Choice Based Credit System (CBCS)

Maharaja Ganga Singh University

Bachelor of Computer Applications (BCA)

(Semester System)

2025-26

Undergraduate Programme

(Effective from Academic Year 2025-26)

SYLLABUS
SCHEME OF EXAMINATION AND
COURSES OF STUDY

Preamble

Considering the curricular reforms as instrumental for desired learning outcomes, Maharaja Ganga Singh University made a rigorous attempt to revise the curriculum of postgraduate and undergraduate programs in alignment with the National Education Policy-2020 and UGC Quality Mandate for Higher Education Institutions. The process of revising the curriculum could be prompted by the adoption of the "Comprehensive Roadmap for Implementation of NEP". 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 University Grants Commission (UGC) has devised a series of regulations and directives over time with the intention of enhancing the higher education system's quality and enforcing minimum standards in Higher Educational Institutions (HEIs) throughout India. The recent academic reforms suggested by the UGC have contributed to an overarching enhancement of the higher education system.

With NEP-2020 in background, the revised curricula articulate the spirit of the Policy by emphasizing upon- 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; exposure to Indian knowledge system, cultural traditions and classical 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 combination of disciplines for study; offering multiple entry and exit points, integration of extracurricular and curricular aspects; exploring internships with local industry, businesses, artists and crafts persons; closer collaborations between industry and higher education institutions for technical, vocational and science programmes; and formative assessment tools to be aligned with the learning outcomes, capabilities, and dispositions as specified for each course. The University has also developed consensus on adoption of Blended Learning with component of online teaching and face to face classes for each programme.

Choice-Based Credit System (CBCS)

The Choice Based Credit System (CBCS), a part of the academic reform process to enhance the quality of education and facilitate the transferability of students from one University/institution to another at the national and international level, provides substantive autonomy to teachers to formulate their own curricula and enable them to introduce innovations in teaching and learning process and upgrade the overall quality of higher education. The CBCS provides scope for Comprehensive and Continuous Evaluation (CCE) of students and encourages them to learn. The CBCS provides a cafeteria-type approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning.

The grading system is widely regarded as an improvement over the traditional marks system, which is why leading institutions in India and abroad have adopted it. Thus, there's a strong rationale for establishing a consistent grading system. This would facilitate seamless student mobility among institutions within the country and abroad, while also allowing prospective employers to accurately assess students' performances. To achieve the desired standardization in the grading system and the method for calculating the Cumulative Grade Point Average (CGPA) based on students' examination results, the UGC has devised these comprehensive guidelines.

Outline of Choice-Based Credit System

(https://www.ugc.gov.in/pdfnews/8023719_guidelines-for-cbcs.pdf)

1. **Core Course:** A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.
2. **Elective Course:** Generally a course that can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/ subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.
    2.1 **Discipline-Specific Elective (DSE) Course: Elective** courses may be offered by the main discipline/subject of study is referred to as Discipline-Specific Elective. The University/Institute may also offer discipline-related Elective courses of an interdisciplinary nature (to be offered by the main discipline/subject of study).
    2.2 **Dissertation/Project:** An elective course designed to acquire special/advanced knowledge, such as supplement study/support study to a project work, and a candidate studies such a course on his own with an advisory support by a teacher/faculty member is called dissertation/project.
    2.3 **Generic Elective (GE) Course:** An elective course chosen generally from an unrelated discipline/subject, with an intention to seek exposure is called a Generic Elective. P.S.: A core course offered in a discipline/subject may be treated as an elective by another discipline/subject and vice versa and such electives may also be referred to as Generic Elective.
3. **Ability Enhancement Courses (AEC):** The Ability Enhancement (AE) Courses may be of two kinds: Ability Enhancement Compulsory Courses (AECC) and Skill Enhancement Courses (SEC). "AECC" courses are the courses based upon the content that leads to Knowledge enhancement; i. Environmental Science and ii. English/MIL Communication. These are mandatory for all disciplines. SEC courses are value-based and/or skill-based and are aimed at providing hands-on training, competencies, skills, etc.
    3.1 Ability Enhancement Compulsory Courses (AECC): Environmental Science, English Communication/MIL Communication.
    3.2 Skill Enhancement Courses (SEC): These courses may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge.

4. Research Component in Undergraduate Courses

Project work/Dissertation is considered as a special course involving the application of knowledge in solving / analysing /exploring a real-life situation / difficult problem. A Project/Dissertation work would be of 6 credits. A Project/Dissertation work may be given in lieu of a discipline-specific elective paper.

Structure of Programme

Bachelor in Computer Application (BCA)

Admission Criteria

Admission rules to the course will be as per Government / University policy declared for undergraduate science programs from time to time**.**

Teaching and Examination Scheme for
Bachelor in Computer Application
Session 2025-26
Examination Dec 2025

Semester I										
Paper Code	**Paper Name**	**Code**	**L**	**T**	**P**	**Total Credits**	**Maximum Marks**			**Minimum Passing Marks(%)**
							Internal	**External**	**Total**	
BCA4.5AECCT11	Environmental studies	**AEC**	2	0	0	2		50		36
BCA4.5DCCT12	Computer Fundamentals	**DCC**	3	1	0	4	30	80	150	36
BCA4.5DCCP12	Computer Fundamentals lab	**DCC**	0	0	2	2		40		36
BCA4.5DCCT13	C++	**DCC**	3	1	0	4	30	80	150	36
BCA4.5DCCP13	C++ Lab	**DCC**	0	0	2	2		40		36
BCA4.5DCCT14	Computer Organization	**DCC**	5	1	0	6	30	120	150	36
Total Credits Semester I							20			
Total Marks Semester I							500			

** A candidate shall be required to obtain 36% marks to pass in theory, practical and internals separately.

Session 2025-26
Examination June 2026

Semester II										
Paper Code	**Paper Name**	**Code**	**L**	**T**	**P**	**Total Credits**	**Maximum Marks**			**Minimum Passing Marks(%)**
							Internal	**External**	**Total**	
BCA4.5AECT21	General Hindi or English	**AEC**	2	0	0	2		50		36
BCA4.5DCCT22	Internet Programming	**DCC**	3	1	0	4	30	80	150	36
BCA4.5DCCP22	Internet Programming lab	**DCC**	0	0	2	2		40		36
BCA4.5DCCT23	DBMS	**DCC**	3	1	0	4	30	80	150	36
BCA4.5DCCP23	DBMS Lab	**DCC**	0	0	2	2		40		36
BCA4.5DCCT24	Mathematics for Computer Science	**DCC**	5	1	0	6	30	120	150	36
Total Credits Semester II							20			
Total Marks Semester II							500			

** A candidate shall be required to obtain 36% marks to pass in theory, practical and internals separately.

Session 2026-27
Examination Dec 2026

Semester III										
Paper Code	**Paper Name**	**Code**	**L**	**T**	**P**	**Total Credits**	**Maximum Marks**			**Minimum Passing Marks(%)**
							Internal	**External**	**Total**	
BCA5SDCT31	Elementary Computer	**SDC**	2	0	0	2		50		36

BCA5DCCT32	Java	**DCC**	3	1	0	4	30	80	150	36
BCA5DCCP32	Java lab	**DCC**	0	0	2	2		40		36
BCA5DCT33	PHP	**DCC**	3	1	0	4	30	80	150	36
BCA5DCP33	PHP Lab	**DCC**	0	0	2	2		40		36
BCA5DCT34	Operating System	**DCC**	5	1	0	6	30	120	150	36
Total Credits Semester III							20			
Total Marks Semester III							500			

