout method, Random subsampling, cross-validation, Bootstrap.

Unit IV

Association analysis: support, confidence, association rules, Frequent Itemsets; Frequent itemset generation - Apriori principle, Apriori algorithm, and examples, FP growth algorithm, and examples; Closed and maximal frequent itemsets.

Unit V

Cluster analysis: Definition, an overview of basic clustering methods, Density-based methods-DBSCAN. Overview of Open source tools for data mining like WEKA.

Instructions for Examination (Theory)

Maximum Marks: 150 (120 External + 30 Internal)
Duration: 3 Hrs
Minimum Passing Marks: 36%

External

A course will contain 5 units. The question paper shall contain three sections. Section A (20 marks) shall contain 10 questions two from each Unit. Each question shall be of 2 marks. All

the questions are compulsory. Section A will be prepared such that questions i through v are multiple-choice questions, while questions vi through x will be fill-in-the-blank questions. Section B (40 marks) shall contain 5 questions (two from each unit with internal choice). Each question shall be of 8 marks. The candidate is required to answer all 5 questions. The answers should not exceed 150 words. Section C (60 marks) shall contain 5 questions, one from each Unit. Each question shall be of 20 marks. The candidate is required to answer any three questions by selecting these three questions from different units. The answers should not exceed 400 words.

Internal
Internal exam shall comprise Theory Exam (15 marks), Seminar Presentation (10 marks) and Class Performance (5 marks).

Recommended Readings

1. Jiawei Han and Micheline Kamber, Data Mining: Concepts and Techniques, 3rd edition.
2. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining, Pearson Education.

Suggested Readings

3. Richard Roiger, Michael Geatz, Data Mining: A Tutorial Based Primer, Pearson Education.
4.G.K. Gupta, Introduction to Data Mining with Case Studies, PHI.
5. Soman K. P., DiwakarShyam, Ajay V., Insight into Data mining: Theory and Practice, PHI.
6. Witten, Frank, Data Mining:: Practical Machine Learning Tools and Techniques (Morgan Kaufmann Series in Data Management Systems) Prentice Hall.

Paper Code: MCS6.5DSET305(A)
Paper Name: Data Analysis Using R
(See Scheme of Examination)

Course Objectives:

CO1. To understand the basics of R programming in terms of constructs, control statements, string Functions.
CO2. To understand the use of R for Data analytics.
CO3. To conduct your independent data analysis.
CO4. To be able to appreciate and to apply the R programming from a statistical perspective.
CO5. To use R Studio for interactive computation
CO6. To practice different features of R for the given problem
CO7. To use different libraries of R
CO8. To get acquainted with application of R

Learning Outcomes:
After completing this course, students will be able to:
CO1. To learn the basics of R programming in terms of constructs, control statements, string Functions.
CO2. To learn the use of R for Data analytics.
CO3. To learn how to conduct your independent data analysis.
CO4. To appreciate and to apply the R programming from a statistical perspective.
CO5. To learn how to use R Studio for interactive computation
CO6. To learn how to practice different features of R for the given problem
CO7. To learn how to use different libraries of R
CO8. Get acquainted with application of R

Unit I

Foundations for data analysis-matrices, the notion of probability, the concept of random variables and various distributions, mean, variance, covariance, normal distributions, an overview of sampling, hypothesis testing, confidence interval, the concept of optimization.

Unit II

Installation of R, data editing, use of R as a calculator; functions, and assignments. matrix operations, logical operators, Conditional executions and loops.

Unit III

Data management with sequences, repeats, sorting and ordering, lists, vector indexing, factors; display and formatting of strings.

Unit IV

Working with data frames, Importing data files; Graphics and plots. Simple Case studies.

Unit V

Basic statistical functions for central tendency, variation, box plots, skewness and kurtosis, correlations; overview of using R functions for simple hypothesis testing, Applications of R.

Instructions for Examination (Theory)

Maximum Marks: 100 (80 External + 20 Internal)
Duration: 3 Hrs
Minimum Passing Marks: 36%

External

A course will contain 5 units. The question paper shall contain three sections. Section A (10 marks) shall contain 10 questions two from each Unit. Each question shall be of 1 mark. All the questions are compulsory. Section A will be prepared such that questions i through v are multiple-choice questions, while questions vi through x will be fill-in-the-blank questions. Section B (25 marks) shall contain 5 questions (two from each unit with internal choice). Each question shall be of 5 marks. The candidate is required to answer all 5 questions. The answers should not exceed 150 words. Section C (45 marks) shall contain 5 questions, one from each Unit. Each question shall be of 15 marks. The candidate is required to answer any three questions by selecting these three questions from different units. The answers should not exceed 400 words.

Internal

Internal exam shall comprise Theory Exam (10 marks), Seminar Presentation (6 marks) and Class Performance (4 marks).

Recommended Readings

1. Garrett Grolemund, Hands-On Programming with R, O′Reilly Publishers.
2. R for Beginner - https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf

Suggested Readings

3. A Learning Guide to R -https://www.westernsydney.edu.au/__data/assets/pdf_file/0011/830909/Rnotes_20180905_web.pdf
4. Douglas Montgomery, Applied Statistics And Probability For Engineers, John Wiley & Sons Inc.
5. C.R. Kothari, Research Methodology: Methods And Techniques, New Age International Publishers.
6. Montgomery, Douglas C, Design and Analysis of Experiments, Wiley India.

Paper Code:MCSDSET305(B)
Paper Name : Introduction to LaTeX
(See Scheme of Examination)

Course Objectives:
CO1. To understand the concept of scientific writing.
CO2. To understand about working with text, images, tables, references etc in LaTeX.

Learning Outcomes:
After completing this course, students will be able to:
LO1. To understand the concept of scientific writing.
LO2. To understand about working with text, images, tables, references etc in LaTeX.

Unit I

Installation of the software LaTeX, Using any online LaTeX editor like Overleaf ; Preparing and compiling a LaTeX input file, LaTeX syntax: Commands, Packages, Keyboard characters in LaTeX. Fonts Selection: Text-mode fonts, Math-mode fonts, Colored fonts.

Unit II

Texts Formatting: Sectional units, Labeling and referring numbered items, Quoted texts, New lines and paragraphs, Creating and filling blank space, Producing dashes within texts, Foot notes .

