



Detailed Syllabus for Bachelor of Computer Application_2022-2023



DEPARTMENT OF COMPUTER APPLICATION
UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR



PREAMBLE

Education plays an enormously significant role in the building of a nation. There are quite a large number of educational institutions, engaged in imparting education in our country. Majority of them have entered recently into semester system to match with international educational pattern. However, our present education system is churning out youth who have to compete locally, regionally, nationally as well as globally. The present alarming situation necessitates transformation and/or redesigning of system, not only by introducing innovations but developing “learner-centric approach”.

Majority of Indian higher education institutions have been following marks or percentage-based evaluation system, which obstructs the flexibility for the students to study the subjects/courses of their choice and their mobility to different institutions. There is need to allow the flexibility in education system, so that students depending upon their interests can choose inter-disciplinary, intra-disciplinary and skill-based courses. This can only be possible when choice based credit system (CBCS), an internationally acknowledged system, is adopted. The choice based credit system not only offers opportunities and avenues to learn core subjects but also explore additional avenues of learning beyond the core subjects for holistic development of an individual. The CBCS will undoubtedly facilitate benchmarking of our courses with best international academic practices.

Advantages of the choice based credit system:

- Shift in focus from the teacher-centric to student-centric education.
- Student may undertake as many credits as they can cope with (without repeating all courses in a given semester if they fail in one/more courses).
- CBCS allows students to choose inter-disciplinary, intra-disciplinary courses, skill oriented papers (even from other disciplines according to their learning needs, interests and aptitude) and more flexibility for students.
- CBCS makes education broad-based and at par with global standards. One can take credits by combining unique combinations.
- CBCS offers flexibility for students to study at different times and at different institutions to complete one course (ease mobility of students). Credits earned at one institution can be transferred to another institution.

CHOICE BASED CREDIT SYSTEM

The Indian Higher Education Institutions have been moving from the conventional annual system to semester system. Currently many of the institutions have already introduced the Choice Based Credit System. The semester system accelerates the teaching-learning process and enables vertical and horizontal mobility in learning. The credit based semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The Choice Based Credit System provides a ‘cafeteria’ type approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses to acquire more than the required credits and adopt an interdisciplinary approach to learning.

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

It has been a necessity to align higher education with the emerging needs of the economy so as to ensure that the graduates of higher education system have adequate knowledge and skills for employment and entrepreneurship since last few years. The higher education system has to incorporate the requirements of various industries in its curriculum, in an innovative and flexible manner while developing a well-groomed graduate. CSE department aims to encourage research and innovation in the field of Machine Learning, Cyber security, Artificial Intelligence and other allied areas such as Computational Theory, Cloud Computing, Block chain Technology, Data Science, Big Data Analytics and many more. The objective of the BCA program in Bachelor of Computer Application is to prepare students to undertake careers involving innovative technologies, develop a problem solving capability, or to opt for advanced studies for research oriented careers.

In order to give due importance to practical applications as well as theoretical aspects of BCA, the curriculum for the Bachelor of Computer Application program covers most of the foundational aspects as well as develops application skills for problem solving. Students in the BCA degree programme gain the knowledge and skills necessary for success in the rapidly evolving and dynamic field of computing.

JOB OPPORTUNITIES

Booming IT sector in India has plenty of jobs for fresh computer science graduates. Candidates with a high percentage of mark and good communication skills as well as sound computer knowledge do not face problem in getting a job. Computer engineers can get jobs in non-IT companies like universities, research, private and public industries, government departments, business organizations, commercial organizations and the manufacturing sector, etc. Besides the Computer Engineers have plenty of options to work in IT companies in departments such as design, development, assembly, manufacture, and maintenance, etc. Software Developers: Software developers are professionals who are concerned with facets of the software development process which involves activities such as design and coding, computer programming, project management, etc.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO 01: Teach the appropriate computer application methods: Graduates of the program will engage in the effective practice of computer application to identify and solve important problems in a diverse range of application areas such as functional programming and object-oriented programming paradigms to enable participants to analyses, design, implement and evaluate computerized solutions (such as developing computer program) to real-life problems.

PEO 02: Real Life Problem Solving: Demonstrate the critical thinking and communication skills required in a technical environment and synthesize data and technical concepts to create novel products and solutions for the real life problems.

PEO 03: Leadership: Graduates of the program will engage in successful careers in industry, academia and attain positions of importance where they have impact on their business, profession and community.

PEO 04: Lifelong Learning: Help participants acquire the knowledge, skills, experience and values to become lifelong learners and be able to obtain employment in a computer-related field or go on to graduate study.

PROGRAM OUTCOMES (PO)

PO	Summary	Description
PO1	Application knowledge	Apply the knowledge of mathematics, science, application fundamentals, and Impart proficiency in the basic mathematics and programming methods as employed in computer science.
PO2	Problem analysis	Identify, formulate, research literature, and analyze complex problems reaching substantiated conclusions using first principles of mathematics, natural sciences and computer application.
PO3	Modern tool usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO4	Environment and sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO5	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO6	Individual and team work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO7	Communication	Communicate effectively on

		complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO8	Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO9	Life-Long Learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAM SPECIFIC OUTCOMES (PSO)

PSO1: The student will learn the fundamental and theoretical aspects of computer science related subjects to analyze the complex real world problems and in turn design an intelligent solution to it.

PSO2: The ability to lead and work in a team with good communication, project management, domain knowledge and expertise for enhancing research capability to transform innovative ideas into reality and documentation skills.

TYPES OF COURSES

1. Courses are the subjects that comprise the Bachelor of Computer Application Programme.
2. A course may be designed to comprise lectures, tutorials, laboratory work, fieldwork, outreach activities, project work, vocational training, viva, seminars, term papers, assignments, presentations, self-study etc. or a combination of some of these components.
3. The learning outcomes of each course will be defined before the start of a semester.
4. Following are the course types:
 - i. **Core Course (CC):** This is a course, which is to be compulsorily studied by a student as a core requirement to complete the requirement of BCA in Bachelor of Computer Application.
 - ii. **Elective Course:** An elective course is a course, which can be chosen from a pool of courses. It is intended to support the discipline of study by providing an expanded scope, enabling exposure to



another discipline/domain and nurturing a student's proficiency and skill. An elective may be of following types:

- a) **Discipline Elective Courses (DE):** It is an elective course that adds proficiency to the students in the discipline.
- b) **Specialization Elective Courses (SE):** This is a course, which is to be compulsorily studied by a student as a core requirement to complete the requirement of Bachelor of Computer Application with Specialization in Cloud Computing/Big Data Analytics/Data Science/Blockchain Technology/Cyber Forensics & Internet Security/Artificial Intelligence & Machine Learning.

iii. **Obligatory Courses:**

- a) **Mandatory Courses (MC):** It can be taken from among a pool of foundation courses, which aim at value-based education. They may provide hands-on training to improve competencies and skills or provide education on human, societal, environmental and national values.
 - b) **Internship/Training/Project/Dissertation (PTI):** 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
 - c) **Humanities, Social Sciences & Management (HSM):** It is an elective course taken from non-engineering disciplines (humanities, social sciences and management) that broadens the perspective of an engineering student.
 - d) **Basic Science Courses (BSC):** It is based upon content that leads to fundamental knowledge enhancement in sciences, and basic application principles.
 - e) **General Studies Courses (GSC):** "Essential Studies for Professionals Skill & Skill Development for Professionals" courses designed to encourage and enrich the students for the technical and professional exams.
 - f) **Extra-curricular activities (ECA):** An extracurricular activity or extra academic activity is an activity, performed by students, that falls outside the realm of the normal curriculum of university education.
5. Each credit course contributes certain credits to the programme. A course can be offered either as a full course (4 credits) or as a half course (2 credits). A full course is conducted with 3 hours of lectures and either 1 hour of tutorial or 2 hours of practical work per week. A half course is conducted with 2 hours of lectures. There are also some exceptional electives with 3 credits and 1 credit.

Definition of Credit:

1 Hr. Lecture (L) per week	1 Credit
1 Hr. Tutorial (T) per week	1 Credit
1 Hr. Practical (P) per week Or 2 Hr. Practical (Lab)/week	0.5 Credits Or 1 Credit

6. A project work/dissertation is considered as a special course involving application of the knowledge gained during the course of study in exploring, analyzing and solving complex problems in real life applications. A candidate completes such a course with an advisory support by a faculty member.
7. **Mandatory Courses** may be offered. They do not carry credits but aim at expanding knowledge or bridging deficiency in knowledge or skill.