** A candidate shall be required to obtain 36% marks to pass in theory, practical and internals separately.

Session 2026-27
Examination June 2027

Semester IV										
Paper Code	**Paper Name**	**Code**	**L**	**T**	**P**	**Total Credits**	**Maximum Marks**			**Minimum Passing Marks(%)**
							Internal	**External**	**Total**	
BCA5VAECT41	Indian Knowledge System	**VAC**	2	0	0	2	50			36
BCA5DCCT42	Python	**DCC**	3	1	0	4	30	80	150	36
BCA5DCCP42	Python lab	**DCC**	0	0	2	2		40		36
BCA5DCCT43	Data Structure	**DCC**	3	1	0	4	30	80	150	36
BCA5DCCP43	Data Structure Lab	**DCC**	0	0	2	2		40		36
BCA5DCCT44	Computer Networks	**DCC**	5	1	0	6	30	120	150	36
Total Credits Semester IV							20			
Total Marks Semester IV							500			

** A candidate shall be required to obtain 36% marks to pass in theory, practical and internals separately.

Session 2027-28
Examination Dec 2027

Semester V										
Paper Code	**Paper Name**	**Code**	**L**	**T**	**P**	**Total Credits**	**Maximum Marks**			**Minimum Passing Marks(%)**
							Internal	**External**	**Total**	
BCA5.5SDCT51	Communication Skill	**SDC**	2	0	0	2	50			36
BCA5.5DCCT52	Android Programming	**DCC**	3	1	0	4	30	80	150	36
BCA5.5DCCP52	Android lab	**DCC**	0	0	2	2		40		36
BCA5.5DCCT53	Advanced Web Programming	**DCC**	3	1	0	4	30	80	150	36
BCA45.5DCCP53	Advanced Web Programming Lab	**DCC**	0	0	2	2		40		36
BCA5.5DCCT54	Software Engineering	**DCC**	5	1	0	6	30	120	150	36
Total Credits Semester V							20			
Total Marks Semester V							500			

** A candidate shall be required to obtain 36% marks to pass in theory, practical and internals separately.

Session 2027-28
Examination June 2028

Semester VI										
Paper Code	**Paper Name**	**Code**	**L**	**T**	**P**	**Total Credits**	**Maximum Marks**			**Minimum Passing Marks(%)**
							Internal	**External**	**Total**	
BCA5.5SECT61	Special Elective	**SEC**	2	0	0	2	50			36

	Courses like DPR, IOJ, CEE, RCC									
Dissertation/Project/Field Study (DPR), Internship or On-Job Experience (IOJ) or Community Engagement Experience (CEE), Research Credit Courses (RCC). # Pass/Fail/Credits would be submitted by the college concerned similar to practical/dissertation										
BCA5.5DCCT62	Digital Marketing	**DCC**	3	1	0	4	30	80	150	36
BCA5.5DCCP62	Digital Marketing Lab	**DCC**	0	0	2	2		40		36
BCA5.5DCCT63	Data Mining	**DCC**	3	1	0	4	30	80	150	36
BCA5.5DCCP63	Data Mining Lab	**DCC**	0	0	2	2		40		36
BCA5.5DCCT64	Cloud Computing	**RCC**	5	1	0	6	30	120	150	36
Total Credits Semester VI							20			
Total Marks Semester VI							500			
TOTAL CREDITS (Sem I + Sem II+ Sem III+ Sem IV+ Sem V+ Sem VI)							**120**			
TOTAL MARKS (Sem I + Sem II+ Sem III+ Sem IV+ Sem V+ Sem VI)							**3000**			

** A candidate shall be required to obtain 36% marks to pass in theory, practical and internals separately.

IMPORTANT INSTRUCTIONS

- For Semesters IV (Indian Knowledge System), V (Communication Skills), and VI (Special Elective Courses such as Dissertation/Project/Field Study (DPR), Internship or On-Job Experience (IOJ), Community Engagement Experience (CEE), Research Credit Courses (RCC)), (for 2-credit course) assessment/exam will not be conducted by the University. The college will send the assessment (marks) of the student to the University.
- For practical papers (P) of semesters I, III, and V, no external examiner will be appointed by the University. Instead, the examiner will be appointed by the respective head or principal of the college, and both marks and credits will be submitted to the University.
- For Internal Evaluation of 20 Marks overall (no bifurcation into theory and practical)-please decide your criteria (Suggestive: 05 Marks for theory paper, 05 Marks for practical paper, 05 Marks for assignment/ seminar, and 05 Marks for Logical thinking/application of knowledge and skills)
- 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 MGS University. External Examiner will prepare question paper of Practical Examination. Students have to perform exercises on the computer. Exercise must be written in answer books in proper documentation.
- Bifurcation of 40 marks for Practical paper will be as follows-
  3 practical questions 30 marks each
  Lab File: 5 marks
  Viva voce: 5 marks

Semester I

Course Code: BCA4.5DCCT12
Type of the course: Discipline Specific Core Course I of Semester I
Title of the Course: Computer Fundamentals
Level of the Course: NHEQF Level 4.5
Credit of the Course: 4
Delivery sub-type of the course: Theory 3. Tutorial 1
Pre-requisites and requisites of the course: Student enrolled and registered in UG Programme first semester.

Duration of Exam: 3 Hours
Maximum Marks: 150
Internal Exam: 30 Marks
Theory Exam: 80 Marks
Practical Exam: 40 Marks
(See Scheme of Examination)

Pattern of Examination:
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.

Objectives of the course: Course Objectives:
1. To understand the characteristics of computers
2. To know about the generations of computers
3. To have knowledge about computer languages
4. To understand the basics of an operating system
5. To be acquainted with word processor, spreadsheet, and presentation
6. To understand and apply the concept of algorithms and algorithm analysis
7. To know about some unsolved problems of computer science

Course Learning Outcomes:
After completion of this course, the student will be able to -
1. Understanding of the characteristics of computers
2. Know about the generations of computers
3. Having knowledge of computer languages
4. Understanding of the basics of operating system
5. Acquaintance with a word processor, spreadsheet, and presentation
6. Understanding and ability to design algorithms
7. Know about some unsolved problems of computer science

Course Contents

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 Software, and Application Software.

Unit II

Operating System: Features of Windows, Linux, Macintosh, Android. Open source software: concept and examples.
Word Processing software: different formats for saving a word document, creating, and 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, datatypes, 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

Google Docs- usage and creating a document, Google Sheets- usage and creating a sheet, Google Slides- usage and creating slides, Google Forms- usage and creating a form, Google Meet- attending and hosting a meeting.

Suggested Readings:

1. P.K Sinha, “Computer Fundamentals”, 2004
2. Rajaraman, Fundamentals of Computers, Fourth edition, Prentice Hall India Pvt. Limited, 2006
3. Peter Norton, “Introduction to Computers”,4th Edition, TMH Ltd, New Delhi, 2017.
4. R.G. Dromey, ”How to solve it by Computers”, Pearson Publishers, New Delhi, 2007.
5. Dorothy House, “Microsoft Word, Excel, and PowerPoint: Just for Beginners, 2015

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

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Course Code: BCA4.5DCCT13
Type of the course: Discipline Specific Core Course I of Semester I
Title of the Course: C++
Level of the Course: NHEQF Level 4.5
Credit of the Course: 4
Delivery sub-type of the course: Theory 3. Tutorial 1
Pre-requisites and requisites of the course: Student enrolled and registered in UG Programme first semester.

Duration of Exam: 3 Hours
Maximum Marks: 150
Internal Exam: 30 Marks
Theory Exam: 80 Marks
Practical Exam: 40 Marks
(See Scheme of Examination)

Pattern of Examination:
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.

Objectives of the course: Course Objectives:
1. To declare, initialize, and process variables, constants, and arrays
2. To read and print values from the keyboard
3. To create statements for decisions and loops
4. To define functions and return values
5. To create classes, objects, and constructors
6. To understand and apply OO design concepts

Course Learning Outcomes:
After completion of this course, the student will be able to -
1. Declare, initialize, and process variables, constants, and arrays
2. Read and print values from the keyboard
3. Create statements for decisions and loops
4. Define functions and return values.
5. Create classes, objects, and constructors.
6. Understand and apply OO design concepts.