Unit III

Listing Texts: Numbered and Unnumbered listing, Listing with user-defined labels; Tabbing Texts; Table Preparation: Table through tabular and tabularx environment, Vertical positioning of tables, Merging rows and columns of tables, Tables in multi-column documents, Tables at the end of a document.

Unit IV

Figure Insertion: Inserting simple figures, Sub-numbering a group of figures, Figures in multi-column documents, Figures at the end of a document.Equations: Basic notations and delimiters, Mathematical operators, Mathematical expressions in text-mode, Simple equations, Array of equations.

Unit V

Bibliography with BIBTEX: Preparation of BIBTEX compatible reference database, Standard bibliographic styles of LaTeX. Article Preparation: List of authors, Title and abstract on separate pages, Articles in multiple columns. Slide Preparation: Frames and Sectional units in presentation, Appearance of a presentation (BEAMER themes).

Instructions for Examination (Theory)

Maximum Marks: 100 (80 External + 20 Internal)
Duration: 3 Hrs
Minimum Passing Marks: 36%

External

A course will contain 5 units. The question paper shall contain three sections. Section A (10 marks) shall contain 10 questions two from each Unit. Each question shall be of 1 mark. All

the questions are compulsory. Section A will be prepared such that questions i through v are multiple-choice questions, while questions vi through x will be fill-in-the-blank questions. Section B (25 marks) shall contain 5 questions (two from each unit with internal choice). Each question shall be of 5 marks. The candidate is required to answer all 5 questions. The answers should not exceed 150 words. Section C (45 marks) shall contain 5 questions, one from each Unit. Each question shall be of 15 marks. The candidate is required to answer any three questions by selecting these three questions from different units. The answers should not exceed 400 words.

Internal
Internal exam shall comprise Theory Exam (10 marks), Seminar Presentation (6 marks) and Class Performance (4 marks).

Recommended Readings

1. Leslie Lamport, LaTeX: A Document Preparation System, Addison- Wesley.

Suggested Readings

2. Stefan Kottwitz, LaTeX Beginner's Guide, Packt Publishing Limited.
3. Tobias Oetiker, Hubert Partl, Irene Hyna, and Elisabeth Schegle, The Not So Short Introduction to LaTeX 2e, https://tobi.oetiker.ch/lshort/lshort-a5book.pdf, 2014.
4. LaTeX in 24 hours (Link)

Paper Code:MCS6.5DSET305(c)
Paper Name : Python Programming

After successful completion of this course, the student will have the fundamental knowledge of programming in Python and various constructs.

Course Objectives:
CO1. To examine Python syntax and semantics and apply Python flow control and functions.
CO2. To create, run and manipulate Python Programs using core data structures like Lists,
CO3. To apply Dictionaries and use Regular Expressions.
CO4. To interpret the concepts of Object-Oriented Programming as used in Python.
CO5. To master object-oriented programming to create an entire python project using objects and classes
CO6. To understand various libraries of Python.

Learning Outcomes:
After completing this course, students will be able to:
LO1. Examine Python syntax and semantics and apply Python flow control and functions.
LO2. Create, run and manipulate Python Programs using core data structures like Lists,
LO3. Apply Dictionaries and use Regular Expressions.
LO4. Interpret the concepts of Object-Oriented Programming as used in Python.
LO5. Master object-oriented programming to create an entire python project using objects and classes
LO6. Understand various libraries of Python.

Unit I

Basics: Indentation, comments, importing a module, standard scalar data types, Control flow: if-else statements, loops (while, for), pass, range; Lists, Tuples, Sets, Dictionaries.

Unit II

Functions; Basics of Exception handling and File handling. Objects and Methods in Python. NumPy: creating N-dimensional arrays, arithmetic with NumPy arrays, basic indexing and slicing, Psuedorandom number generation.

Unit III

Pandas: DataFrames, reading data from csv file, operations for analyzing data, cleaning data. Matplotlib- plotting basic figures, subplots, line plots, bar plots, histograms, scatter plots.

Unit IV

Seaborn: Basics of Heatmaps, pair plots, distributions. Overview of Supervised and Unsupervised Learning, classification, regression, clustering.

Unit V

Scikit-learn: Dataset Loading, Splitting the dataset, Evaluating the Model. Overview of Python-based open-source frameworks across various domains.

Instructions for Examination (Theory)

Maximum Marks: 100 (80 External + 20 Internal)
Duration: 3 Hrs
Minimum Passing Marks: 36%

External

A course will contain 5 units. The question paper shall contain three sections. Section A (10 marks) shall contain 10 questions two from each Unit. Each question shall be of 1 mark. All the questions are compulsory. Section A will be prepared such that questions i through v are multiple-choice questions, while questions vi through x will be fill-in-the-blank questions. Section B (25 marks) shall contain 5 questions (two from each unit with internal choice). Each question shall be of 5 marks. The candidate is required to answer all 5 questions. The answers should not exceed 150 words. Section C (45 marks) shall contain 5 questions, one from each Unit. Each question shall be of 15 marks. The candidate is required to answer any three questions by selecting these three questions from different units. The answers should not exceed 400 words.

Internal

Internal exam shall comprise Theory Exam (10 marks), Seminar Presentation (6 marks) and Class Performance (4 marks).

Suggested Readings

1. Python for Data Analysis: Data Wrangling with Pandas, NumPy, and Ipython, by Wes McKinney, O'Reilly Media, 2017
2. Python All-in-One for Dummies, by John Shovic and Alan Simpson, John Wiley & Sons, Inc., 2019
3. A Complete Introduction to the Python Language, Mark Summerfield, Pearson.
4. Swaroop, C. H. (2003). A Byte of Python. Python Tutorial.
5. Introduction to Computation and Programming Using Python. By John V. Guttag, MIT Press.
6. Learning Python , Mark Lutz, David Ascher, O'Reilly
7. T. Budd, Exploring Python, TMH, 1st Ed, 2011

Web Resources

1. https://www.learnpython.org/
2. https://nptel.ac.in/courses/106/106/106106212/
3. http://greenteapress.com/thinkpython/thinkpython.pdf
4. Python tutorial: https://docs.python.org/3/tutorial/index.html

Semester IV

Paper Code:MCS6.5DSET402(A)
Paper Name: Machine Learning
(See Scheme of Examination)

Course Objectives:
CO1. To be able to understand the basics of Machine learning;
CO2. To be able to understand the different types of datasets;
CO3. To be able to have the concept of basic classification and clustering algorithms;
CO4. To be able to understand the concept of simple artificial neural networks;
CO5. To be able to build and implement a simple ML model and evaluate the results.