8. A course may have pre-requisite course(s) that are given in the Semester-wise Course Allocation scheme.
9. A student can opt for a course only if he/she has successfully passed its pre- requisite(s).
10. A student has to register for all courses before the start of a semester.
11. **Program codes:** Bachelor of Computer Application(BCA)
12. **Departmental Course Codes:** The codes for departmental core courses and discipline-specific electives are specific to each discipline. The first two characters are derived from departmental codes listed above. The third character is 'C' for core courses and 'D' for discipline-specific courses and 'INT' for Dissertation/Project/Training/Internship. This is followed by a digit sequence number:
 - i. BCAyyy: Core Course
 - ii. BCDyyy: Discipline-Specific Elective Courses
 - iii. XXXyyy: Specialization Specific Elective Courses (Depends on the Specialization)
 - iv. INTyyy: Project/Training/Internship/Dissertation
13. **Common Elective Course Codes:** All disciplines will follow a common code as shown below. The 3-digit sequence number 'yyy' is taken from the respective tables of different types of courses.
 - i. HSMyyy: Humanities, Social Sciences & Management Course
 - ii. BSCyyy: Basic Science Course
 - iii. MCyyy: Mandatory Course
 - iv. GSCyyy: General Studies Courses

Here, yyy will be follow by a sequence of digit.
14. The opting of a course by the student will depend upon the requisites for that course and with the consent of the course advisor.

PROCESS FOR DESIGNING THE PROGRAM CURRICULUM

The process for designing the program curriculum involves consideration of the following aspects:

- i) Feedback from stakeholders
- ii) Institutional and Departmental Vision, Mission and PEOs
- iii) Recent trends in industry and research



SCHEME – SEMESTER WISE COURSE ALLOCATION

First Semester Syllabus

Sl No.	Type	Subject Code	Topic	L	T	P	S	Credit Points
1.	CC	BCA101	Programming for Problem Solving Using C	3	0	2	0	4
2.	CC	BCA102	Computer System & Office Automation Tools	3	0	2	0	4
3.	CC	BCA103	Digital Electronics	3	0	0	0	3
4.	CC	BCA104	Business System & Administration	3	0	0	0	3
5.	BSC	BSC101	Mathematics-I	3	0	0	0	3
6.	HSM	HSM101	English Communication & Public Speaking Skills-I	2	0	2	0	3
7.	GSC	BGSC101	ESP & SDP-I	2	0	0	1	2
8.	ECA	ECA101	Extra-curricular activities	-	-	-	-	-
Total				19	0	6	1	22

#Students will undergo a mandatory Induction Program

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**TITLE OF COURSE: PROGRAMMING FOR PROBLEM SOLVING USING C****COURSE CODE: BCA101****L-T-P: 3-0-0****CREDITS: 3****Pre-requisite:** Students must have basic knowledge of mathematics.**Introduction:**

The course is designed to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs, applications in C. Also by learning the basic programming constructs they can easily switch over to any other language in future.

Course Outcomes (COs):

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

CO1: Appreciate and understand the working of a digital computer**CO2:** Analyze a given problem and develop an algorithm to solve the problem**CO3:** Improve upon a solution to a problem**CO4:** Use the 'C' language constructs in the right way**CO5:** Design, develop and test programs written in 'C'**Mapping of Course Outcomes (CO) and Program Outcomes (PO):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	3	2		2			2		2	2
CO2	3			2					2	2	3
CO3	3	2	2			2				2	2
CO4	3	2	2		2			2		2	2
CO5	3	2	2		2		1			2	2

Course Contents:**Module-1: Introduction to Programming & Computer**

Generations, Classifications, Applications, Basic Organization, Input and output devices, Basic concept of Computer memory, disks, memory, processor, where a program is stored and executed, operating system, compilers etc.

Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudo code with examples.

From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code.

Module-2: Number system

Decimal, Binary, Octal, Hexa-decimal, Conversion of numbers, Addition and subtraction of two numbers, Two's complement, Multiplication and division of binary numbers, working with fractions, signed number representation in binary form, Logic gates

Module-3: Introduction to C

Compiling and executing C programs, using comments, keywords, identifiers, Data type, variables, constants, input/output statements in C, operators in C, type conversion and type casting.

Module 4: Arithmetic expressions and precedence



Operators in C, Precedence of operators, Operators Precedence & Associativity Table, associativity of operators

Module-5: Decision Control and looping statements

Conditional branching statement, iterative statements, nested loops, break and continue statements, goto statement

Module-6: Arrays & Strings

Declaration, accessing elements of array, storing values, calculating the length of array, two dimensional arrays, reading and writing strings, suppressing input, string taxonomy, string operations – using and without using library function, array of strings

Module-7: Functions

Declaration, prototype, definition, function call, return statement, passing parameters to the function, scope of variable, storage classes, recursive functions.

Module-8: Pointers

introduction, declaration, Pointer expression and arithmetic, null pointer, generic pointer, passing arguments to functions using pointer, pointers and arrays, passing an array to function, difference between array name and pointer, pointers and strings, array of pointers, function pointers, pointers to pointers, dynamic memory allocation, drawbacks

Module 9: Recursion

Recursion, as a different way of solving problems. Example programs, such as Finding, Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

Module-10: Structure-union, Files, Preprocessor directives

Structure, nested structure, array of structure, union, array of union variable, unions inside structure, Files – Reading –writing etc, Preprocessor directives

Module 11: Basic Algorithms

Notion of order of complexity through example programs, Searching, Basic Sorting Algorithms (Bubble, Insertion).

Text Books

1. Let Us C by Yashavant P. Kanetkar
2. Programming in C by Reema Thareja
3. Computer Fundamentals and C Programming by Sumitabha Das
4. Programming in ANSI C by Balagurusamy

References

1. Programming with C by Byron S Gottfried
2. Computer Programming in C Dr. Syed Jalal Ahmad, Arshad Ahmad Khan Mohamma

TITLE OF COURSE: PROGRAMMING FOR PROBLEM SOLVING LAB

COURSE CODE: BCA191

L-T-P: 0-0-2

CREDITS: 1

Pre-requisite: Students must have already registered for the course, Networking, Linux.

Introduction:

The course is designed to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs, applications in C. Also by learning the basic programming

constructs they can easily switch over to any other language in future.

Course Outcomes (CO):

Students will also be able develop applications.

CO1: Appreciate and understand the working of a digital computer

CO2: Analyze a given problem and develop an algorithm to solve the problem

CO3: Improve upon a solution to a problem

CO4: Use the 'C' language constructs in the right way

CO5: Design, develop and test programs written in 'C'

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	3	2		2			2		2	2
CO2	3			2					2	2	3
CO3	3	2	2			2				2	2
CO4	3	2	2		2			2		2	2
CO5	3	2	2		2		1			2	2

Course Contents:

Module-1: Introduction to Computers

Generations, Classifications, Applications, Basic Organization, Input and output devices, Basic concept of Computer memory, Computer software and networks

Module-2: Number system

Decimal, Binary, Octal, Hexa-decimal, Conversion of numbers, Addition and subtraction of two numbers, Two's complement, Multiplication and division of binary numbers, working with fractions, signed number representation in binary form, Logic gates

Module-3: Introduction to C

Compiling and executing C programs, using comments, keywords, identifiers, Data type, variables, constants, input/output statements in C, operators in C, type conversion and type casting.

Module-4: Decision Control and looping statements

Conditional branching statement, iterative statements, nested loops, break and continue statements, goto statement

Module-5: Arrays & Strings

Declaration, accessing elements of array, storing values, calculating the length of array, two dimensional arrays, reading and writing strings, suppressing input, string taxonomy, string operations – using and without using library function, array of strings

Module-6: Functions

Declaration, prototype, definition, function call, return statement, passing parameters to the function, scope of variable, storage classes, recursive functions

Module-7: Pointers

introduction, declaration, Pointer expression and arithmetic, null pointer, generic pointer, passing arguments to functions using pointer, pointers and arrays, passing an array to function, difference between array name and pointer, pointers and strings, array of pointers, function pointers, pointers to pointers, dynamic memory allocation, drawbacks

Module-8: Structure-union, Files, Preprocessor directives

Structure, nested structure, array of structure, union, array of union variable, unions inside structure, Files – Reading –writing etc, Preprocessor directives



List of Experiments

- Experiment 1: Write a program in C to compute the average of a few inputs given by the user.
- Experiment 2: Write a program in C to swap 2 numbers using a user defined function and print the values in main.
- Experiment 3: Write down the importance of type conversion with example.
- Experiment 4: Write a program in C to reverse a number.
- Experiment 5: Write a program to find largest number between two numbers.
- Experiment 6: Write a program to find a character is vowel or not using switch case.
- Experiment 7: Write a program to find a given number is even or odd?
- Experiment 8: Write a program in C that will find the sum of the series:
- Experiment 9: Write a C program to print the following pattern using loop control instructions.
- Experiment 10: Write a program to calculate the sum of cubes of first n numbers
- Experiment 11: Write a C program to determine the factorial of a given number
- Experiment 12: Write a program in C that will find the sum of the following series:
- Experiment 13: Write a C program to print the following pattern using loop control instructions:
- Experiment 14: Write a program in C that will concatenate two strings.
- Experiment 15: Write a C program to calculate the number of vowels present in the string.
- Experiment 16: Write a program in C to calculate number of characters present in a string.
- Experiment 17: How does one-dimensional array differ from two-dimensional array?
- Experiment 18: Write a program in C that will reverse a string.
- Experiment 19: Write a program in C to sort a single dimension array in an ascending order.
- Experiment 20: Write a program in C that will find area and circumference of a circle using a user defined function calc(). Take input and display the output in main().
- Experiment 21: Write a program of factorial using recursive function.
- Experiment 22: Write a program to define a structure of a student which contains roll, name, section etc. Then you need to find a record using a given roll.
- Experiment 23: Write a program to read and write a file.