Course Contents

Unit I

Object Oriented System**:** Difference Between Procedural and Object Oriented Languages, Object Oriented Paradigm, Inheritance, Polymorphism, Abstraction, Encapsulation, Benefits and Application of Oops. Introduction to C++: Character Set, Token, Constants, Variables and Data Types, Enumeration Types, Operators, Expressions, Operator Precedence and Associativity, Input, Output, Conditional Statements, Scope of Variables, Type Conversion.

Unit II

Iteration, Break, Continue, goto; Pointers**:** Introduction, implementation advantage and disadvantage**.** Functions **-** Standard and User-Defined Function, Recursive Function, Passing By Value And Reference, Function Overloading Pointer and Function: Function Returning Pointer, Passing Pointer as argument, Reference and Functions. Structures and Pointers. Containers.

Unit III

Array**:** introduction, advantage, One, Two and Multidimensional, Passing Array to a Function, Array and Pointers: Pointer to One and Two Dimensional Arrays, Dynamic Arrays, array containers, Array of Pointers, pointers using String Processing.Class: Introduction to Class and Object, Declaring Members and Methods in a class, declaring objects.

Unit IV

Functions and objects, Inline Function, Friend Functions and Its Usage, Abstract Class, Function Overriding. Constructor and Destructor**-** Needs and Its Usage, Types of Constructors, Destructor, Static Data Members and Methods. Inheritance - Need of Inheritance, Types of Inheritance and its implementation.

Unit V

Operator Overloading: Need and Rules of Operator Overloading, Overloading Through Member Function and Friend Function. Compile Time and Run Time Polymorphism- Virtual Function and virtual class. Exception Handling. Templates, Additional features of C++11, C++14 and C++17.

References:

1. Object Oriented Programming With C++ by E. Balagurusamy (Tata Mcgraw Hill)
2. C++ The Complete Reference by Herbert Sehildt (Tata Mcgraw Hill)
3. Object Oriented Programming With C++ by Schaum Series (Tata Mcgraw Hill)
4. C++11 for Programmers (Deitel Developer) by Paul J. Deitel (Author), Harvey M. Deitel, Prentice Hall; 2nd edition
5. Professional C++ by Marc Gregoire, Nicholas A. Solter, and Scott J.Kleper (Goodreads Publications)
6. A Tour of C++ by Bjarne Stroustrup, 2018
7. C++17 in Detail by Bartłomiej Filipek

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Course Code: BCA4.5DCCT14
Type of the course: Discipline Specific Core Course II of Semester I
Title of the Course: Computer Organization
Level of the Course: NHEQF Level 4.5
Credit of the Course: 6
Delivery sub-type of the course: Theory 5. Tutorial 1
Pre-requisites and requisites of the course: Student enrolled and registered in UG Programme first semester.

Duration of Exam: 3 Hours
Maximum Marks: 150
Internal Exam: 30 Marks
Theory Exam: 120 Marks
(See Scheme of Examination)

Pattern of Examination:
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 answerall 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.

Objectives of the course: Course Objectives:
1. To understand the structure, function, and characteristics of computer systems.
2. To understand the design of the various functional units and components of computers.
3. To Identify the elements of modern instruction sets and their impact on processor design.
4. To acquire the ability to explain the function of each element of a memory hierarchy,
5. To identify and compare different methods for computer I/O

Course Learning Outcomes:
After completion of this course, the student will be able to -
1. Understand the structure, function, and characteristics of computer systems.
2. Understand the design of the various functional units and components of computers.
3. Identify the elements of modern instruction sets and their impact on processor design.
4. Explain the function of each element of a memory hierarchy,
5. Identify and compare different methods for computer I/O.

Course Contents

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. **Binary Arithmetic:** Addition, overflow, subtraction.

Unit II

Logic gates: Boolean Algebra, Map Simplification. **Combinational circuits**: Half Adder, Full Adder, Decoders, Multiplexers. **Sequential circuits:** Flip Flops- SR, JK, D, T Flip-Flop.

Unit IV

Input Output Organization: Peripheral devices, I/O Interface, Asynchronous Data Transfer, Modes of Data Transfer, Direct Memory Access, I/O Processor.

Unit V

Memory Organization: Types and capacity of Memory, Memory Hierarchy, Cache Memory, Virtual Memory.

Unit III

Central Processing Unit: Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Mode, Data Transfer and Manipulation, Program Control.

Suggested Readings-

1. Computer System Architecture, By M. Morris Mano (Pearson, Prentice Hall)
2. Carter Nicholas, "Computer Architecture", Schaun outline Sevies , Tata McGraw-Hill.
3. J.P. Hayes, "Computer Architecture & Organization", Tata McGraw Hill
4. Digital Computer Electronics By Malvino Leach, Jerald A. Brown(McGraw Hill)

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Semester II

Course Code: BCA4.5DCCT22
Type of the course: Discipline Specific Core Course I of Semester II
Title of the Course: Internet Programming
Level of the Course: NHEQF Level 4.5
Credit of the Course: 4
Delivery sub-type of the course: Theory 3. Tutorial 1
Pre-requisites and requisites of the course: Student enrolled and registered in UG Programme second semester.
Duration of Exam: 3 Hours
Maximum Marks: 150
Internal Exam: 30 Marks
Theory Exam: 80 Marks
Practical Exam: 40 Marks
(See Scheme of Examination)

Pattern of Examination:
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.

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

Course Learning Outcomes:
After completion of this course, the student will be able to -
1. Explain how the client-server model of Internet programming works
2. Design and develop interactive, client-side, executable web applications
3. Demonstrate how Internet programming tasks are accomplished

4. Build tools that assist in automating data transfer over the Internet
5. Compare the advantages and disadvantages of the core Internet protocols

Course Contents

Unit I

Internet Basics: Evolution of Internet, Basic internet terms and applications. ISP, Anatomy of an e-mail Message, basic of sending and receiving, E-mail Protocol; Mailing List- Subscribing, Unsubscribing.

Unit II

Introduction to World Wide Web and its work, Web Browsers, Search Engine, Downloading, Hyper Text Transfer Protocol (HTTP), URL, Web Servers, FTP, Web publishing- Domain Name Registration, Space on Host Server for Web Site, Maintain and Updating.

Unit III

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, div, Use of Forms in Web Pages.

Unit IV

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

Unit V

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

Suggested 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.
3. Bayross, "Web Enabled Commercial Applications Development Using HTML, DHTML, Java Script, Perl CGI," Third Edition, BPB Publications.
4. Internet and Web Page Designing By V.K Jain (BPB)
5. Web Enabled Commercial Application Development Using HTML, DHTML , java script, Perl CGI By Ivan Bayross (BPB)

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Course Code: BCA4.5DCCT23
Type of the course: Discipline Specific Core Course II of Semester II
Title of the Course: DBMS
Level of the Course: NHEQF Level 4.5
Credit of the Course: 4
Delivery sub-type of the course: Theory 3. Tutorial 1
Pre-requisites and requisites of the course: Student enrolled and registered in UG Programme second semester.
Duration of Exam: 3 Hours
Maximum Marks: 150
Internal Exam: 30 Marks
Theory Exam: 80 Marks
Practical Exam: 40 Marks
(See Scheme of Examination)

Pattern of Examination:
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.