Learning Outcomes:
After completing this course, students will be able to-
LO1. To be able to understand the basics of Machine learning;
LO2. To be able to understand the different types of datasets;
LO3. To be able to have the concept of basic classification and clustering algorithms;
LO4. To be able to understand the concept of simple artificial neural networks;
LO5. To be able to build and implement a simple ML model and evaluate the results.

Unit I

Introduction: Concept and Applications of Machine Learning(ML), Types of ML Systems: Supervised, Unsupervised, Reinforcement. Cleaning the data: Feature Selection, Row Compression, One-hot Encoding, Normalization, Missing Data.

Unit II

Types of datasets: Training, Validation, Test Dataset; Real open dataset repositories. Decision Trees: Concept, Splitting the data on basis of different attributes, Calculating entropy and choosing the variable for classification.Meaning of Bias, Variance, Underfitting, Overfitting, Hyperparameters.

Unit III

Linear Regression: concept with example; Logistic Regression: concept with example. k-Means Clustering: concept with example, setting the right number of clusters.

Unit IV

Artificial Neural Networks(ANN): Nodes, edges/weights, and sum/activation function of a basic neural network, Three general layers of an ANN, Weight updation and output calculation in case of simple activation functions like binary step function.

Unit V

Importing datasets and preview basic things using library like Pandas. Overview of Scikit-learn library. Building a basic model in Python using steps like : Import libraries, Import dataset, Scrub dataset, Split data into training and test data, Select an algorithm and configure its hyperparameters, Evaluate the results. Overview of Model Optimization.

Instructions for Examination (Theory)

Maximum Marks: 100 (80 External + 20 Internal)
Duration: 3 Hrs
Minimum Passing Marks: 36%

External

A course will contain 5 units. The question paper shall contain three sections. Section A (10 marks) shall contain 10 questions two from each Unit. Each question shall be of 1 mark. All the questions are compulsory. Section A will be prepared such that questions i through v are multiple-choice questions, while questions vi through x will be fill-in-the-blank questions. Section B (25 marks) shall contain 5 questions (two from each unit with internal choice). Each question shall be of 5 marks. The candidate is required to answer all 5 questions. The answers should not exceed 150 words. Section C (45 marks) shall contain 5 questions, one from each Unit. Each question shall be of 15 marks. The candidate is required to answer any three questions by selecting these three questions from different units. The answers should not exceed 400 words.

Internal

Internal exam shall comprise Theory Exam (10 marks), Seminar Presentation (6 marks) and Class Performance (4 marks).

Recommended Readings

1. Machine Learning with PyTorch and Scikit-Learn: Develop machine learning and deep learning models with Python, by Sebastian Raschka , Yuxi (Hayden) Liu , Vahid Mirjalili, packt publishers.
2. Machine Learning For Absolute Beginners: A Plain English Introduction, Oliver Theobald, Third Ed.
3. Tom M. Mitchell, Machine Learning, First Edition, Tata McGraw-Hill Education.
4. Ethem Alpaydin, Introduction to Machine Learning, 2nd Edition, The MIT Press.
5. Christopher M. Bishop, Pattern Recognition and Machine Learning, Springer.
6. Mevin P. Murphy, Machine Learning: A Probabilistic Perspective, The MIT Press.

Suggested Readings

1. John Paul Mueller, Luca Massaron, Machine Learning For Dummies, For Dummies; 1st edition.
2. O Theobald, Machine Learning for Absolute Beginners: A Plain English Introduction, Scatterplot Press; 2nd edition.

3. Andreas C. Müller, Sarah Guido, Introduction to Machine Learning with Python: A Guide for Data Scientists, O′Reilly; 1st edition
4. https://www.cmpe.boun.edu.tr/~ethem/i2ml3e/
5. Aurélien Géron - Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow_ Concepts, Tools, and Techniques to Build Intelligent Systems-O'Reilly Media (2022)

Paper Code: MCS6.5DSET402(b)
Paper Name: Computer Graphics & Multimedia
(See Scheme of Examination)

Course Objectives:

CO1. To develop line and circle generation algorithms
CO2. To apply 2D and 3D transformations
CO3. To develop clipping algorithms for point, line, and polygons
CO4. To learn the concepts of projections, viewing, and graphics pipeline
CO5. To create a simple animation and interaction for multimedia presentation
CO6. To understand image types and color models
CO7. To describe the concepts regarding the digitization of audio signals
CO8. To compress images, videos, and audios using data compression methods
CO9. To encode videos and audios using MPEG
CO10. To ExplainfunctionalIdentify the core concepts of computer graphics, including viewing, projection, perspective, modeling, and transformation in two and three dimensions.
CO11. To apply the concepts of color models, lighting and shading models, textures, ray tracing, hidden surface elimination, anti-aliasing, and rendering.
CO12. To interpret the mathematical foundation of the concepts of computer graphics.
CO13. To describe the fundamentals of animation, parametric curves, and surfaces, and spotlighting.
CO14. To identify a typical graphics pipeline and apply graphics programming techniques to design and create computer graphics.
CO15. To create effective OpenGL programs to solve graphics programming issues, including 3D transformation, object modeling, color modeling, lighting, textures, and ray tracing.
CO16. To understand multimedia concerning any applications, including business, schools, home, education, and virtual reality.
CO17. To understand the hardware and software needed to create projects using creativity and organization to create them.
CO18. To develop multimedia skills to be the principal player of individual multimedia teams in developing projects.
CO19. To work with all aspects of images.
CO20. To work with all aspects of sound.
CO21. To work with all aspects of the video.
CO22. To learn copyright laws associated with multimedia.
CO23. To learn the cost involved in multimedia planning, designing, and producing.
CO24. To learn ways to present their multimedia projects.