Text Books

1. Let Us C by Yashavant P. Kanetkar
2. Programming in C by Reema Thareja
3. Computer Fundamentals and C Programming by Sumitabha Das
4. Programming in ANSI C by Balagurusamy

References

1. Programming with C by Byron S Gottfried
2. Computer Programming in C Dr. Syed Jalal Ahmad, Arshad Ahmad Khan Mohammad

TITLE OF COURSE: COMPUTER SYSTEM & OFFICE AUTOMATION TOOLS

COURSE CODE: BCA102

L-T-P: 3-0-0

COURSE CREDITS: 3

Pre-requisite: Basic knowledge is assumed about computer components and software system.

Introduction:

This course examines operating system design concepts, internet technologies, and software and hardware basics. The Topics to be covered (tentatively) include:

- Computer and operating system structures
- Process and working of computer

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- Software & Hardware
- Memory
- File system and management
- I/O devices management
- Selected examples in networking, protection and security this course in Computer Science for the BCA students; therefore, it deals with the basic concepts of computers. It discusses about the computer hardware, its components and basic computer architecture. The course also deals with the basic computer software including the operating system and its concepts. This course also highlights some of the open source software technologies. Finally the course highlights the applications of computers that include web applications, social networking.

Course Outcomes:

CO1: Understand the theory and logic behind the design and construction of operating systems.

CO2: Will differentiate between various operating systems functionalities in terms of performance.

CO3: Become aware of the issues in the management of resources like processor, memory and input-output.

CO4: Understand the need and features of open source software.

CO5: Learn File systems and methods of accessing

CO6: Understanding various internet technologies.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3		2	2	2	2				2	2
CO2					2					2	3
CO3	3	2		2	2		2	2	2	2	2
CO4	3	2	2	2	2	2			2	2	2
CO5			2		2	2				2	2
CO6	3		2		2				2	2	2

Course Contents:

MODULE 1: Basics of Computer Hardware

Module 1: Computer their Origin and Applications A bit of history highlighting the concepts, Abacas, Difference Engine, Electro-magnetic Computers, Discrete components, IC circuits, Current hardware Platforms, Description of current applications of computer highlighting role of computers, Limitations of Computers.

Module 2 : Functioning of a Computer Components of a computer and their role, Number system, Codes ASCII Unicode Concept of Instruction – a simple example, Role of ALU and CU with the help of an example.

Module 3: Memory System Type of memories and their characteristics, what is the need of memory hierarchy? Memory Hierarchy with examples of each level, Current trends in memory.

Module 4: I/O devices and their functions I/O devices, Current trends in I/O.

Module 5: My Personal Computer Explain the configuration of PC and its components in respect of identification of various components so that a student can relate all the terms discussed in Module 1 to 4 to this configuration.

MODULE 2: Basics of Computer Software



Module 1: Software Evolution Different type of software and its evolution, System and application software, Utility software, perverse software, Open Source software

Module 2: Operating System Concepts Need and Functions, Type of OS starting from Batch, Multiprogramming and real time Network and distributed OS, Web OS, Examples of OS and their features

Module 3: Concept of Programming Languages Some basic constructs, Editors, Compilers and interpreters, Assemblers

Module 4: Computer Applications Concepts of Open Source Software, Philosophy – licensing, copyright, Project Management Software, Timesheet system, Office Applications, Word Processing – Creating a Memo for a number of people, Spreadsheet – Creating a sheet of Income & deduction and calculation of IT Database – a small application with data records, a form, a query and a report Email – Sending mail to a number of people in a group.

MODULE 3: Internet Technologies

Module 1: Networking and Internet Basic of Networking Concepts, Advantages of Networking, Basic model of Networks, Network Devices, TCP/IP, Web addresses, DNS, IP addresses

Module 2: Web Applications I Browsing, E-mail, Messenger/Chat

Module 3: Web Applications II Blogging, E-Learning and wiki, Collaboration, Social Networking

Text Books

1. Ramesh Bangia, “PC Software Made Easy (SIXTEEN-IN-ONE)”, Khanna Publishing.

References

1. Sinha P K, Computer Fundamentals, Bpb Publications-New Delhi.

TITLE OF COURSE: COMPUTER SYSTEM & OFFICE AUTOMATION TOOLS LAB

LAB COURSE CODE: BCA192

L-T-P: 0-0-2

CREDITS: 1

Pre-requisite: Basic knowledge is assumed about computer components and software system.

Introduction:

The main objectives of PC Software Lab course are to familiarize with basic operations of:

1. Operating systems such as Windows and Linux.
2. Word Processor such as Open Office and MSWord.
3. Workbook, worksheet, graphics and Spreadsheets.
4. PowerPoint including animation and sounds.
5. Address book, Spam and Filtering in E-mail.
6. Browsing, Search, Discussion forum and Wiki's.

Course Outcomes:

The students will have a detailed knowledge of the concepts of process and memory, learn the basics behind file systems and input output systems and understand the fundamentals of network and operating systems.

CO1: Understand and implement basic services and functionalities of the operating system using system calls.

CO2: Understand the features of MS office tools such as word, excel, PowerPoint.

CO3: Understand the concept of searching and email.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):



CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3		2	2	2	2				3	3
CO2	3				2			2		2	3
CO3		2		2	2		2	2	3	2	2

Course Contents:

Exercises that must be done in this course are listed below:

Section 1: Operating System

Session 1: Familiarization (Keyboard, Memory, I/O Port),

Session 2: Windows (2 Session)

Session 3: Linux (2 Session)

Section 2: Word Processor (Open Office and MS Word)

Session 1: Basic Operations (Font selection, Justification, Spell check, Table, Indentation),

Session 2: Table of Contents, Track Changes and Commenting.

Session 3: Mail Merge, Printing, Practice session.

Section 3 : Spread sheet (Concept of Worksheet, Workbook and cell)

Session 1 : Data entry, Data editing and Formula

Session 2 : Functioning

Session 3 : Graphics and Practice session

Section 4 : PowerPoint

Session 1 : Basics operation

Session 2 : Animation and Sounds

Section 5 : E-mail

Session 1 : Basic Operation,

Session 2: Address Book, Spam and Filtering

Section 6 : Browsing and Discussion Forum

Session 1 : Browsing and Search (2 Sessions)

Session 2 : Discussion Forum, Wiki and Google Doc (3 Sessions)

Text Book:

1. Ramesh Bangia, "PC Software Made Easy (SIXTEEN-IN-ONE)", Khanna Publishing.

2. Sinha P K, Computer Fundamentals, Bpb Publications-New Delhi.

Recommended Systems/Software Requirements:

1. Microsoft Office 2007, 2010.

2. Windows XP or Linux Operating System.

TITLE OF COURSE: DIGITAL ELECTRONICS

COURSE CODE: BCA103

L-T-P: 3-0-0

CREDITS: 3

Pre-requisite: Binary numbers & Basic Boolean algebra, Logic gates, Truth Tables and function realization, Basic Electronics

Introduction:

This course is important for number system, Boolean algebra, basic requirements for a design application etc.

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Course Outcomes (CO):

Upon successful completion of this course, students should be able to:

CO1: Students would be able to convert from one number system to another, work out and design problems related to Boolean algebra, minimization etc.

CO2: Have the ability to identify basic requirements for a design application and propose a cost-effective solution.

CO3: Have the ability to understand, analyse and design various combinational and sequential circuits.

CO4: Have the ability to understand, analyse and design various A/D and D/A conversion techniques.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1		3	2	2	2					2	2
CO2	3	2	2	2	2					2	2
CO3	3	2	3	2	2					1	2
CO4	3	3	2	2						2	3

Course Contents:

Module-1:

Binary Number System & Boolean Algebra (recapitulation); BCD, ASCII, EBCDIC, Gray codes and their conversions; Signed binary number representation with 1's and 2's complement methods, Binary arithmetic, Venn diagram, Boolean algebra (recapitulation); Representation in SOP and POS forms; Minimization of logic expressions by KMAP, Quine-McCluskey Minimization Technique (Tabular Method).

Module-2:

Combinational circuits - Adder and Subtractor circuits (half & full adder & subtractor); Encoder, Decoder, Comparator, Multiplexer, De-Multiplexer and Parity Generator.

Module-3:

Sequential Circuits - Basic Flip-flop & Latch, Flip-flops -SR, JK, D, T and JK Master-slave Flip Flops, Registers (SISO,SIPO,PIPO,PISO), Ring counter, Johnson counter, Basic concept of Synchronous and Asynchronous counters (detail design of circuits excluded), Design of Mod N Counter.

Module-4:

A/D and D/A conversion techniques – Basic concepts (D/A: R-2-R only, A/D: successive approximation, Logic families- TTL, ECL, MOS and CMOS - basic concepts.

Text Books

1. Digital Logic Design by Morris Mano - PHI
2. Digital Electronics by S. Salivahanan, S. Arivazhagan-OXFORD
3. Digital Electronics by P.Raja - Scitech Publications
4. Digital Fundamentals by Floyd & Jain -Pearson.