Objectives of the course: Course Objectives:

1. To understand the need for a DB approach and understand the components and roles of DBMS
2. To know how to write SQL queries for the given problem statement
3. To apply DB system development life cycle to business problems
4. To develop ER diagram for representing the conceptual data model
5. To convert ER diagram into a set of relations representing the logical data model
6. To implement a collection of ties in the chosen DBMS product, such as ORACLE
7. To have a broad understanding of database concepts and database management system software
8. To have a high-level experience of major DBMS components and their function
9. 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.
10. To be able to write SQL commands to create tables and indexes, insert/update/delete data, and query data in a relational DBMS.
11. To understand detailed architecture, define objects, load data, query data, and performance-tune SQL databases.
12. To be able to handle large volumes of structured, semi-structured, and unstructured data using database technologies.

Course Learning Outcomes:
After completion of this course, the student will be able to -

1. Appreciate the need for a DB approach and understand the components and roles of DBMS
2. Write SQL queries for the given problem statement
3. Apply DB system development life cycle to business problems
4. Develop ER diagram for representing the conceptual data model
5. Convert ER diagram into a set of relations representing the logical data model
6. Implement a collection of ties in the chosen DBMS product, such as ORACLE

7. Have a broad understanding of database concepts and database management system software
8. have a high-level experience of major DBMS components and their function
9. 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.
10. be able to write SQL commands to create tables and indexes, insert/update/delete data, and query data in a relational DBMS.
11. To understand detailed architecture, define objects, load data, query data, and performance-tune SQL databases.

Course Contents

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

Introduction to Relational model, Constraints: Domain, Key, Entity integrity, Referential integrity; Keys: Primary, Super, Candidate, Foreign; Relational algebra: select, project, union, intersection, cross product, different types of join operations.

Unit III

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

Unit IV

Normalization: Definition, Functional dependencies and, inference rules, 1NF, 2NF, 3NF; 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; and the concept of data warehousing.

Suggested Readings:

1. Fundamentals of Database Systems, Ramez A. Elmasri, Shamkant Navathe,5th Ed(Pearson)
2. Database System Concepts By Korth, Silberschatz, Sudarshan (Mcgraw Hill)
3. An Introduction to Database Systems By Bipin C. Desai (Galgotia Publication.)
4. SQL, PL/SQL Programming By Ivan Bayross (BPB)
5. Commercial Application Development Using Oracle Developer 2000 By Ivan Bayross (BPB)

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Course Code: BCA4.5DCCT24
Type of the course: Discipline Specific Core Course III of Semester II
Title of the Course: Mathematics for Computer Science
Level of the Course: NHEQF Level 4.5
Credit of the Course: 6
Delivery sub-type of the course: Theory 5. Tutorial 1
Pre-requisites and requisites of the course: Student enrolled and registered in UG Programme first semester.
Duration of Exam: 3 Hours
Maximum Marks: 150
Internal Exam: 30 Marks
Theory Exam: 120 Marks
(See Scheme of Examination)

Pattern of Examination:
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 answerall 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.

Course Objectives:

1. To learn to evaluate mathematical arguments revolving around computation
2. To understand the basics of Combinations and Permutations
3. To acquire the ability to represent relations matrices and digraphs
4. To acquire and apply the knowledge on Graphs and Trees to real-world applications
5. 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 -

1. Comprehend and evaluate mathematical arguments revolving around computation.
2. Understand the basics of Combinations and Permutations.
3. Represent relations matrices and digraphs.
4. Apply the knowledge of Graphs and Trees to real-world applications.
5. Demonstrate the working of grammar and Languages.

Course Contents

Unit-I

Matrices: Basic Definitions, matrix operations- addition, multiplication, transpose, Adjoint and inverse. Determination of a square matrix (up to 3X3 matrix). Eigenvalues and eigenvectors of real symmetric matrices.

Unit-II

Statements (Propositions), Logical Operations, Truth Table, Tautologies, Contradiction, Logical Equivalence, Algebra of Propositions, Conditional Statements, Propositional Functions, Quantifiers, Normal forms.

Unit-III

Mathematical Induction, Euclid's division algorithm, Congruence modulo: meaning, properties and compatibility with addition, subtraction, multiplication and exponentiation.

Unit-IV

Relations: Definition, Types of relations; Functions: concept, various types and composition. Probability: basics, conditional probability, Bayes theorem, discrete and continuous random variables, Likelihood.

Unit-IV

Sets: different types and operations. Limits: Meaning and Basic Limit Evaluation; Derivatives:Meaning and Derivatives of Basic Functions; and Integrals: Meaning and Integration of Simple Functions.

Suggested Readings:

1. Discrete Mathematics and its applications by K.H. Rosen, seventh edition
2. NCERT Mathematics Textbook for class XI and XII
3. Discrete Mathematical Structures by Kolman, Busby and Ross, Sixth Edition, PHI.
4. Sheldon M Ross, “Introduction to Probability Models”, Academic Press, 2003.
5. Mathematics Volume I By R.D. Sharma (Dhanpat Rai Publication)
6. Mathematics Volume II By R.D. Sharma (Dhanpat Rai Publication)
7. Engineering Mathematics Volume I By S.S. sastry (Prentice-Hall of India)
8. Discrete mathematics Schaum’s Series By Seymour LipSchutz, Marc Lipson (Tata McGraw Hill)
9. Discrete mathematics By Vinay Kumar (BPB)
10. Discrete mathematical Structure By Dr. K.C. Jain, Dr. M.L. Rawat.
11. https://www.mathsisfun.com/algebra/eigenvalue.html
12. https://courses.csail.mit.edu/6.042/spring17/mcs.pdf

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Semester III

Course Code: BCA5DCCT32
Type of the course: Discipline Specific Core Course I of Semester III
Title of the Course: Java
Level of the Course: NHEQF Level 5
Credit of the Course: 6
Delivery sub-type of the course: Theory 3. Tutorial 1 Practical 1
Pre-requisites and requisites of the course: Student enrolled and registered in UG Programme third semester.
Duration of Exam: 3 Hours
Maximum Marks: 150
Internal Exam: 30 Marks
Theory Exam: 80 Marks
Practical Exam: 40 Marks
(See Scheme of Examination)

Pattern of Examination:
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.

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.

Course Contents

Unit I

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

Unit II

Class: syntax, instance variable, class variables, methods, constructors, overloading of constructors and methods. Arrays, Strings and Vectors.

Unit - III

Inheritance: types of inheritance, use of super, method overriding, final class, abstract class, wrapper classes. Interface, Packages and 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. **Multithreaded Programming:** Creating Threads, Life cycle of thread, Thread priority, Thread synchronization, Inter-thread communication, Implementing the Runable Interface;

Unit - V

Swings : Classes, Working With JFrame Windows, Working With Graphics, Working With Colour, Adding And Removing Controls, Responding To Controls, Labels, Buttons, Checkbox, Checkbox Group, Choice Control, Lists, Text Field, Text Area. Menus, Dialog Box, Handling Events.

References

1. The Complete reference Java Ninth Edition By Herbert Schildt (Tata McGraw Hill)
2. Core Java Volume I--Fundamentals (9th Edition) by Cay S. Horstmann, Gary Cornell, Prentice Hall
3. Java: A Beginner's Guide, Sixth Edition: A Beginner's Guide by Herbert Schildt, McGraw-Hill Osborne Media
4. Programming in JAVA By E. Balagurusamy (TMH)
5. JAVA 2 programming Black Book By Steven Holzner et al. (Dreamtech Press)

Horstmann, Cay S. and Gary Cornell, “Core Java 2: Fundamentals Vol. 1”, Pearson Education.

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Course Code: BCA5DCCT33
Type of the course: Discipline Specific Core Course II of Semester III
Title of the Course: PHP
Level of the Course: NHEQF Level 5
Credit of the Course: 6
Delivery sub-type of the course: Theory 3. Tutorial 1 Practical 1
Pre-requisites and requisites of the course: Student enrolled and registered in UG Programme third semester.
Duration of Exam: 3 Hours
Maximum Marks: 150
Internal Exam: 30 Marks
Theory Exam: 80 Marks
Practical Exam: 40 Marks
(See Scheme of Examination)

Pattern of Examination:
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.