Learning Outcomes:

After completing this course, students will be able to:
LO1. Develop line and circle generation algorithms
LO2. Apply 2D and 3D transformations
LO3. Develop clipping algorithms for point, line, and polygons
LO4. Learn the concepts of projections, viewing, and graphics pipeline
LO5. Create a simple animation and interaction for multimedia presentation
LO6. Understand image types and color models
LO7. Describe the concepts regarding the digitization of audio signals
LO8. Compress images, videos, and audios using data compression methods
LO9. Encode videos and audios using MPEG
LO10. ExplainfunctionalIdentify the core concepts of computer graphics, including viewing, projection, perspective, modeling, and transformation in two and three dimensions.
LO11. apply the concepts of color models, lighting and shading models, textures, ray tracing, hidden surface elimination, anti-aliasing, and rendering.
LO12. interpret the mathematical foundation of the concepts of computer graphics.
LO13. Describe the fundamentals of animation, parametric curves, and surfaces, and spotlighting.
LO14. Identify a typical graphics pipeline and apply graphics programming techniques to design and create computer graphics.

LO15. Create effective OpenGL programs to solve graphics programming issues, including 3D transformation, object modeling, color modeling, lighting, textures, and ray tracing.
LO16. Students will understand multimedia concerning any applications, including business, schools, home, education, and virtual reality.
LO17. Students will understand the hardware and software needed to create projects using creativity and organization to create them.
LO18. The student will develop multimedia skills to be the principal player of individual multimedia teams in developing projects.
LO19. Students will work with all aspects of images.
LO20. Students will work with all aspects of sound.
LO21. Students will work with all aspects of the video.
LO22. Students will learn copyright laws associated with multimedia.
LO23. Students will learn the cost involved in multimedia planning, designing, and producing.
LO24. Students will learn ways to present their multimedia projects.

Unit I

Basic elements of Computer Graphics, Graphics display devices, Applications of Computer Graphics, Raster and random scan; Color Models: RGB, CMY, HSV; Graphics Standard: OpenGL; Scan Conversion: DDA line algorithm, Midpoint circle Algorithm.

Unit II

2D Transformation: Translation, Rotation, Scaling, Homogeneous Coordinates and Matrix Representation of 2D Transformation, Composite Transformation. 3D Graphics: Matrix Representation of 3D transformations, Translation, Rotation, Scaling, Composite Transformation.

Unit III

Overview of concepts: Clipping, orthographic and parallel projection, hidden surface removal, lighting, transparency, modeling and texturing, rendering; Animations: Principles of animations, keyframing, the concept of 2D and 3D animation.

Unit IV

Blender: GUI Interface, Selecting, rotating, and Translating Objects, Using Snap to move objects precisely, Creating mesh primitives and extrusions, Subdividing meshes, Creating a simple creature, Joining mesh objects and stitching vertices, Organizing a scene with layers, groups, and hierarchies, Assigning glossy and reflective materials to objects, Creating bump maps,

Unit V

Creating sky and ambient light, Understanding ambient occlusion, Adding motion blur and depth of field, Editing animation in the Graph Editor, Building and animating a simple character.

Instructions for Examination (Theory)

Maximum Marks: 100 (80 External + 20 Internal)
Duration: 3 Hrs
Minimum Passing Marks: 36%

External

A course will contain 5 units. The question paper shall contain three sections. Section A (10 marks) shall contain 10 questions two from each Unit. Each question shall be of 1 mark. All the questions are compulsory. Section A will be prepared such that questions i through v are multiple-choice questions, while questions vi through x will be fill-in-the-blank questions.

Section B (25 marks) shall contain 5 questions (two from each unit with internal choice). Each question shall be of 5 marks. The candidate is required to answer all 5 questions. The answers should not exceed 150 words. Section C (45 marks) shall contain 5 questions, one from each Unit. Each question shall be of 15 marks. The candidate is required to answer any three questions by selecting these three questions from different units. The answers should not exceed 400 words.

Internal

Internal exam shall comprise Theory Exam (10 marks), Seminar Presentation (6 marks) and Class Performance (4 marks).

Recommended Readings

1. Foley, van Dam, Feiner and Hughes, Computer Graphics (Principles and Practice), Addison Wesley (Indian Edition).
2. D Hearn and PM Baker, Computer Graphics, Prentice Hall of India (Indian Edition).

Suggested Readings

3. DF Roger, Mathematical Elements for Computer Graphics.
4. Krishnamurthy N, Introduction to Computer Graphics, Tata McGraw Hill.
5. Zhigang X. and Plastock Ra, Theory and Problems of Computer Graphics (Schaum's Outline), Tata McGraw Hill.

Web Resources

1. https://www.cs.duke.edu/brd/Teaching/Previous/Animation/animation.html
2. http://zikky.lecturer.pens.ac.id/Produksi 3D untuk Designer/Beginning Blender-book.pdf
3. http://www.blenderhd.com/wp-content/uploads/2015/08/BeginnersGuideToBlender.pdf
4. https://people.sc.fsu.edu/~gerlebacher/gd/blender/blender/blender_noob_to_pro.pdf
5. http://download.blender.org/documentation/pdf/John M Blain - An Introduction To Blender 3D - A Book For Beginners (2011).pdf
6. http://www.cdschools.org/cms/lib04/PA09000075/Centricity/Domain/81/BlenderBasics_4th Edition2011.pdf
7. https://docs.blender.org/manual/en/dev/index.html

Paper Code: MCS6.5DSET402(c)
Paper Name: Natural Language Processing
(See Scheme of Examination)

Course Objectives:

CO1. To have an introduction of the fundamental concepts and techniques of natural language processing (NLP).
CO2. To gain an in-depth understanding of the computational properties of natural languages and the commonly used algorithms for processing linguistic information.
CO3. To examine NLP models and algorithms using both the traditional symbolic and the more recent statistical approaches.
CO4. To understand critical concepts from NLP are used to describe and analyze language.
CO5. To perform POS tagging and context-free grammar for the English language.
CO6. To understanding semantics and pragmatics of English language for processing·
CO7. To write programs in Python to carry out natural language processing

Learning Outcomes:

After completing this course, students will be able to-
LO1. Introduction to the fundamental concepts and techniques of natural language processing (NLP).
LO2. Students will gain an in-depth understanding of the computational properties of natural languages and the commonly used algorithms for processing linguistic information.
LO3. The course examines NLP models and algorithms using both the traditional symbolic and the more recent statistical approaches.
LO4. Critical concepts from NLP are used to describe and analyze language.
LO5. POS tagging and context-free grammar for the English language.
LO6. Understanding semantics and pragmatics of English language for processing·
LO7. Writing programs in Python to carry out natural language processing

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Unit I

Introduction, Basics of text processing, Spelling Correction: Edit Distance; N-Gram Language Models, Evaluation of Language Models, Basic Smoothing, Computational Morphology, Introduction to POS Tagging.