References

1. Microelectronics Engineering by Sedra & Smith-Oxford.



2. Principles of Electronic Devices & circuits by B L Thereja & Sedha,
3. S Chand Digital Electronics, Kharate –Oxford

TITLE OF COURSE: BUSINESS SYSTEM & ADMINISTRATION

COURSE CODE: BCA104

L-T-P: 3-0-0

CREDITS: 3

Introduction:

Business system application, especially e-business systems, use computer and web-based technology to deliver existing business models or promote new ones. This module examines existing business systems, applications and environments, as well as emerging ones that support these business models and system management. The primary focus is on the various business systems, applications and management and understanding how an enterprise framework and integration of disparate application environments facilitate functioning of business and enable development of new models.

Course Outcomes (CO):

CO1: Fully understand how e-business systems can contribute to broader enterprise management issues

CO2: Comprehensively evaluate and critically analyze various business systems (including e- business systems), applications and management

CO3: Compare and evaluate alternative business application environments that enable business systems

CO4: Demonstrate a good understanding of architectural options for implementing and facilitating business systems and management

CO5: Research and evaluate interdependencies between business systems and the rest of the enterprise management environment

CO6: Critically analyze the impact of business systems and applications on enterprise performance and development of society.

CO7: Demonstrate interpersonal skills and the ability to work effectively with others to achieve common goals.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3		3		2	3		3			
CO2				3	2						
CO3	3	2			2			3	3		
CO4		1		2	2			2			
CO5			1		2	3	2		2		
CO6	3		2		2						
CO7					3				3		

Course Contents:

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Module -1: Use of computers for managerial applications, Technology issues and data processing in organizations, Introduction to Information Systems, shift in Information system thinking, latest trends in Information Technology.

Module -2: Computer Based Information Systems- office automation systems, Decision making and MIS, transaction processing systems.

Module -3: Decision support system, Group Decision Support, Executive Information systems, DSS generator.

Module -4: Introduction to: Artificial Intelligence Based Systems, End user computing, distributed data processing.

Module -5: Deciding on IS architecture, IT leadership & IS strategic planning.

Module -6: Introduction to: IS strategy and effects of IT on competition.

Module -7: Introduction to: ERP, re-engineering work processes for IT applications, Business Process Redesign.

Module -8: Knowledge engineering and data warehouse.

Text Books:

1. Management Information System, O'Brien, TMH
2. Management Information System: A Concise Study, Kelkar, PHI
3. Decision support Systems, Janaki Raman, PHI

References

1. Business Information Systems, Munish Kumar, VIKAS
2. Business Application of Computers, M.M. Oka, EPH

TITLE OF COURSE: MATHEMATICS-I

COURSE CODE: BSC101

L-T-P: 3-0-0

CREDITS: 3

Introduction:

The goal of this course is for students to gain proficiency in calculus computations. In calculus, we use three main tools for analyzing and describing the behavior of functions: limits, derivatives, and integrals. Students will use these tools to solve application problems in a variety of settings ranging from physics and biology to business and economics.

Course Outcomes (CO):

The students will learn:

CO1: Find intervals where a function is concave up or concave down.

CO2: Find inflection points.

CO3: Use the second derivative test to find local extrema.

CO4: Evaluate definite integrals to find net area between a curve and the x-axis using the fundamental Theorem of Calculus.

CO5: Use basic integration properties to solve graphical net area problems.

CO6: Find the equilibrium point of supply and demand.

CO7: Use definite integrals to calculate consumer and producer surplus.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3		3		3			3		1	



CO2		2		3			3		3		
CO3	3	3						3	3	2	2
CO4	3	2		3	2			3			
CO5			1		2		3		3		1
CO6	3		3		3						
CO7	3								3	1	

Course Contents:

Module 1: Function (5L)

Definition, domain and range of function, types of functions (into, onto, one to one), composite function.

Module 2: Limit (3L)

Definition, first principle, properties, and simple problems related to limit. Some standard limits.

Module 3: Continuity (4L)

Definition, continuity of sum, product, difference and quotient of two continuous functions, simple problems.

Module 4: Differentiation (10L)

Definition, differentiation of simple functions using first principle, differentiation of trigonometric functions and inverse circular functions, method of substitution, differentiation of product and quotient of functions, maxima and minima of a function of single variable.

Module 5: Integration (10L)

Definition, integration of simple functions using substitution, integration of trigonometric and inverse circular functions and related problems, integration by parts, integration of rational functions. Definite integral and their properties, simple problems. Reduction formula and simple problems.

Text Books

1. Mathematics for Class 12 by R D Sharma
2. NCERT Mathematics for Class 12

TITLE OF COURSE: ENGLISH COMMUNICATION & PUBLIC SPEAKING SKILLS-I

COURSE CODE: HSM101

L-T-P: 2-0-0

CREDITS: 2

Pre-requisite: Basics of English.

Introduction:

Learn the English speaking and writing skills with this Basic English structure and soft skills.

Course Outcomes (CO):

It is a well-balanced course that focuses on the four core language skills:

CO1: Students would be able to Listening English language

CO2: Students would be able to Speaking English language

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CO3: Students would be able to Reading English language

CO4: Students would be able to Writing English language

CO5: Use the English language more effectively.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1									2		
CO2									3		
CO3									3		
CO4									2		
CO5									3		

Course Contents:

Module 1: ENGLISH LANGUAGE: GRAMMAR & VOCABULARY (6L)

Correction of Errors in Sentences , Building Vocabulary, Word formation, Single Word for a group of Words, Fill in the blanks using correct Words, Sentence Structures and Transformation, Active & Passive Voice, Direct & Indirect Narration (MCQ Practice during classes)

Module 2: READING COMPREHENSION (6L)

Strategies for Reading Comprehension, Short Stories for Comprehension, Practicing Technical & Non-Technical Texts for Global/Local/Inferential/Referential comprehension; Précis Writing, Essay/Paragraph writing

Module 3: TECHNICAL COMMUNICATION (6L)

The Theory of Communication –Definition & Scope, Barriers of Communication, Different Communication Models, Effective Communication (Verbal / Nonverbal), Presentation / Public Speaking Skills, (MCQ Practice during classes)

Module 4: MASTERING TECHNICAL COMMUNICATION (6L)

Technical Report (formal drafting); Business Letter (formal drafting); Job Application (formal drafting); Organizational Communication: Memo, Notice, Agenda, Minutes Group Discussion –Principle & Practice

Text Books

1. Communication Skills, Sanjay Kumar and Pushpa Lata,(OUP),2015
2. Objective English, Prasad and Sinha, Tata McGraw Hill Education Pvt. Ltd, 2013
3. English Grammar, Wren and Martin, Regular Edition
4. Fantasy- A Collection of Short Stories,V. Sashikumar,Orient Black swan (Reprint 2006)

References

1. Proficiency in Reading Comprehension, Ajay Singh, Paperback, 2015
2. Selected Contemporary Essays, Soumitra Mohan, Paperback, 2016

TITLE OF COURSE: ENGLISH COMMUNICATION & PUBLIC SPEAKING SKILLS-I LAB

COURSE CODE: HSM191

L-T-P: 0-0-2

CREDITS: 1

Pre-requisite: Basics of English.

**Introduction:**

Learn the English speaking and writing skills with this Basic English structure and soft skills.

Course Outcomes (CO):

It is a well-balanced course that focuses on the four core language skills:

CO1: Listening

CO2: Speaking

CO3: Reading

CO4: Writing

CO5: Use the English language more effectively.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

<u>CO</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PSO1</u>	<u>PSO2</u>
CO1									2		
CO2									3		
CO3									3		
CO4									2		
CO5									3		

Course Contents:**Module -1 (LISTENING):**

Listening Skill & its sub skills (Assignment: Listening to story or read aloud passage or newspaper reading, and then answering the questions set from that passage), like-, Oral Comprehension-Story, Oral Comprehension-Newspaper report, Oral comprehension-Conversation played by audio-visual devices

Module -2 (SPEAKING):

Speaking Skill & its sub skills (Assignment: Storytelling, Debate, Oral Presentation) for helping students to master Linguistic/Paralinguistic features (Pronunciation, Phonetics, Voice modulation, Stress, Intonation, Pitch & Accent) of connected speech (Assignment: Language Functions-Permission, Request, Order, etc.), like- Story telling practice- Individual work, Storytelling- Pair work, Storytelling-Group work, Just-a Minute(JAM) Session, Face to face conversation, Telephonic conversation, Role Play Mode, Mobile Phone

Module -3 (READING):

Reading Skills and its sub skills using Visual / Graphics/Diagrams /Chart Display/Technical/Non Technical Passages; Learning Global / Contextual / Inferential Comprehension (Assignment: Comprehension passages: Question answer sessions), like- Newspaper reading, Technical topics reading, Story reading and summarizing.

Module -4 (WRITING):

Writing Skill: Practice Sessions. Writing practice hones expressive potential of students, thereby accentuating the correct usage of vocabulary. (Assignment: Story writing, Essay writing, etc) like Paragraph Writing, Instruction Writing, Essay Writing, Rearranging jumbled sentences, Antonyms



and Synonyms, Word formation : Prefixes and Suffixes, Word formation : Homonyms and Homophones, Comprehension passages: Question answer sessions.