Course Contents:

Unit - I

PHP: Versions of PHP, Installation of PHP, Php.ini basics. Testing Installation. **Building Blocks of PHP:** Variables, data types, Operators & Expressions, Constants, Switching, Flow, Loops, Code Blocks and Browser Output.

Unit - II

Functions: Meaning, Calling, Defining a function. Return value from user defined function. Saving state with 'static' function. **Arrays:** Creating arrays, Array related functions.**Working with String, Date & Time:** Formatting String with PHP, Using Date and time Functions with PHP.

Unit - III

Forms: Creating simple input Form. Accessing Form input with user defined arrays, HTML and PHP Code on a single page. Redirecting User. Working with File Upload. Uploading & Downloading.

Unit- IV

State management: Using query string(URL rewriting), Using Hidden field, Using cookies, Using session. **String matching with regular expression:** What is regular expression, Pattern matching in Php, Replacing text, Splitting a string with a Regular Expression. **Email**: Sending Email, Headers, Reviewing SMTP, PHP Mailer, Building Notifications

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.

Suggested Readings :

1. Deitel, Deitel and Nieto : Internet & WWW. How to program, 2nd Edition, Pearson Education Asia.
2. Teach Yourself PHP, MYSQL &Apache ByMeloni, Pearson Education.
3. Open Source Development with LAMP: Using Linux, Apache, MySQL, Perl & PHP By James Lee, Pearson Education.
4. PHP: A Beginner's Guide ByVaswani, Vikram Tata Mc-Graw Hill.

Web Resources:

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

Course Code: BCA5DCCT34
Type of the course: Discipline Specific Core Course III of Semester III
Title of the Course: Operating System
Level of the Course: NHEQF Level 5
Credit of the Course: 6
Delivery sub-type of the course: Theory 5. Tutorial 1
Pre-requisites and requisites of the course: Student enrolled and registered in UG Programme third semester.
Duration of Exam: 3 Hours
Maximum Marks: 150
Internal Exam: 30 Marks
Theory Exam: 120 Marks
(See Scheme of Examination)

Pattern of Examination:
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 answerall 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.

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

Course Content:

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.

Unit II

CPU Scheduling, Pre-Emptive Scheduling, Scheduling Criteria- CPU Utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling Algorithms- FCFS, SJF, Priority Scheduling, Round Robin Scheduling, MLQ Scheduling.

Unit III

Synchronization: Critical Section Problem, Requirements for a solution to the critical section problem; Semaphores. Deadlock: Characterization, Prevention, Avoidance, Banker's Algorithm, Recovery from Deadlock.

Unit IV

Memory Management: Physical and virtual address space, Paging, Overview of Segmentation;Virtual Memory Management: Concept,Page Replacement technique- FIFO. Linux: features of Linux, steps of Installation, Shell and kernel, Directory structure.

Unit V

Linux: Users and groups,file permissions, commands- ls, cat, cd, pwd, chmod, mkdir, rm, rmdir, mv, cp, man, apt, cal, uname, history etc. ; Installing packages; Shell scripts: writing and executing a shell script,shell variables, read and expr, decision making (if else), for and while loops.

Suggested Readings:

1. Operating System Principals By Abraham Silberschatz, Peter Baer Galvin (John Wiley And Sons Inc.)
2. Operating System Concepts And Design By Milan Milen Kovic (Tata Mcgraw Hill)
3. Modern Operating System Andrew S. Tanenbaum, Herbert Bos
4. Linux in easy steps, Mike McGrath, in easy steps limited
5. Unix concepts and apllications , TMH, Sumitabha Das

Course Code: BCA5DCCT42
Type of the course: Discipline Specific Core Course I of Semester III
Title of the Course: Python
Level of the Course: NHEQF Level 5
Credit of the Course: 6
Delivery sub-type of the course: Theory 3. Tutorial 1 Practical 1
Pre-requisites and requisites of the course: Student enrolled and registered in UG Programme third semester.
Duration of Exam: 3 Hours
Maximum Marks: 150
Internal Exam: 30 Marks
Theory Exam: 80 Marks
Practical Exam: 40 Marks
(See Scheme of Examination)

Pattern of Examination:
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.

Course Objectives:

CO1. Apply language features including strings, lists, tuples, dictionaries, regular expressions.
CO2. Create and call functions.
CO3. Create and manipulate files.
CO4. Develop classes using OO features.
CO5. Develop internet applications using packages such as urllib.
CO6. To understand why Python is a proper scripting language for developers.
CO7. To learn how to design and program Python applications.
CO8. To learn how to use lists, tuples, and dictionaries in Python programs.
CO9. To learn how to identify Python object types.
CO10.To learn how to use indexing and slicing to access data in Python programs.
CO11. To define the structure and components of a Python program.
CO12. To learn how to write loops and decision statements in Python.
CO13. To learn how to write functions and pass arguments in Python.
CO14. To learn how to build and package Python modules for reusability.
CO15. To learn how to read and write files in Python.
CO16. To learn how to design object-oriented programs with Python classes.
CO17. To learn how to use class inheritance in Python for reusability.
CO18. To learn how to use exception handling in Python applications for error handling.

Learning Outcomes:

After completing this course, students will be able to:
LO1. Apply language features including strings, lists, tuples, dictionaries, regular expressions. LO2. Create and call functions.
LO3. Create and manipulate files.
LO4. Develop classes using OO features.
LO5. Develop internet applications using packages such as urllib.
LO6. To understand why Python is a proper scripting language for developers.

LO7. To learn how to design and program Python applications.
LO8. To learn how to use lists, tuples, and dictionaries in Python programs.
LO9. To learn how to identify Python object types.
LO10.To learn how to use indexing and slicing to access data in Python programs.
LO11. To define the structure and components of a Python program.
LO12. To learn how to write loops and decision statements in Python.
LO13. To learn how to write functions and pass arguments in Python.
LO14. To learn how to build and package Python modules for reusability.
LO15. To learn how to read and write files in Python.
LO16. To learn how to design object-oriented programs with Python classes.
LO17. To learn how to use class inheritance in Python for reusability.
LO18. To learn how to use exception handling in Python applications for error handling.

Unit I

Basics: Python Interpreter, writing code in Jupyter Notebook, Indentation, comments, importing a module, binary operators, standard scalar data types, type casting, if-else statements, loops(while, for), pass, range, ternary expressions.

Unit II

Data Structures and Sequences: Tuples, Lists and slicing, Built-in Sequence functions, Dictionary, Sets; List, Set, and Dict Comprehensions. Functions: Namespaces, Scope, and Local Functions; Returning Multiple Values.

Unit III

Functions: Anonymous (Lambda) Functions, Partial Argument Application, Generators. Objects and Methods in Python. NumPy: creating N-dimensional arrays, arithmetic with NumPy arrays, basic indexing and slicing, Psuedorandom number generation.

Unit IV

Pandas: Overview of Series and DataFrames, reading data from csv file, DataFrame operations-working with data using functions like head, tail , info, shape, reshape, columns, isnull, dropna, mean, sum, describe, value_counts, corr, loc, iloc, apply.

Unit V

Matplotlib- plotting basic figures, subplots, line plots, bar plots, histograms, scatter plots. Overview of Scikit-learn, SciPy, networkx. Basic Errors and Exception handling. Basic File Handling. Applications of python.

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. Programming in Python 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**

Course Code: BCA5DCCT43
Type of the course: Discipline Specific Core Course II of Semester IV
Title of the Course: Data Structure
Level of the Course: NHEQF Level 5
Credit of the Course: 6
Delivery sub-type of the course: Theory 3. Tutorial 1 Practical 1
Pre-requisites and requisites of the course: Student enrolled and registered in UG Programme third semester.
Duration of Exam: 3 Hours
Maximum Marks: 150
Internal Exam: 30 Marks
Theory Exam: 80 Marks
Practical Exam: 40 Marks
(See Scheme of Examination)

Pattern of Examination:
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.