Unit II

Overview of Hidden Markov Model, Basics of Models for Sequential tagging – Introduction to Maximum entropy and Conditional Random Fields. Constituency syntax parsing, examples of parsing using CKY and PCFG.

Unit III

Introduction to Dependency Grammars and Parsing, understanding of Transition Based Parsing; Distributional Semantics - Introduction, Applications; Word Embedding: Frequency-based embedding, Prediction based embeddings.

Unit IV

Lexical Semantics: an overview of WordNet, Word Sense Disambiguation. Topic models: introduction, LDA; Introduction to Entity Linking and Information Extraction;

Unit V

Text Summarization: an overview of various approaches. Text Classification: introduction and simple practical implementation using Python. Sentiment Analysis: Concept, Analysis, and Applications.

Instructions for Examination (Theory)

Maximum Marks: 100 (80 External + 20 Internal)
Duration: 3 Hrs
Minimum Passing Marks: 36%

External

A course will contain 5 units. The question paper shall contain three sections. Section A (10 marks) shall contain 10 questions two from each Unit. Each question shall be of 1 mark. All the questions are compulsory. Section A will be prepared such that questions i through v are multiple-choice questions, while questions vi through x will be fill-in-the-blank questions. Section B (25 marks) shall contain 5 questions (two from each unit with internal choice). Each question shall be of 5 marks. The candidate is required to answer all 5 questions. The answers should not exceed 150 words. Section C (45 marks) shall contain 5 questions, one from each Unit. Each question shall be of 15 marks. The candidate is required to answer any three questions by selecting these three questions from different units. The answers should not exceed 400 words.

Internal

Internal exam shall comprise Theory Exam (10 marks), Seminar Presentation (6 marks) and Class Performance (4 marks).

Required Readings

1. James Allen, Natural Language Understanding, Pearson Education; 2nd edition.
2. Jurafsky / Martin. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition, 2e.
3. Nitin Indurkhya, Fred J. Damerau, Handbook of Natural Language Processing, Taylor and Francis; Second edition.
4. Alexander Clark, Chris Fox, Shalom Lappin, The Handbook of Computational Linguistics and Natural Language Processing, Wiley-Blackwell; 1st edition
5. Steven Bird, Ewan Klein, Edward Loper, Natural Language Processing with Python: Analysing Text with the Natural Language Toolkit, Shroff pub.
6. Christopher D. Manning, Hinrich Schütze, Foundations of Statistical Natural Language Processing, MIT press.

Suggested Readings

1. Frederick Jelin, Statistical Methods for Speech Recognition (Language, Speech, and Communication) Fourth Printing Edition.

Yoav Goldberg, Graeme Hirst, Morgan and Claypool, Neural Network Methods for Natural Language Processing Synthesis Lectures on Human Language Technologies, Life Sciences.

Paper Code**: MCS6.5DSET403(a)**
Paper Name : Cloud Computing
(See Scheme of Examination)

Course Objective: To have an understanding of key aspects of cloud computing
Learning Outcome: After completing this course the student will have an understanding of key aspects of cloud computing

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Unit I

Introduction: Concept of Cloud Computing, Benefits and limitations of Cloud Computing. Cloud Computing Architecture: Comparison with traditional computing architecture (client/server), Services provided at various levels,

Unit II

Service Models- IInfrastructure as a Service(IaaS), Platform as a Service(PaaS), Software as a Service(SaaS). Deployment Models- Public cloud, Private cloud, Hybrid cloud, Community cloud, Case study of NIST architecture.

Unit III

Case study of Service model using Google App Engine, Microsoft Azure, Amazon EC2 , Eucalyptus. Creating virtual machines that access different programs on different platforms.

Unit IV

Service Management in Cloud Computing: Service Level Agreements(SLAs), Billing & Accounting, Comparing Scaling Hardware: Traditional vs. Cloud, Economics of scaling.

Unit V

Cloud Security: Infrastructure Security- Network level security, Host level security, Application level security, Data privacy and security Issues, Jurisdictional issues raised by Data location, Authentication in cloud computing.

Instructions for Examination (Theory)

Maximum Marks: 100 (80 External + 20 Internal)
Duration: 3 Hrs
Minimum Passing Marks: 36%

External

A course will contain 5 units. The question paper shall contain three sections. Section A (10 marks) shall contain 10 questions two from each Unit. Each question shall be of 1 mark. All the questions are compulsory. Section A will be prepared such that questions i through v are multiple-choice questions, while questions vi through x will be fill-in-the-blank questions. Section B (25 marks) shall contain 5 questions (two from each unit with internal choice). Each question shall be of 5 marks. The candidate is required to answer all 5 questions. The answers should not exceed 150 words. Section C (45 marks) shall contain 5 questions, one from each Unit. Each question shall be of 15 marks. The candidate is required to answer any three questions by selecting these three questions from different units. The answers should not exceed 400 words.

Internal
Internal exam shall comprise Theory Exam (10 marks), Seminar Presentation (6 marks) and Class Performance (4 marks).

Suggested Readings

1. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
2. Ronald L. Krutz, Russell Dean Vines, "Cloud Security A comprehensive Guide to secure Cloud Computing" Wiley
3. Thomas Erl, Cloud Computing Concepts Technology and Architecture, Prentice Hall.
4. Rajkumar Buyya, James Broberg and Andrzej Goscinski, Cloud Computing Principles and paradigms, John Wiley and Sons, Inc. Publication.
5. Dan C. Marinescu,Cloud Computing Theory and Practice, Morgon Kaufman Publication.

Paper Code: MCS6.5DSET403(b)
Paper Name: Internet of Things
(See Scheme of Examination)

Course Objectives:

CO1. To understand the definition and significance of the Internet of Things
CO2. To discuss the architecture, operation, and business benefits of an IoT solution
CO3. To examine the potential business opportunities that IoT can uncover
CO4. To explore the relationship between IoT, cloud computing, and big data
CO5. To identify how IoT differs from traditional data collection systems
CO6. To understand the definition and significance of the Internet of Things
CO7. To discuss the architecture, operation, and business benefits of an IoT solution
CO8. To examine the potential business opportunities that IoT can uncover
CO9. To explore the relationship between IoT, cloud computing, and big data
CO10. To identify how IoT differs from traditional data collection systems.