Text Books

1. Communication Skills, Sanjay Kumar and Pushpa Lata,(OUP),2015
2. Objective English, Prasad and Sinha, Tata McGraw Hill Education Pvt. Ltd, 2013
3. English Grammar, Wren and Martin, Regular Edition
4. Fantasy- A Collection of Short Stories,V. Sashikumar,Orient Black swan (Reprint 2006)

References

1. Proficiency in Reading Comprehension, Ajay Singh, Paperback, 2015
2. Selected Contemporary Essays, Soumitra Mohan, Paperback, 2016

TITLE OF COURSE: ESP & SDP-I

COURSE CODE: BGSC101

L-T-P: 2-0-0

CREDITS: 2

Pre-requisite: Basic concepts in mathematics, English

Introduction:

The Topics to be covered (tentatively): Aptitude, Indian Constitution and Governance, Basic English and Data Interpretation.

Course Outcomes (CO):

Students are expected to be capable numerical problems, literature, and basic of Indian constitution. To reach this goal, the following objectives need to be met:

CO1: Students would be able to design & implement any basic numerical problem properly.

CO2: Students would be able to know basic English language and communicate with the society.

CO3: Students would be able to know basic Indian constitution.

CO4: Students would be able to stress management by doing Yoga

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	2	2		2				2		
CO2	2			2					2		
CO3	3	2	2						3		
CO4	2	1	2		2				2		

Course Contents:

Essential Studies for Professionals-I

Section-A: Employment Enhancement Skills:

Module-1: Number System:

Numbers, Face value and place value of a digit, Types of numbers, Tests of Divisibility, Factorial of a



number, Modulus of a number, greatest integral value, Multiplication by short cut methods, Division Algorithm.

Module-2: HCF and LCM of Numbers:

Factors and Multiples, HCF or GCD, LCM, Product of two numbers, Co-primes, HCF and LCM of fractions, HCF and LCM of decimal fractions, Comparison of fractions,

Module-3: Average & Percentage:

Concepts, Results on population, Results on Depreciation

Module-4: Profit and Loss:

Cost Price, Selling Price, Profit or Gain, Loss

Section B: Yoga, Games and Meditation:

Module-1: Asana sitting postures and Karate, Asana lying in supine & prone position and karate, Surya Namaskar, Asana standing posture and Karate, Kriyas, Pranayam and Karate, Meditation and Karate, Meditative posture and Karate, Tratak, Kapalbhati and Meditation.

Meditation and Stress Management, Meditation, Stretching and Self Defense. Meditation, Kicking and Punching of Karate. (Games and Sports will be evaluated on the basis of the participation and performance in different sports events that the students shall participate in).

Section C: Skill Development for Professionals-I

Module-1: Parts of speech: Introduction, Brief discussion of Parts of speech, noun, Kinds of Noun, Rules & Application. Pronoun, Examples, Rules & Application, Verb, Kinds of Verb, Rules & Application, Definition of Tense, Different types of Tenses, Examples, Rules & Application, Adjective, Kinds of Adjective, Rules & Application, Adverb, Kinds of Adverb, Rules & Application, Preposition, Examples, Rules & Application, Interjection, Examples, Rules & Its Application, Conjunction, Examples, Rules & Application, Articles, Examples, Rules & Application English Grammar.

Vocabulary- : Synonyms, Antonyms with examples, one word Substitution, Idioms & Phrases, Spotting Errors.

Reading Comprehension (Level I)

Module-2: Indian Constitution and Governance: Historical background (in brief) - The company Rule (1773-1858), the crown rule (1858-1947), making of constitutions, features of constitution. The Preamble- Ingredients, keywords, amendment of preamble. Part & schedule, Citizenship (in brief) - Constitutional provisions, Citizenship act, Comparing PIO & OCI card holders, Fundamental Rights- Concept & different articles, Right to equality, prohibition of discrimination on certain ground, Equality of opportunity, abolition of untouchability & titles, right to freedom, right to education, right against exploitation, right to freedom of religion, cultural & educational rights, different writs & scopes, DPSP- Classification of directive principle, sanctioned of directive principal, criticism, Distinction between fundamental rights & directive principle List of Fundamental duties, criticism, significance, Verma committee. Features of parliament govt. Features of Presidential Govt. Merits & Demerits. Duties of Honorable President & Vice President & their selection, Provision & scopes, Duties of PM, CM & Governor & their selections

Module-3: Data Interpretation Level-I

Newspaper reading: The Hindu & Economic Times

Text Books

1. Quantitative Aptitude for Competitive Examinations by R S Aggarwal
2. Introduction to the Constitution of India, by D D Basu
3. The Constitution of India by Dr. B.R. Ambedkar Under Chairmanship of Dr. Rajendra Prasad



Including Coloured Preamble, Signatures

References

1. The Constitution of India by Dr. B.R. Ambedkar 2020.

Second Semester Syllabus

Sl No.	Type	Subject Code	Topic	L	T	P	S	Credit Points
1.	CC	BCA205	Object Oriented Programming using Python	3	0	2	0	4
2.	CC	BCA206	Software Engineering	3	0	2	0	4
3.	CC	BCA207	Computer Organization & Architecture	3	0	2	0	4
4.	BSC	BSC202	Mathematics-II	3	0	0	0	3
5.	MC	MC201	Environment & Ecology	3	0	0	0	3
6.	HSM	HSM202	Professional Writing & Technical Seminar	2	0	2	0	3
7.	GSC	BGSC202	ESP & SDP-II	2	0	0	0	2
8.	PTI	INT201	Project-I	0	0	0	1	1
9.	ECA	ECA201	Extra-curricular activities	-	-	-	-	-
Total				19	0	8	1	24

TITLE OF COURSE: OBJECT ORIENTED PROGRAMMING USING PYTHON

COURSECODE: BCA205

L-T-P: 3-0-0

CREDITS: 3

Pre-requisite: Knowledge is also assumed of basic concepts in data structures, programming languages, and basic mathematics.

Introduction:

- To know the basics of algorithmic problem solving
- To read and write simple Python programs.
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures — lists, tuples, dictionaries.
- To do input/output with files in Python.

Course Outcomes (CO):

After completion of the course, students will able:

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- CO1:** Develop algorithmic solutions to simple computational problems
CO2: Read, write, execute by hand simple Python programs.
CO3: Structure simple Python programs for solving problems.
CO4: Decompose a Python program into functions.
CO5: Represent compound data using Python lists, tuples, and dictionaries.
CO6: Read and write data from/to files in Python Programs.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3		2		2			2		3	3
CO2		2		2			2			2	2
CO3	3	2				2				2	2
CO4		2		2	2			2	2	3	3
CO5	2		2					2	3	2	2
CO6	2		2		2			22		2	1

Course Contents:

Module-1: ALGORITHMIC PROBLEM SOLVING

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, and guess an integer number in a range, Towers of Hanoi.

Module-2: DATA, EXPRESSIONS, STATEMENTS

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

Module-3: CONTROL FLOW, FUNCTIONS

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

Module-4: LISTS, TUPLES, DICTIONARIES

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, merge sort, histogram.

Module-5: FILES, MODULES, PACKAGES

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

Text Books

1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers.

2. Guido van Rossum and Fred L. Drake Jr, —An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

References

1. John V Guttag, —Introduction to Computation and Programming Using Python“, Revised and expanded Edition, MIT Press, 2013
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, —Introduction to Programming inPython: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
3. Timothy A. Budd, —Exploring PythonI, Mc-Graw Hill Education (India) Private Ltd., 2015.
4. Kenneth A. Lambert, —Fundamentals of Python: First ProgramsI, CENGAGE Learning, 2012.
5. Charles Dierbach, —Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
6. Paul Gries, Jennifer Campbell and Jason Montojo, —Practical Programming: An Introduction to Computer Science using Python 3I, Second edition, Pragmatic Programmers, LLC, 2013.

TITLE OF COURSE: INTRODUCTION TO PYTHON PROGRAMMING LAB

COURSE CODE: BCA295

L-T-P: 0-0-2

CREDITS: 1

Pre-requisite: Knowledge is also assumed of basic concepts in data structures, programming languages, and basic mathematics.

Introduction:

- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, and dictionaries.
- Read and write data from/to files in Python.

Course Outcomes (CO):

After completion of the course, students will able:

CO1: Write, test, and debug simple Python programs.

CO2: Implement Python programs with conditionals and loops.

CO3: Develop Python programs step-wise by defining functions and calling them.

CO4: Use Python lists, tuples, dictionaries for representing compound data.