Course Objectives:

CO1. To Create and initialize variables, constants, arrays, pointers, structures, and unions.
CO2. To Manipulate values of variables, arrays, pointers, structures, unions, and files.
CO3. To create a function that can receive variables, arrays, pointers, and structures.
CO4. To define functions that can receive variables, arrays, pointers, and structures.
CO5. To create open, read, manipulate, write and close files.
CO6. To select and use appropriate data structures for the given problems.
CO7. To design efficient algorithms using various algorithm designing strategies
CO8. To analyze the problem and develop the algorithms related to these problems
CO9. To classify the problem and apply the appropriate design strategy to develop an algorithm
CO10. To design algorithm in the context of space and time complexity and apply the asymptotic notation
CO11. To be able to analyze algorithms and algorithm correctness.
CO12. To be able to summarize searching and sorting techniques
CO13. To be able to describe stack, queue, and linked list operations.
CO14. To be able to know. tree and graphs concepts

Learning Outcomes:

After completing this course, students will be able to:
LO1. Create and initialize variables, constants, arrays, pointers, structures, and unions.
LO2. Manipulate values of variables, arrays, pointers, structures, unions, and files.
LO3. Create a function that can receive variables, arrays, pointers, and structures.
LO4. Define functions that can receive variables, arrays, pointers, and structures.
LO5. Create open, read, manipulate, write and close files.
LO6. Select and use appropriate data structures for the given problems.
LO7. Design efficient algorithms using various algorithm designing strategies

LO8. Analyze the problem and develop the algorithms related to these problems
LO9. Classify the problem and apply the appropriate design strategy to develop an algorithm
LO10. Design algorithm in the context of space and time complexity and apply the asymptotic notation
LO11. Ability to analyze algorithms and algorithm correctness.
LO12. Ability to summarize searching and sorting techniques
LO13. Ability to describe stack, queue, and linked list operations.
LO14. Ability to know. tree and graphs concepts

Unit I

Primitive and Composite Data Types, Time and Space Complexity of Algorithms, Stack and Primitive Operation on Stack.Applications- Infix, Postfix, Prefix and Recursion. Queues, Primitive Operations on Queues, Circular Queue, De Queue and Priority Queue.

Unit II

Basic Operation on Linked List, Circular Linked List, Doubly Linked List, Linked Representation of Stack and Queue, Application of Linked List.

Unit III

Trees: Basic Terminology, Binary Trees, Tree Representation as Array and Linked List, Basic Operation on Binary Tree, Traversal of Binary Tree – In Order, Preorder, Post Order, Application of Binary Tree, Threaded Binary Tree, B-Tree and Height Balance Tree.

Unit IV

Sequential Search, Binary Search, Insertion Sort, Selection Sort, Quick Sort, Bubble Sort, Heap Sort, Comparison of Sorting Methods.

Unit V

Hash Table, Collision Resolution Techniques. Introduction to Graphs, Definition, Terminology, Directed, Undirected, Weighted Graph, Representation of Graphs, Graph Traversal – Depth First and Breadth First, Spanning Trees, Minimum Spanning Trees, Shortest Path Algorithm.

Suggested Readings -

1. Expert Data Strutcture with ‘C’ By R.B Patel (Khana Book Publishing Co.(P))
2. Data structure By Lipschutz (Tata McGraw Hill)
3. Data Structure By YashvantKanitkar (BPB)
4. An Introduction to Data Structures with Applications, By Jean-Paul tremblay, Paul G.Sarerson (Tata McGraw Hill)
5. Data Structure Using C and C++ By Yedidyahlangsam, Moshe J.Augenstein, Arora M. Tenenbaum (Prentice- Hall India)

Course Code: BCA5DCCT44
Type of the course: Discipline Specific Core Course III of Semester IV
Title of the Course: Computer Networks
Level of the Course: NHEQF Level 5
Credit of the Course: 6
Delivery sub-type of the course: Theory 5. Tutorial 1
Pre-requisites and requisites of the course: Student enrolled and registered in UG Programme third semester.
Duration of Exam: 3 Hours
Maximum Marks: 150
Internal Exam: 30 Marks
Theory Exam: 120 Marks
(See Scheme of Examination)

Pattern of Examination:
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 answerall 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.

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.

Course Contents:

Unit - I

Data Communication and Networking: Overview, Network Types, LAN Technologies, Topologies, Models- OSI Model, TCP/IP Stack

Unit - II

Physical Layer: Introduction, Digital Transmission, modes, digital to digital, analog to digital, Analog Transmission, digital to analog, analog to analog, Transmission media, Wireless Transmission, **Switching techniques:** Circuit Switching, Packet switching, Message switching.

Unit - III

Data Link Layer: Introduction, 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

Unit V

Transport Layer: Introduction, Transmission Control Protocol, User Datagram Protocol
Application Layer: Introduction, Client-Server Model, Application Protocols.

Suggested Readings:

1. Computer Forensics by Marie- Helen Maras
2. Data Communication and Networking By Forozan (Tata McGraw Hill)
3. Data Communication And Computer Networks By Dr. Madhulika Jain, Satish Jain (BPB)
4. William Stallings, “Data and Computer Communications”, Pearson Education, 2008.
5. Rajneesh Agrawal and Bharat Bhushan Tiwari, “Data Communication and Computer Networks”, Vikas Publishing house Ltd. , 2005.
6. A. S. Tanenbaum, “Computer Networks”, Fourth Edition, Pearson Education.
7. A. Leon-Gracia and I. Widjaja, “Communication Networks”, Tata McGraw Hill, 2004.

Course Code: BCA5DCCT52
Type of the course: Discipline Specific Core Course I of Semester V
Title of the Course: Android Programming
Level of the Course: NHEQF Level 5
Credit of the Course: 6
Delivery sub-type of the course: Theory 3. Tutorial 1 Practical 1
Pre-requisites and requisites of the course: Student enrolled and registered in UG Programme third semester.
Duration of Exam: 3 Hours
Maximum Marks: 150
Internal Exam: 30 Marks
Theory Exam: 80 Marks
Practical Exam: 40 Marks
(See Scheme of Examination)

Pattern of Examination:
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.

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 toolsCO7. 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

Course Content:

Unit I

Introduction: What is Android?, Android Architecture, Setting Android Environment, Android SDK Manager & required Packages, Using Android Studio, Android Virtual Device(AVD), Creating First Android Application, Package Structure

Unit II

Introduction to Gradle, Running the Application, Views, Layouts and more. Introduction to Views: TextView, EditText View, RadioButton and CheckBox View, Button View, ImageView and ImageButton View, Toast, Notifications.

Unit III

Introduction to Layouts/ViewGroups: Linear Layout, Relative Layout, Tabular Layout, Hierarchical Layout Arrangements, Adapter and Adapter View, Using ListView and GridView, SQLite Database.

Unit IV

Spinner in Android, Working with Spinners, Margin and Padding, Working with EditText and TextView, RadioGroup, RadioButton and CheckBox, AutoCompleteTextView in Android, Android Core and Projects.