Learning Outcomes:

After completing this course, students will be able to:
LO1. Understand the definition and significance of the Internet of Things
LO2. Discuss the architecture, operation, and business benefits of an IoT solution
LO3. Examine the potential business opportunities that IoT can uncover
LO4. Explore the relationship between IoT, cloud computing, and big data
LO5. Identify how IoT differs from traditional data collection systems
LO6. Understand the definition and significance of the Internet of Things
LO7. Discuss the architecture, operation, and business benefits of an IoT solution
LO8. Examine the potential business opportunities that IoT can uncover
LO9. Explore the relationship between IoT, cloud computing, and big data
LO10. Identify how IoT differs from traditional data collection systems.

Unit I

M2M to IoT: Introduction, Market Perspective, Architectural Overview. M2M to IoT Technology- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, IoT analytics, Knowledge management,
IOT Architecture, Architecture Reference Model, Real-world design constraints. IoT Use Cases- Asset Management,

Unit II

Industrial Automation- Service-oriented architecture-based device integration, SOCRADES: realizing the enterprise integrated Web of Things, IMC-AESOP: from the Web of Things to the Cloud of Things,

Unit III

Commercial Building Automation- Introduction, Case study: phase one-commercial building automation today, Case study: phase two- commercial building automation in the future.

Unit IV

Internet of Things Privacy, Security and Governance Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, IOT and Smart Cities,

Unit V

Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security

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Instructions for Examination (Theory)

Maximum Marks: 100 (80 External + 20 Internal)
Duration: 3 Hrs
Minimum Passing Marks: 36%

External
A course will contain 5 units. The question paper shall contain three sections. Section A (10 marks) shall contain 10 questions two from each Unit. Each question shall be of 1 mark. All the questions are compulsory. Section A will be prepared such that questions i through v are multiple-choice questions, while questions vi through x will be fill-in-the-blank questions. Section B (25 marks) shall contain 5 questions (two from each unit with internal choice). Each question shall be of 5 marks. The candidate is required to answer all 5 questions. The answers should not exceed 150 words. Section C (45 marks) shall contain 5 questions, one from each Unit. Each question shall be of 15 marks. The candidate is required to answer any three questions by selecting these three questions from different units. The answers should not exceed 400 words.

Internal
Internal exam shall comprise Theory Exam (10 marks), Seminar Presentation (6 marks) and Class Performance (4 marks).

Recommended Readings

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, 1st Edition, Academic Press.
2. Vijay Madisetti and Arshdeep Bahga, Internet of Things (A Hands-on-Approach), 1stEdition, VPT.
3. Francis daCosta, Rethinking the Internet of Things: A Scalable Approach to Connecting Everything, 1st Edition, Apress Publications.
4. Hakim Cassimally, Designing the Internet of Things , Adrian McEwen (Author).
5. Dr. Ovidiu Vermesan, Dr. Peter Friess. Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, River Publishers.
6. Vijay Madisetti , Arshdeep Bahga, Internet of Things, A Hands-on-Approach.
7. Daniel Minoli, Building the internet of things with ipv6 and mipv6, The Evolving World of M2M Communications, John Wiley & Sons.

Paper Code: MCS6.5DSET403(c)
Paper Name: Android Programming
(See Scheme of Examination)

Course Objectives:

CO1. To create an android project from XML Layout.
CO2. To debug Android apps and create UI fragments
CO3. To pass data between fragments
CO4. To design apps with audio playback.
CO5. To create a database and communicate with mobile apps
CO6. To install and configure Android application development tools
CO7. To design and develop user interfaces for the Android platform.
CO8. To save state information across important operating system events.
CO9. To apply Java programming concepts to Android application development.
CO10. To develop the ability to develop Android Application

Learning Outcomes:

After completing this course, students will be able to:
LO1. Create an android project from XML Layout.
LO2. Debug Android apps and create UI fragments
LO3. Pass data between fragments
LO4. Design apps with audio playback.
LO5. Create database and communicate with mobile apps
LO6. Install and configure Android application development tools.
LO7. Design and develop user interfaces for the Android platform.
LO8. Save state information across important operating system events.
LO9. Apply Java programming concepts to Android application development.
LO10. Develop the ability to develop Android Application

Unit-I

Android Introduction- What is Android?, History and Version, Android Architecture, Android Emulator, Install Android, Setup Android Studio, Introduction to Gradle, What is Context in Android? First Android App, Application Components, AndroidManifest.xml, MainActivity.java, activity_main.xml, R.java, Hide Title Bar, Screen Orientation.

Unit-II

UI Layouts- Linear Layout, Relative Layout, Table Layout, Absolute Layout, Frame Layout. UI Controls- TextView, EditText, AutoCompleteTextView, Button, ImageButton, Checkbox, ToggleButton, RadioButton, RadioGroup, ProgressBar, Spinner, TimePicker, DatePicker. ListView, GridView, WebView, Vertical ScrollView, Horizontal ScrollView, ImageSlider. Event Handling.

Unit-III

Activity and Intents- Activity LifeCycle, Implicit Intent, Explicit Intent, Share App Data. BroadcastReceiver, Notifications, Fragments, Android Menu- Option Menu, Context Menu, Popup Menu. Android Service, Android AlarmManager, Android Storage, Toast, Custom Toast, Spinner.

Unit-IV

Android SQLite- Database Creation, Insertion, Deletion, Updation and Fetching Data. XML Parsing and JSON Parsing.

Android Multimedia- MediaPlayer, VideoView, Recording Media. Android Speech

Unit-V

Android Telephony- TelephonyManager, Get Call State, Simple Caller Talker, Phone Call, Send SMS, Send Email

Android Device- Bluetooth, List Paired Devices, WIFI. Camera, Sensor, Graphics, Animation, Working with Google Maps.