CO5: Read and write data from/to files in Python.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3		2		2			2	2	2	3
CO2		2		2			2			2	2
CO3	3	2		2		2	2			2	2
CO4		2		2	2			2		3	3
CO5	2		2		2		2	2	3	2	2



Course Contents:

- Experiment No: 1. Compute the GCD of two numbers.
- Experiment No: 2. Find the square root of a number (Newton's method)
- Experiment No: 3. Exponentiation (power of a number)
- Experiment No: 4. Find the maximum of a list of numbers
- Experiment No: 5. linear search and Binary search
- Experiment No: 6. Selection sort, Insertion sort
- Experiment No: 7. Merge sort
- Experiment No: 8. First n prime numbers
- Experiment No: 9. multiply matrices
- Experiment No: 10. Programs that take command line arguments (word count)
- Experiment No: 11. Find the most frequent words in a text read from a file
- Experiment No: 12. Simulate elliptical orbits in Pygame
- Experiment No: 13. Simulate bouncing ball using Pygame

PLATFORM NEEDED

Python 3 interpreter for Windows/Linux

Text Books

- 1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers.
- 2. Guido van Rossum and Fred L. Drake Jr, —An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

References

- 1. John V Guttag, —Introduction to Computation and Programming Using Python“, Revised and expanded Edition, MIT Press, 2013
- 2. Robert Sedgewick, Kevin Wayne, Robert Dondero, —Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
- 3. Timothy A. Budd, —Exploring Python, Mc-Graw Hill Education (India) Private Ltd., 2015.
- 4. Kenneth A. Lambert, —Fundamentals of Python: First Programs, CENGAGE Learning, 2012.
- 5. Charles Dierbach, —Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
- 6. Paul Gries, Jennifer Campbell and Jason Montojo, —Practical Programming: An Introduction to Computer Science using Python 3, Second edition, Pragmatic Programmers, LLC, 2013.

TITLE OF COURSE: SOFTWARE ENGINEERING

COURSE CODE: BCA206

L-T-P: 3-0-0

CREDITS: 3

Pre-requisite: Knowledge is also assumed of basic concepts in data structures, programming languages, and computer architecture.

Introduction:

Software engineering concepts include the collection of tools, procedures, methodologies, and accumulated knowledge about the development and maintenance of software-based systems. This

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course is strongly suggested for any student planning to take an internship in Computer Science. After an overview of the phases of the software lifecycle, current methodologies, tools, and techniques being applied to each phase will be discussed in depth with localized exercises given to reinforce learning of concepts.

Course Outcomes (CO):

This course will serve to broaden the student's understanding of the issues and latest developments in the area of software development and maintenance. To reach this goal, the following objectives need to be met:

CO1:How to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.

CO2: An ability to work in one or more significant application domains.

CO3: Work as an individual and as part of a multidisciplinary team to develop and deliver quality software.

CO4: Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle.

CO5: Demonstrate an ability to use the techniques and tools necessary for engineering practice.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	2					2	2	3	3	3
CO2	2				2	2		2	2	2	2
CO3	3			2	2				3	2	2
CO4	2		2				3	2	2	3	3
CO5	2	2	2						3	2	2

Course Contents:

Module-1:- Introduction: Software Engineering approach, Need of engineering aspect for Software Design, SDLC, Software Crisis, Software Process, Process models (Classical Waterfall Model, Build-n- Fix Model, Iterative Waterfall Model, Prototyping Model, Evolutionary Model and Spiral Model)

Module-2:- Software Requirement Analysis and Specifications: Software Requirement Specifications, Need of SRS, Steps for constructing good SRS, Behavioral and Non-Behavioral requirements, Analysis Model

Module-3:- Software Design: Design Concepts & Principle, problem partitioning, abstraction, and top down and bottom up-design, Cohesion & Coupling, How to measure degree of Cohesion and Coupling, Function Oriented Design, DFDs, Structure Chart, Object Oriented Design.

Module-4:- UML: Use case diagram, State chart diagram, Activity Diagram, Class Diagram, Sequence diagram, Collaboration diagram, Deployment Diagram, Event trace diagram.



Module-5:- Software Estimation: Software Project Estimating Size, Effort and Cost: Metric for Analysis, Metric for Design, COCOMO model.

Module-6:- Software Testing: Validation and Verification, Black Box testing approach, White Box testing approach, Levels of testing: Unit Testing, Integration Testing, Validation testing, System testing and debugging.

Module-7:- Software Maintenance: Software Maintenance Process and its types, Introduction to Reverse Engineering.

Software Reliability & Quality Assurance: Software Reliability issues, Software quality, Overview of Quality Standards like ISO 9001, SEI-CMM and its comparison with ISO, Introduction, scope and architecture of CASE.

Text Books

1. Software Engineering: A practitioner's approach: Roger Pressman, McGraw- Hill Pub (6th Edi).
2. Fundamentals of Software Engineering: Mall, Rajib, Prentice Hall of India, New Delhi (2nd Edition.

References

1. Software Testing Techniques, B. Beizer.
2. Structured Systems Analysis: Tools and Techniques, Gane and Sarson.
3. Software Engineering, Sommerville, Addison Wesley.
4. Modern Structured Analysis, E. Yourdon.
5. An Integrated approach to Software Engineering: Pankaj Jalote, Narosa Publishing House.
6. Structured design, E. Yourdon and L. Constantine.
7. Fundamentals of Software Engineering: Ghezzi, Jazayeri, Mandriol, PHI

TITLE OF COURSE: SOFTWARE ENGINEERING LAB

COURSE CODE: BCA296

L-T-P: 0-0-2

CREDITS: 1

Prerequisite: Students must have already registered for the course, "Software Engineering".

Objectives:

Students will be capable to acquire the generic software development skill through various stages of software life cycle. He will also be able to ensure the quality of software through software development with various protocol based environment.

Course Outcomes (CO):

Students will also be able to handle software development models through rational method. After completion of course student will be able to generate test cases for software testing.

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CO1:How to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.

CO2: An ability to work in one or more significant application domains.

CO3: Work as an individual and as part of a multidisciplinary team to develop and deliver quality software.

CO4: Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle.

CO5: Demonstrate an ability to use the techniques and tools necessary for engineering practice.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	2					2	2	3	3	3
CO2	2				2	2		2	2	2	2
CO3	3			2	2				3	2	2
CO4	2		2				3	2	2	3	3
CO5	2	2	2						3	2	2

Course Contents:

Module-1: Software Process Model: A Model of Software Development

Module-2: Requirement Analysis: Requirement Elicitation, specification, IEEE standard template for SRS, Requirement Engineering tools.

Module-3: UML Modeling: Use case diagram, State diagram, Activity Diagram, Class Diagram, Sequence diagram, Collaboration diagram, Deployment Diagram, Component Diagram, Event trace diagram, C++ code generation.

Module-4: Software Metrics: Product, process and project metrics.

Module-5: Software Testing: Structural testing, functional Testing, Testing Strategies and Tactics, Test Case design.

List of Experiments

1. Identifying the Requirements from Problem Statements Requirements, Characteristics of Requirements, Categorization of Requirements, Functional Requirements, And Identifying Functional Requirements.
2. E-R Modeling from the Problem Statements, Entity Relationship Model, Entity Set and Relationship Set, Attributes of Entity, Keys, Weak Entity, Entity Generalization and Specialization, Mapping Cardinalities, ER Diagram, Graphical Notations for ER Diagram Importance of ER modeling.
3. Identifying Domain Classes from the Problem Statements, Domain Class, Traditional Techniques for Identification of Classes, Grammatical Approach Using Nouns, Advantages, Disadvantages, Using Generalization, Using Subclasses, Steps to Identify Domain Classes from Problem Statement, Advanced Concepts
4. Modeling UML Use Case Diagrams and Capturing Use Case Scenarios, Use case diagrams, Actor, Use Case, Subject, Graphical Representation, Association between Actors and Use Cases, Use Case Relationships, Include
5. Modeling UML Class Diagrams and Sequence diagrams, Structural and Behavioral aspects, Class diagram, Elements in class diagram, Class Relationships, Sequence diagram, Elements in sequence diagram, Object, Life-line bar, Messages.
6. Modeling Data Flow Diagrams, Data Flow Diagram, Graphical notations for Data Flow Diagram, Explanation of Symbols used in DFD, Context diagram and leveling DFD



7. State chart and Activity Modeling State chart Diagrams, Building Blocks of a State chart Diagram State, Transition, Action, Guidelines for drawing State chart Diagrams, Activity Diagrams, Components of an Activity Diagram, Activity, Flow Decision, Merge, Fork, Join, Note, Partition, A Simple Example, Guidelines for drawing an Activity Diagram
8. Estimation of Project Metrics Project Estimation Techniques, COCOMO, Basic COCOMO Model, Intermediate COCOMO Model, Complete COCOMO Model, Advantages of COCOMO, Drawbacks of COCOMO, Halstead's Complexity Metrics.
9. Estimation of Test Coverage Metrics and Structural Complexity, Control Flow Graph, Terminologies, McCabe's Cyclomatic Complexity, Computing Cyclomatic Complexity, Optimum Value of Cyclomatic Complexity, Merits, Demerits
10. Ant - Deploying Applications, build.xml, Ant - Executing Java code, Ant - Creating WAR files, basedir, compress, Keepcompression, destfile, duplicate, excludes, excludesfile, includes, includesfile, update.