Unit V

Location Based Services: Sending Email, Sending SMS, Phone Calls

Activity in Android, Intents in Android, Introduction to Fragments, Working with Fragments

Suggested Readings:

- Android Programming for Beginners by John Horton Publisher: Packt Publishing
- Learn Java for Android Development (2nd edition) by Jeff Friesen Publisher: Apress
- Android application development for java programmers. By James C. Sheusi. Publisher: Cengage Learning, 2013.
- Beginning Android Programming with Android Studio, Fourth Edition by Jerome F. DiMarzio Publisher: John Wiley & Sons
- Android Programming: The Big Nerd Ranch Guide by Kristin Marsicano , Chris Stewart , Bill Phillips Publisher: Big Nerd Ranch Guides

Level of the Course: NHEQF Level 5
Credit of the Course: 6
Delivery sub-type of the course: Theory 3. Tutorial 1 Practical 1
Pre-requisites and requisites of the course: Student enrolled and registered in UG Programme third semester.
Duration of Exam: 3 Hours
Maximum Marks: 150
Internal Exam: 30 Marks
Theory Exam: 80 Marks
Practical Exam: 40 Marks
(See Scheme of Examination)
Pattern of Examination:
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.

Course Content:

Unit I

Introduction to Web Application Development: Life Cycle of Web Application. Introduction to .NET Framework, Features of .Net, .Net Versions, Microsoft Intermediate Language – Meta Data, .Net types and .Net name spaces, Common Language Runtime, Common Type System, Common Language Specification, .Net Applications using command line compiler and visual studio .Net IDE.

Unit II

Basics of ASP.NET: Introducing ASP .NET, Creating ASP .NET applications, Web forms, Web controls, working with events, Rich web controls, Custom web controls, Validation controls, Debugging ASP .NET pages. Advanced ASP .NET: ASP .NET configuration, Business objects, State Management: Query String, Session, Cache, Cookies.

Unit III

ASP .NET security: Authentication and authorization, Deployment projects. Basics of ADO .NET, ADO vs. ADO.NET, ADO.NET Namespaces, ADO .NET Providers – OLEDB & SQL, Connected and Disconnected Mode, Dataset, Data Adapter, Command Object's Method, Programming with ADO.NET

Unit IV

Web Services: Introduction to Web Services, Web services Infrastructure, Building a web service, Deploying and publishing web services, finding web services, Consuming web services.

Unit V

Cyber Security: definition, cybercrime and information security, classification of cybercrime, cybercriminals, phishing, password cracking, keyloggers steganography, DoS and DoS attacks, SQL Injection, Cyber Law, The Indian IT Act, Digital Signatures and IT Act, Cyber security and organizational implications, Cyber crisis management.

Suggested Readings

1. Asp.net with C# by Chirs Hart, John Kauffman, Chris UllmanWorx Publication
2. ASP.NET 2.0 Black Book By Rudraksh Batra, Charul Shukla (Dream Tech Press)
3. ASP. NET Bible By Mridula Parihar and et al. (Hungry Minds, New York)
4. Cyber Security by Nina Godbole & sunit Belapure
5. Computer Forensics by Marie- Helen Maras

Course Code: BCA5DCCT54
Type of the course: Discipline Specific Core Course III of Semester V
Title of the Course: Software Engineering
Level of the Course: NHEQF Level 5
Credit of the Course: 6
Delivery sub-type of the course: Theory 5. Tutorial 1
Pre-requisites and requisites of the course: Student enrolled and registered in UG Programme third semester.
Duration of Exam: 3 Hours
Maximum Marks: 150
Internal Exam: 30 Marks
Theory Exam: 80 Marks
Practical Exam: 40 Marks
(See Scheme of Examination)

Pattern of Examination:
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.

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.

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.

Course Contents:

Unit I

Software Engineering: Software, **Software Process**, Process Characteristics, Software Process Model- Linear Sequential Model, Prototyping Model, Spiral Model. **Software Quality**, McCall's Quality Factors. **Software Requirement Analysis and Specification (SRS)**: Need, Characteristics and Components.

Unit II

Cost Estimation: COCOMO Model, **Designing Concepts:** Design Principles, Module level concepts- Cohesion and Coupling, Design notations and specifications, Verification, Metrics.

Unit III

Object Oriented Design: Concepts, Design Notation and Specification, Design methodology, metrics. **Debugging Process:** Information Gathering, Fault Isolation, Fault Confirmation, Documentation, Fixing fault isolation.

Unit IV

Testing: Testing Fundamental, Functional Testing (Black Box), Structural Testing (White Box), Alpha And Beta Testing, Testing Object Oriented Programs, Testing Process: Comparison of Different Testing, Level of Testing. Project management for special classes of software projects: Using CASE tools, CBSE.

Unit – V

UML: An overview of UML- UML notations, UML Class diagrams- association, multiplicity, generalization, aggregation, interfaces.

Suggested Readings:

1. Software Engineering: A Practitioner's Approach by Roger S. Pressman(McGraw Hill)
2. An Integrated Approach to Software Engineering By PankajJalote, (Narosa Publishing House)
3. Object-Oriented SoftwareEngineering: Practical Software Development using UML and Java By Timothy C. Lethbridge, Robert Laganière (McGraw Hill)
4. Object-Oriented Software EngineeringUsing UML, Patterns, and Java By Bernd Bruegge& Allen H. Dutoit(Prentice Hall)

Course Code: BCA5DCCT62
Type of the course: Discipline Specific Core Course II of Semester VI
Title of the Course: Digital Marketing
Level of the Course: NHEQF Level 5
Credit of the Course: 6
Delivery sub-type of the course: Theory 3. Tutorial 1 Practical 1
Pre-requisites and requisites of the course: Student enrolled and registered in UG Programme third semester.
Duration of Exam: 3 Hours
Maximum Marks: 150
Internal Exam: 30 Marks
Theory Exam: 80 Marks
Practical Exam: 40 Marks
(See Scheme of Examination)

Pattern of Examination:
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.

Course Objectives
The Course Objectives of this course are as follows:
• To acquaint the students with the knowledge of growing integration between the traditional and digital marketing concepts and practices in the digital era.
• To familiarize the students with the tools and techniques used by the digital marketers for driving the marketing decisions to attain marketing objectives.

Learning outcomes
The Learning Outcomes of this course are as follows:
• After studying this course, students will be able to understand the concept of digital marketing and its integration with traditional marketing.
• After studying this course, students will be able to understand customer value journey in digital context and behaviour of online consumers.
• After studying this course, students will be able to understand email, content and social media marketing and apply the learnings to create digital media campaigns.
• After studying this course, students will be able to examine various tactics for enhancing a website's position and ranking with search engines.
• After studying this course, students will be able to leverage the digital strategies to gain competitive advantage for business and career.

Unit I

Marketing in the Digital World :Digital marketing: Concept, Features, Difference between traditional and digital marketing, Moving from traditional to digital Marketing;
Digital Marketing Channels: Intent Based- SEO, Search Advertising; Brand Based- Display Advertising; Community Based Social Media Marketing; Others- Affiliate, Email, Content, Mobile.

Unit II

Customer Value Journey: 5As Framework; The Ozone O3 Concept Key; Traits of online consumer. Content and Email Marketing: Content Marketing: Step-by-step Content Marketing Developing a content marketing strategy Email Marketing: Types of Emails in email marketing, Email Marketing best practices

Unit III

Social Media Marketing: Building Successful Social Media strategy; Social Media Marketing Channels; Facebook, LinkedIn, YouTube (Concepts and strategies)
Display Advertising: Working of Display Advertising; Benefits and challenges; Overview of Display ad Process.; Define- Customer, Publisher, Objectives; Format- Budget, Media, Ad Formats, Ad Copy.

Unit IV

Introduction of Search Engine Marketing: Working of Search Engine; SERP Positioning; online search behaviour, DMI's 5P Customer Search Insights Model. Search Engine Optimization: Overview of SEO Process; Goal Setting-Types. On-Page Optimization: Keyword Research, SEO Process -Site Structure, Content, Technical Mechanics, Headings, Image & Alt text, Social Sharing, Sitemaps, Technical Aspects- Compatibility, Structured Data Markup.