Instructions for Examination (Theory)

Maximum Marks: 100 (80 External + 20 Internal)
Duration: 3 Hrs
Minimum Passing Marks: 36%

External

A course will contain 5 units. The question paper shall contain three sections. Section A (10 marks) shall contain 10 questions two from each Unit. Each question shall be of 1 mark. All the questions are compulsory. Section A will be prepared such that questions i through v are multiple-choice questions, while questions vi through x will be fill-in-the-blank questions. Section B (25 marks) shall contain 5 questions (two from each unit with internal choice). Each question shall be of 5 marks. The candidate is required to answer all 5 questions. The answers should not exceed 150 words. Section C (45 marks) shall contain 5 questions, one from each Unit. Each question shall be of 15 marks. The candidate is required to answer any three questions by selecting these three questions from different units. The answers should not exceed 400 words.

Internal

Internal exam shall comprise Theory Exam (10 marks), Seminar Presentation (6 marks) and Class Performance (4 marks).

Recommended Readings

1. Android Programming for Beginners by John Horton Publisher: Packt Publishing
2. Learn Java for Android Development (2nd edition) by Jeff Friesen Publisher: Apress

Suggested Readings

3. James C. Sheusi, Android application development for java programmers, Cengage Learning.
4. Jerome F. DiMarzio, Beginning Android Programming with Android Studio, Fourth Edition, John Wiley & Sons.
5. Kristin Marsicano , Chris Stewart , Bill Phillips, Programming: The Big Nerd Ranch Guide, Big Nerd Ranch Guides.

Paper Code: MCS6.5DPR/OJT/RCC404
Paper Name: Combined Practical & Project/Dissertation/Industrial Training
(See Scheme of Examination)

Course Objectives:

CO1. Identify and define the problem statement
CO2. Define and justify the scope of the proposed problem
CO3. Gather and analyze system requirements
CO4. Propose an optimized solution among the existing solutions
CO5. Practice software analysis and design techniques
CO6. Develop technical report writing and oral presentation skills
CO7. Develop a functional application based on the software design
CO8. Apply to code, debugging, and testing tools to enhance the quality of the software
CO9. Prepare the proper documentation of software projects following the standard guidelines
CO10. Become a master in specialized technology
CO11. Become updated with all the latest changes in the technological world.
CO12. Ability to communicate efficiently.
CO13. Ability to be a multi-skilled engineer with sound technical knowledge, management, leadership, and entrepreneurship skills.
CO14. Capability and enthusiasm for self-improvement through continuous professional development and life-long learning
CO15. Awareness of the social, cultural, global, and environmental responsibility of an engineer.

Learning Outcomes

After completing this course, students will be able to:

LO1. Identify and define the problem statement
LO2. Define and justify the scope of the proposed problem
LO3. Gather and analyze system requirements
LO4. Propose an optimized solution among the existing solutions
LO5. Practice software analysis and design techniques
LO6. Develop technical report writing and oral presentation skills
LO7. Develop a functional application based on the software design
LO8. Apply to code, debugging, and testing tools to enhance the quality of the software
LO9. Prepare the proper documentation of software projects following the standard guidelines
L10. Become a master in specialized technology
LO11. Become updated with all the latest changes in the technological world.
LO12. Ability to communicate efficiently.
LO13. Ability to be a multi-skilled engineer with sound technical knowledge, management, leadership, and entrepreneurship skills.
LO14. Capability and enthusiasm for self-improvement through continuous professional development and life-long learning
LO15. Awareness of the social, cultural, global, and environmental responsibility of an engineer.

Practical Training and Project Work:

1. Project Work may be done individually or in groups in case of bigger projects. However, if the project is done in groups, each student must be given responsibility for a distinct module and care should be taken to monitor the individual student.
2. Project Work can be carried out in the college or outside with prior permission of the college.
3. The Student must submit a synopsis of the project report to the college for approval. The Project Guide can accept the project or suggest modification for resubmission. Only on acceptance of the draft project report, the student should make the final copies.

Submission Copy:

The Student should submit a spiral-bound copy of the project report.

Format of the Project:

1. **Paper:**
   The Report shall be typed on White Paper of A4 size.
2. **Final Submission:**
   The Report to be submitted must be original.
3. **Typing:**
   Font:- Times New Roman
   Heading:- 16 pt., Bold
   Subheading:- 14 pt, Bold
   Content:- 12 pt.
   Line Spacing:- 1.5 lines.
   Typing Side :-One Side
   Font Color:- Black.
4. **Margins:**
   The typing must be done in the following margin:
   Left : 0.75”
   Right: 0.75”
   Top: 1”
   Bottom: 1”
   Left Gutter: 0.5”
5. **Binding:**
   The report shall be Spiral Bound.
6. **Title Cover:**
   The Title cover should contain the following details:
   Top: Project Title in block capitals of 16pt.
   Centre: Name of project developer’s and Guide name.
   Bottom: Name of the university, Year of submission all in block capitals of 14pt letters on separate lines with proper spacing and centering.
7. **Blank sheets:**
   At the beginning and end of the report, two white blank papers should be provided, one for the Purpose of Binding and other to be left blank.
8. **Content:**
   - **I).** Acknowledgment
   - **II).** Institute/College/Organization certificate where the project is being developed.
   - **III).** Table of contents
   - **IV).** A brief overview of the project
   - **V).** Profiles of problems assigned
   - **VI).** Study of Existing System
   - **VII).** System Requirement

VIII). Project plan

- Team Structure
- Development Schedule
- Programming language and Development Tools

IX). Requirement Specification

X). Design

- Detailed DFD and Structure Diagram
- Data structure, Database and File Specification

XI). Project Legacy

- Current Status of project
- Remaining Areas of concern
- Technical and Managerial Lessons Learnt
- Future Recommendations

- Nomenclature and Abbreviations.
- Bibliography
- Source Code

Teaching-Learning Process

The teaching learning process may include the following-

- Lectures
- Discussions
- Simulations
- Virtual Labs
- Role Playing
- Participative Learning
- Interactive Sessions
- Seminars
- Research-based Learning/ Dissertation/ Case Study/ Project Work

The Blended Learning mode of teaching and learning is preferable in which offline (face-to-face) and online learning both are used to provide learners the opportunity to enjoy both of the worlds. Teachers can share instructions, lecture notes, and assignments online. On the other hand, students can share information/work/assignments with teachers and other students directly in a collaborative setting. This may have a more enriched learning experience, and collaboration between students can be improved upon if group activities rely on information gathered from online resources or lessons. Students who complete online coursework followed by interactive, face-to-face class activities have richer educational experiences.