References

1. R.S. Pressman, "Software Engineering: A Practitioner's Approach", 7th Edition, McGraw Hill, 2010
2. Fundamentals of Software Engineering: Mall, Rajib, Prentice Hall of India, New Delhi (2nd Ed).
3. Sommerville, "Introduction to Software Engineering", 8th Edition, Addison-Wesley, 2007
4. Ghezzi, Jazayeri and Mandrioli, "Fundamentals of Software Engineering", 2nd Ed, Prentice Hall
5. Peters and Pedrycz, "Software Engineering: An Engineering Approach, John Wiley, 2004
6. Len Bass, "Software Architecture in Practice", 2nd Edn. Addison Wesley, 2003

TITLE OF COURSE: COMPUTER ORGANIZATION & ARCHITECTURE

COURSE CODE: BCA207

L-T-P: 3-0-0

CREDITS: 3

Pre-requisite: Knowledge is required in Basic Computation and any of the high level programming language.

Introduction:

All students should acquire some understanding and appreciation of a computer system's functional components, their characteristics, their performance, and their interactions. Students need to understand computer architecture in order to structure a program so that it runs more efficiently on a real machine. The course provides an overview of computer architecture and teaches students the operation of a typical computing machine. It covers the basic principles, while acknowledging the complexity of existing commercial systems.

The format of the course will be lecture-discussions, assignments. Students are strongly encouraged to participate actively in class discussions.

Course Outcomes (CO):

The course is intended to create an appreciation for contemporary concepts in high performance multi-core super scalar architectures and appreciate their implementation in modern multi processors. To reach this goal, the following objectives need to be met:

CO1: Draw the functional block diagram of single bus architecture of a computer and describe the function of the instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set.

CO2: Write assembly language program for specified microprocessor for computing 16 bit multiplication, division and I/O device interface (ADC, Control circuit, serial port communication).

CO3: Write a flowchart for Concurrent access to memory and cache coherency in Parallel Processors and describe the process.

CO4: Given a CPU organization and instruction, design a memory module and analyze its operation by

interfacing with the CPU.

CO5: Given a CPU organization, assess its performance, and apply design techniques to enhance performance using pipelining, parallelism and RISC methodology

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	2	3		2					3	3
CO2	2	3		3				2	2	2	2
CO3	3		3			3		2		2	2
CO4	2		2		3		3		2	3	3
CO5	2	2				3				2	2

Course Contents:

Module-1:- Basic Building Blocks: Half Adder, Full Adder, Half Subtractor, Full Subtractor, Decoder, Encoders, Multiplexer, Demultiplexer, Registers, Registers with parallel load

Module-2:- Register Transfer Language: Bus and Memory Transfer, Three State Bus Buffers, Memory Transfer, Arithmetic Micro operation (Binary Adder, Binary Adder-Subtractor, Binary Increment, Arithmetic Circuit), Logic Micro operations (List of logic operation), Shift Micro operations, Arithmetic Logic Shift Unit.

Module-3:- Memory Organization: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, and write policies.

Module-4:- Processor Organization: General register organization, Stack organization, Reverse Polish Notation, addressing mode, Instruction type.

Module-5:- Input-Output Organization: I/O Interface, I/O bus and interface modules, Strobe control, Hand Shaking, DMA, Interrupts & Interrupt handling, Direct Memory access: DMA Controller and DMA Transfer.

Module-6:- Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards. Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency.

Text Books

1. "Computer Organization and Design: The Hardware/Software Interface", 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.
2. "Computer Organization and Embedded Systems", 6th Edition by Carl Hamacher, McGraw Hill Higher Education.

References

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



TITLE OF COURSE: COMPUTER ORGANIZATION & ARCHITECTURE LAB

COURSE CODE: BCA297

L-T-P: 0-0-2

CREDITS: 1

Pre-requisite: Students must have already registered for the course, “Computer Organization & Architecture”.

Introduction:

To learn the fundamental aspects of computer architecture design and analysis. This lab course provides a comprehensive introduction to understand the underlying of VHDL (VHSIC Hardware Description Language) which is a hardware description language used to describe a logic circuit by function. In particular defined data flow, behavior or structure. It can also be used as a general purpose parallel programming language i.e. commands, which correspond to logic gates, are executed (computed) in parallel, as soon as a new input arrives. The emphasis of the course will be placed on understanding HDL Programming using xilinx to implement different type of circuit.

Course Outcomes:

Students can understand the functions, structures and history of VHDL programming. Understand the data flow model, behavioral model, structural model.

CO1: Draw the functional block diagram of single bus architecture of a computer and describe the function of the instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set.

CO2: Write assembly language program for specified microprocessor for computing 16 bit multiplication, division and I/O device interface (ADC, Control circuit, serial port communication).

CO3: Write a flowchart for Concurrent access to memory and cache coherency in Parallel Processors and describe the process.

CO4: Given a CPU organization and instruction, design a memory module and analyze its operation by interfacing with the CPU.

CO5: Given a CPU organization, assess its performance, and apply design techniques to enhance performance using pipelining, parallelism and RISC methodology

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

<u>CO</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PSO1</u>	<u>PSO2</u>
CO1	3	2	3		2					3	3
CO2	2	3		3				2	2	2	2
CO3	3		3			3		2		2	2
CO4	2		2		3		3		2	3	3
CO5	2	2				3				2	2

Course Contents:

Module-1: Implement AND NOT, OR Gate. **Module-2:** Implement NAND, NOR, XOR Gate,

Module-2: Implement Half Adder and Full Adder,

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Module-3: Implement Half-subtractor and Full-subtractor,

Module-4: Implement Flip-Flop, S-R Flip Flop, J-K Flip Flop, D Flip Flop, T Flip Flop.

List of Experiments

1. Implement the basic gates using Data flow, behavioral model in Xilinx.
2. Implement the universal gates using Data flow, behavioral model in Xilinx.
3. Implement different gates using universal gates.
4. Implement half adder and half subtractor in both data flow and behavioral model.
5. Implement full adder and full subtractor in both data flow and behavioral model.
6. Implement parallel and serial adder which can add two 8 bit numbers.
7. Implement Encoder (8: 3) and Decoder (3: 8).
8. Implement Multiplexer and De-multiplexer.
9. Implement Different flip-flops using data flow and behavioral model.\
10. Implement ring counter.
11. Implement a basic ALU which can perform different arithmetic and logical operations.

References

1. “Essential of Computer Architecture”, Douglas E. Corner, Pearson.
2. “Computer Organization and Design” David A. Patterson, John L. Hennessy, Elsevier.

TITLE OF COURSE: MATHEMATICS-II

COURSE CODE: BSC202

L-T-P: 3-0-0

CREDITS: 3

Introduction:

The undergrad curriculum in Statistics provides majors with the skills needed to utilize statistical techniques for addressing quantitative, data-based problems in fields such as biological and social sciences, engineering and technology, business and finance, law, and health and education

Course Outcomes:

The students will learn:

CO1: Statistical reasoning and inferential methods

CO2: Statistical modeling and its limitations

CO3: Interpreting and communicating the results of a statistical analysis

CO4: Data analysis using statistical computing tools and software

CO5: Probability and the mathematical foundations of statistics

CO6: Knowledge and Understanding: Students are able to understand the nature and operations of Numerical Analysis.

CO7: Intellectual Skills: By the end of the course the student is expected to solve real-life and engineering applications.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	2	3		2				2	1	
CO2	2			3		2		2			
CO3	3		3			3		2			2

CO4	2	2	2		3		3			2	
CO5	2					3			2		
CO6	2	2		2		2					1
CO7	2			2			2		2	2	

Course contents:

Statistics:

Module 1: Basic Statistics

Scope, functions and limitations of statistics, Collection and presentation of data– Tabular and diagrammatic representation, Frequency distribution, relative frequency, cumulative frequency; Bar graphs and pie charts; Histogram.

Module 2: Measures of Central tendency

Mean, Median, Mode, Percentiles, Quartiles

Module 3: Measures of Dispersion

Range, Interquartile range, Mean deviation, Mean Absolute deviation, Standard deviation, Variance, Coefficient of Variation. Measures of shape and relative location; Skewness and Kurtosis, Simple correlation and regression analysis

Numerical Methods:

Module 4 : Finite Differences

Definition of operators and relations among them (All operators)

Module 5: Interpolation

Interpolation With Equal Intervals: Newton's forward difference formula, Newton's backward difference formula. Interpolation with unequal intervals: Lagrange's Method, Newton divided Difference.

Module 6: Solution of Algebraic and Transcendental Equations

Bisection method, Regula-Falsi method, Newton-Raphson Method, Iterative method.

Text Books:

- 1.R. K. Jain, S.R.K. Iyengar & M.K. Jain, "Numerical Methods", New Age International Publishers, 2013.
2. B. S. Grewal, "Numerical Methods", Khanna publications, 2014.
3. S. C. Gupta, "Fundamentals of statistics", Sultan Chand & Sons, Delhi, 2006.
4. Goon, Gupta & Das Gupta, "Fundamentals of statistics", The World Press Pvt. Ltd., Kolkata, 2008.

Reference:

1. Mathews & Fink, "Numerical Methods using MATLAB", Pearson, 2010.
2. Gerald and Wheatly, "Applied Numerical Analysis", Pearson, 2010
3. Rohtagi, V.K., "An Introduction to Mathematical Statistics", John Wiley & Sons, 1976.
4. Mood A.M., Greybill, F.A. and Bose D.C., "Introduction to the Theory of Statistics", Mc Graw Hill, 1974.