Unit V

Off Page Optimisation: Link Formats, Link Building, Content Marketing, Social Sharing; Black and White Hat Techniques Search Advertising: Overview of PPC Process; Benefits of Paid Search; Basis of Ranking; Goal Setting-Objectives; Account Setting-Creation of Google Ads, Campaign architecture, Campaign setup, Targeting, Bid Strategy, Delivery, Ad Scheduling, Ad Rotation, Keyword Selection; Ad Copy composition, Ad Extension

Suggested Readings

1. Dodson, I. (2016). The art of digital marketing: the definitive guide to creating strategic, targeted, and measurable online campaigns. John Wiley & Sons.
2. Kartajaya, H., Kotler, P., & Setiawan, I. (2016). Marketing 4.0: moving from traditional to digital. John Wiley & Sons.
3. Ryan, Damien: Understanding Digital Marketing - Marketing Strategies for Engaging the Digital Generation. Kogan Page Limited.
4. Moutusy Maity: Internet Marketing: A practical approach in the Indian Context: Oxford Publishing • Seema Gupta: Digital Marketing: Mcgraw Hill
5. Ultimate guide to digital Marketing by Digital Marketer

Course Code: BCA5DCCT63
Type of the course: Discipline Specific Core Course II of Semester V
Title of the Course: Data Mining
Level of the Course: NHEQF Level 5
Credit of the Course: 6
Delivery sub-type of the course: Theory 3. Tutorial 1 Practical 1
Pre-requisites and requisites of the course: Student enrolled and registered in UG Programme third semester.
Duration of Exam: 3 Hours
Maximum Marks: 150
Internal Exam: 30 Marks
Theory Exam: 80 Marks
Practical Exam: 40 Marks
(See Scheme of Examination)

Pattern of Examination:
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.

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. o 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

Data mining Introduction: Definition, Data mining tasks, Data mining as a step of Knowledge discovery process, Applications of Data mining; Data objects and types of attributes, Recalling mean, median ,mode and weighted arithmetic mean.

Unit II

Data quality , overview of data preprocessing. Classification analysis- definition, Overview of various classification techniques; Decision tree induction- working, examples ,specifying attribute test conditions.

Unit III

Evaluating the performance of a classifier- Holdout method, Random subsampling , cross-validation, Bootstrap; Association analysis: support, confidence, association rules ,Frequent Item sets.

Unit IV

Frequent itemset generation - Apriori principle , Apriori algorithm and examples, FP growth algorithm and examples.

Unit V

Cluster analysis: Definition , overview of basic clustering methods, Density based methods- DBSCAN.

Suggested Readings:

1. Data Mining: Concepts and Techniques, 3rd edition, Jiawei Han and Micheline Kamber
2. Introduction to Data Mining, Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Pearson Education.
3. Data Mining: A Tutorial Based Primer, Richard Roiger, Michael Geatz, Pearson Education 2003.
4. Introduction to Data Mining with Case Studies, G.K. Gupta, PHI 2006
5. Insight into Data mining: Theory and Practice, Soman K. P., DiwakarShyam, Ajay V., PHI 2006
6. Data Mining:: Practical Machine Learning Tools and Techniques (Morgan Kaufmann Series in Data Management Systems) by Witten, Frank, Hall

Course Code: BCA5DCCT64
Type of the course: Discipline Specific Core Course
Title of the Course: Cloud Computing
Level of the Course: NHEQF Level 5
Credit of the Course: 6
Delivery sub-type of the course: Theory 5. Tutorial 1
Pre-requisites and requisites of the course: Student must have fundamental knowledge of Networking and Storage Systems
Duration of Exam: 3 Hours
Maximum Marks: 150
Internal Exam: 30 Marks
Theory Exam: 120 Marks
(See Scheme of Examination)

Pattern of Examination:
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 answerall 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.

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 to Client – Server Computing, Peer-to-Peer Computing, Distributed Computing, Collaborative Computing, Cloud Computing

Unit II

Functioning of Cloud Computing, Cloud Architecture, Cloud Storage, Cloud Services – SaaS, IaaS, PaaS, DaaS and VDI etc.

Unit II

Cloud as Web-Based Application, Cloud Service Development: Pros and Cons, Types, Software as a Service, Platform as a Service, Web Services, On-Demand computing
Discovering Cloud Services, Development Services and Tools, overview of major Cloud Service providers- Amazon Ec2, Google App Engine, IBM Clouds, Eucalyptus etc.

Unit III

Application of Cloud Computing for Centralizing Email communications, collaborating on Schedules, Calendars, To-Do Lists, Contact Lists. Cloud for the Community, Group Projects and Events; Cloud Computing for the Corporation. Cloud Computing for Schedules and Task Management, Exploring Online Scheduling Applications and Online Planning and Task Management;

Unit IV

Cloud Computing Collaborating on Event Management, Contact Management and Collaborating on Project Management. Cloud Collaborating on Word Processing, Databases, Storing and Sharing Files; Evaluating Web Mail Services, Evaluating Web Conference Tools; Cloud computing and Social Networks, Groupware, Blogs and Wikis.

Unit V

Data privacy and security Issues and other risks in Cloud Computing

Suggested Readings-

1. Cloud Computing Concepts Technology and Architecture by Thomas Erl, Prentice Hall
2. Cloud Computing Principles and Paradigm by Rajkumar Buyya, James Broberg, Andrzej Goscinski, Wiley Publications

CloudComputingTheoryAndPractice by Dan C. Marinescu, Morgan Kaufman Publications

Scheme of end-of-semester examination:

The Bachelor in Computer Application is of 6 semester's duration full time programme. The programme will have ability enhancement course, core courses, value added, skill development, and special elective papers, and practical paper based on theory papers in each semester.

1. English/Hindi shall be the medium of instructions and examination.
2. There will be semester end examination. The semester end examinations, evaluation, publication of results, award of marks statements and award of diploma shall be undertaken by MGS University, Bikaner.
3. The system of evaluation shall be as follows:
    - 3.1 The evaluation scheme shall comprise external evaluation and internal evaluation. The internal evaluation will carry 30 (20T+10P for practical papers) marks. Each theory paper will carry 80 marks (as per model above). Practical paper will carry 40 marks. Any student who fails to participate in classes, viva-voce, practical work will be debarred from appearing in the end semester examination.
    - 3.2 The duration of written examination for each paper shall be of three hours and Practical examination shall be for one day duration.
    - 3.3 The minimum attendance required by a candidate will be as per the University rules.
4. Award of degree, grading, scope for improvement/appeal – as per Maharaja Ganga Singh University rules and regulations/ordinances (CBCS/Semester).
5. For practical papers (P) of semesters I, III, and V, no external examiner will be appointed by the University. Instead, the examiner will be appointed by the respective head or principal of the college, and both marks and credits will be submitted to the University.
6. For Semesters VI (Indian Knowledge System), V (Communication Skills), and VI (Special Elective Courses such as Dissertation/Project/Field Study (DPR), Internship or On-Job Experience (IOJ), Community Engagement Experience (CEE), Research Credit Courses (RCC)), (the 2-credit course) **assessments/exams will not be conducted** by the University. The college will send the assessment marks of the student to the University.
7. **Pass Criteria:** For passing in each theory examination, a candidate is required to obtain 36% marks in all theory papers and 36% marks separately in the practical examination and internal.

Internal Evauation

- Internal evaluation will be of 30 marks. Continuous evaluation process will be adopted to achieve and find out the objectives and learning outcome.

- The marks of Internal Examination should be given on the basis of regular class tests (at least two with a gap of 40 days), seminar, assignments, presentations, other activities etc.) based on each Unit.

Pattern of Examination

80 marks Theory:
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.

120 marks Theory:
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 answerall 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.

Model Paper for 80 marks Theory Paper

Bachelor of Computer Application

Semester I

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

BCA4.5DCCT12- 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

Bachelor of Computer Application

Semester I

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

BCA4.5DCCT24- 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……