Assessment and Evaluation

- A comprehensive and continuous evaluation by mid-semester examinations at regular intervals to find out each course level learning outcome
- Formative assessment on the basis of activities of a learner throughout the program instead of one assessment. for this provision of internal exams, student seminars, and assignments is included
- Open book exam is suggested for internal/ mid-term exams to better facilitate the understanding of the knowledge required
- Group examinations are recommended on problem-solving exercises and in major projects to enhance the teamwork capabilities of the learner
- Collaborative/Individual assignments are useful to enhance the capability of learners to gain domain-specific knowledge
- Student Seminars and Quizzes are recommended for the continuous learning and evaluation process

ELIGIBILITY FOR ADMISSION

Graduates possessing 55% marks (As per Admission Policy Govt. of Rajasthan) in any faculty of any statutory university shall be eligible for admission to the M.Sc. Computer Science Course (Relaxation to SC/ST etc. as per Prevailing Rules)

PASS CRITERIA

For passing in the examination, a candidate is required to obtain at least a Satisfactory Grade in each paper (Internal + External) and also acquire a Satisfactory Grade in theory and practical separately (in each semester examination).

INSTRUCTIONS FOR PRACTICAL EXAMINATION

Marks Distribution for Practical Exam -

Each practical exam is to be conducted by two examiners one External and one Internal. The external examiner should be a senior lecturer from the jurisdiction of other universities. Credit Weightage distribution for external practical of 2 credits (40 marks) is as under

a) Practical Examination exercise of 3 questions 1 credits (20 marks)
b) Viva-Voce 0.5 credit (10 marks)
c) Laboratory Exercise File 0.5 credit (10 marks)

Marks distribution for External Project report of 12 Credits (240 marks) is as under

External Evaluation-

Research Project/ Case Study 6 credits (120 marks)
Presentation 3 credits (60 marks)
External Viva Voce 3 credits (60 marks)

Internal Evaluation- Project Report + Presentation (40 marks + 20 marks)

INSTRUCTIONS FOR STUDENTS

The student has to complete two months of career-oriented summer training from any firm/organization. If the student does not get a chance to go for training, he/she can choose a research topic and can complete the dissertation under the supervision of any of the faculty in his college.

The student who has to opt for training has to provide a signed certificate from the firm/ organization authority stating that the student has spent two months as a trainee in his organization/firm. The student who has opted for a dissertation has to submit his/her dissertation report with a certificate from his supervisor.

In both cases, the student has to present his work in front of all the faculty members and fellow students at the starting of the next session.

*** An Academic/ Industrial Tour shall be organized by the college/department in every session. A Tour Report shall be prepared and submitted by the students after a study tour to industries/academic institutions of repute.**

- comprehensive and continuous evaluation by mid-semester examinations at regular intervA als to find out each course level learning outcome
- Formative assessment on the basis of activities of a learner throughout the program instead of one assessment. for this provision of internal exams, student seminars, and assignments is included
- Open book exam is suggested for internal/ mid-term exams to better facilitate the understanding of the knowledge required
- Group examinations are recommended on problem-solving exercises and in major projects to enhance the teamwork capabilities of the learner
- Collaborative/Individual assignments are useful to enhance the capability of learners to gain domain-specific knowledge
- Student Seminars and Quizzes are recommended for the continuous learning and evaluation process

Key Features of Revised Curriculum

Following are the key features of the revised curriculum-

- Student Centric Teaching and Learning approach
- Technology oriented approach of teaching
- Hand-on Practical/ Laboratory Sessions
- Problem-oriented teaching and learning
- Problem-analysis oriented assignments and evaluation
- Enhance logical thinking and analytical capabilities

Model Paper for 80 marks Theory Paper

Masters of Computer Science

Semester I

Duration: 3 Hours **Maximum Marks: 80**

MCS6.5DCCT101- Computer Fundamentals

Section – A

1. (a) …..…… MCQ from unit 1 ……. [1 x 10 =10]

(b) ……MCQ from unit 2 ……..

(c) ……MCQ from unit 3 ……..

(d) ……MCQ from unit 4……...

(e) ……MCQ from unit 5……...

(f) ……Fill in the Blanks from unit 1……...

(g) ……Fill in the Blanks from unit 2……..

(h) ……Fill in the Blanks from unit 3……..

(i) ……Fill in the Blanks from unit 4 ……...

(j) ……Fill in the Blanks from unit 5……...

Section - B

2. ……from unit 1…… [5 x 5=25]

or

3……from unit 1……..

4. ……from unit 2……

or

5……from unit 2……

6……from unit 3……

or

7……from unit 3……

8……from unit 4……

or

9……from unit 4……...

10……from unit 5…….

or

11……from unit 5…….

Part - C

[15 x 3=45]

12. ……from unit 1…….

13. ……from unit 2…….

14……from unit 3……...

15. ……..from unit 4……..

16. ……..from unit 5……..

Model Paper for 120 marks Theory Paper

Masters of Computer Science

Semester I

Duration: 3 Hours **Maximum Marks: 120**

MCS6.5DCCT24- Mathematics for Computer Science

Section – A

1. (a) …..…… MCQ from unit 1 ……. [2 x 10 =20]

(b) ……MCQ from unit 2 ……..

(c) ……MCQ from unit 3 ……..

(d) ……MCQ from unit 4 …….

(e) ……MCQ from unit 5 …….

(f) ……Fill in the Blanks from unit 1 ……..

(g) ……Fill in the Blanks from unit 2…….

(h) ……Fill in the Blanks from unit 3…….

(i) ……Fill in the Blanks from unit 4…….

(j) ……Fill in the Blanks from unit 5…….

Section - B

2. ……from unit 1…… [8 x 5=40]

or

3……from unit 1……

4. ……from unit 2…….

or

5……from unit 2…….

6……from unit 3……

or

7……from unit 3…….

8……from unit 4……

or

9……from unit 4…….

10……from unit 5…….

or

11……from unit 5……...

Part - C

[20 x 3=60]

12. ……from unit 1…….

13. ……from unit 2…….

14……from unit 3…….

15. ……..from unit 4……..

16. ……..from unit 5…….