TITLE OF COURSE: ENVIRONMENT & ECOLOGY

COURSE CODE: MC201

L-T-P: 3-0-0

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CREDITS: 3

Pre-requisite: Basic concepts in social Science.

Introduction:

This course examines basic environment. The Topics to be covered (tentatively) include: Renewable and non-renewable resources, Ecosystems in INDIA, Environmental Pollution, Social Issues and the Environment.

Course Outcomes (CO):

Students are expected to be capable of understanding the Indian society for environment, their advantages and drawbacks, how to implement them in ecology aspect, how their drawbacks can be overcome and what the applications are and where they can be used. To reach this goal, the following objectives need to be met:

CO1: Students would be able to know Environment problem properly.

CO2: Students would be able to know ecology system in India, national plan to protect ecology.

CO3: By analyzing student will be proper person to guide our society

CO4: To become an efficient human being for the society.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1		2	3		2		3	2	2		
CO2				3			3	2	2		
CO3		2	3				3	2	1		
CO4		2	2		3		3	1	2		

Course Contents:

Module-1: Basic Ideas of Environment & Ecology, Environmental Geology & Microbiology, Multidisciplinary nature of environmental studies, Definition, scope and importance Need for public awareness,

Module-2: Renewable and non-renewable resources: Natural resources and associated problems.

Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.

Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies.

Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

Module-3: Ecosystems in INDIA : Basic Concept of an ecosystem, Structure and function of an ecosystem, Energy Flow in Ecosystem, Ecosystem, Biogeochemical Cycles, Nitrogen Cycle, Biodiversity, Biodiversity Hotspots in India, IUCN Red List Conservation of Biodiversity, Importance of Biodiversity,



Loss of Biodiversity, Causes of Loss of Biodiversity, Food chains, food webs and ecological pyramids. Biosphere Reserves in India, Tiger Conservation of India Wildlife, Protection Act 1972, Climate Change in India Alien Invasive Species, Paris Agreement, UNFCCC, Kyoto Protocol, Albedo of Earth, National Green Tribunal Montreal Protocol, Kigali Agreement, Green House Gases (GHGs), Air Pollutants Central Board, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

National Health Mission, National Action Plan on Climate Change, National Water Mission, National Mission for Sustaining Himalayan Ecosystem (NMSHE), National Solar Mission, National Mission for Enhanced Energy Efficiency, National Mission on Sustainable Habitat, Green India Mission

Module-5: Environmental Pollution: Environmental ethics, Cause, effects and control of:- Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, global warming, acid rain, Climate change, ozone layer depletion, nuclear accidents and holocaust. Solid waste Management: Causes, effects and control measures of urban and industrial wastes, Role of an individual in prevention of pollution. Pollution case studies. Disaster management: floods, earthquake, cyclone and landslides.

Module-7: Social Issues and the Environment: Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people; its problems and concerns.

Module-7: Human Population and the Environment: Population growth, variation among nations, Population explosion – Family Welfare Program, Environment and human health, Human Rights, Value Education, Women and Child Welfare, Role of Information Technology in Environment and human health, Virus and vaccination.

Text Books

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., India,
3. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.
4. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
5. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001,
6. Environmental Encyclopedia, Jaico Publ. House, Mumbai,
7. De A.K., Environmental Chemistry, Wiley Eastern Ltd.

Reference:

1. Down to Earth, Centre for Science and Environment (R)
2. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev, Environment & Security. Stockholm Env. Institute Oxford Univ. Press.
3. Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay.

TITLE OF COURSE: PROFESSIONAL WRITING & TECHNICAL SEMINAR

COURSE CODE: HSM202

L-T-P: 2-0-0

CREDITS: 2

Pre-requisite: Basic knowledge is assumed about grammar, comprehension, English speaking, reading and writing skills.

Introduction: This course will help the students to get idea about the professional world. The course is designed to provide students and faculty with a means for assessment of technical competence of students as well as written, oral, and presentation communication skills that are critically important for success in their professional careers.



Course Outcomes (CO):

On successful completion of this module, students should be able to learn:

CO1: How to write professional letter etc.

CO2: Public speaking

CO3: Use the English language more effectively.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1							2		2		
CO2							2		2		
CO3							2		3		

Course Contents:

Module 1: Elements of Communication: Definition and Meaning of communication, Process of Communication, Essential components of the Process of Communication, Importance and Objectives of Communication, Differences between general and technical communication.

Module 2: Types of Communication: Extra personal communication, Intrapersonal communication, Interpersonal communication, Organizational communication, Mass communication

Module 3: Verbal and Non-Verbal Communication: Verbal communication, Oral Communication, Advantages of Oral Communication, limitation/Disadvantages of Oral Communication, Non-verbal communication, Body Languages, Sign Languages, Space Languages, Paralanguages, Time Languages, Haptics or Languages of Touch, Color Languages, difference between verbal and non-verbal communication.

Module 4: Formal and Informal Channels of Communication Down ward Communication, Upward Communication, Horizontal /Lateral Communication, Diagonal /Clockwise Communication, and Merits & demerits of each type of communication.

Module 5: Barriers to Communication, Physical Barrier, Semantic/language Barrier, Socio psychological Barrier, Organizational/hierarchical Barrier, Emotional Barrier, Cultural Barrier, Information overload, Poor listening, Wrong assumption, Selective perception, Methods to overcome barriers to Communication, Qualities of Good Communication

Module 6: Composition. Need and function of Business Letter, planning and layout of Business Letter, kinds of Business Letter, Drafting of business Letter: Sales, Credit, Enquiry, Order, Claim, Complaint, Job Applications, etc.

Module 7: Preparation of Notices & circular, Memo, Declaration, Telephone etiquettes, E-mail writing

Text Book:

1. Hari Mohan Prasad, "Objective English", Tata Mcgraw Hill
2. A.Amin,R.Eravelly & F.J.Ibrahim, "Grammar Builder Level", ISBN :9780521744843

TITLE OF COURSE: PROFESSIONAL WRITING & TECHNICAL SEMINAR LAB
COURSE CODE: HSM292

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L-T-P: 0-0-2
CREDITS: 1

Pre-requisite: Basic Grammar, Comprehension, Writing skills.

Introduction:

To enable students listen, speak, read and write effectively for academic purposes and face real life situations

Course Outcomes (CO):

On successful completion of this module, students should be able to learn:

CO1: How to write professional letter etc.

CO2: Public speaking

CO3: Use the English language more effectively.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

<u>CO</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PSO1</u>	<u>PSO2</u>
CO1							3		2		
CO2							2		3		
CO3							2		2		

Course Contents:

Module-1

Listening: Listening Skill & its sub skills helps the students to improve their concentration power, simultaneously honing their vocabulary. (Assignment: Listening to passages read aloud and then answering the questions set from that passage, and so forth), like- Dialogue Practice Sessions, Oral Comprehension. Conversation Practice Sessions: Situational Dialogue, Role Play, Use of Audio aids for Conversation Practice, Use of Video Clips for Conversation Practice

Module-2

Presentation: It helps to teach students effective communication through innovative methods of learning, like Individual Presentation, Group Presentation, Using Powerpoint/OHP in Presentation, Project Work on PowerPoint Presentation, Paper Presentation. Public Speaking and Soft Skills: Just A Minute (JAM) Sessions

Module- 3

Grammar and Vocabulary: Students will be able to communicate ideas effectively and powerfully using correct grammar and appropriate vocabulary. Related areas include topics like-Connectives, Modifiers, Idiomatic Usage, Online exercises on Grammar and Vocabulary. Report Writing: Report Writing - Principles and Practice

Module-4

GROUP DISCUSSION: Prepares BCA first year students for various aspects of their social and professional lives through interactive sessions, handouts, workshops, self-assessment, peer assessment, and teacher assessment. Related activities include, Group Discussion - Principles and Practice

Text Books

1. Advanced English Communication Skills Lab, Lakshminarayan, Paperback, 2015
2. English Language Laboratories-A Comprehensive Manual, Nira Konar, (OUP), 2016



3. Advanced Grammar in Use with Answers: A Self-Study Reference and Practice Book for Advanced Learners of English 3rd Edition, Martin Hewings, Paperback, 2015
4. Communication Skills, Sanjay Kumar and Pushpa Lata, (OUP), 2015

References

1. English Grammar, Wren and Martin, Regular Edition
2. The Art of Public Speaking, 10th Edition, Stephen E. Lucas, McGraw-Hill, 2008

TITLE OF COURSE: ESP & SDP-II

COURSE CODE: BGSC202

L-T-P: 2-0-0

CREDITS: 2

Pre-requisite: Basic concepts in mathematics, English

Introduction:

The Topics to be covered (tentatively): Aptitude, Indian Constitution and Governance, Basic English and Data Interpretation.

Course Outcomes (CO):

Students are expected to be capable numerical problems, literature, and basic of Indian constitution. To reach this goal, the following objectives need to be met:

CO1: Students would be able to design & implement any basic numerical problem properly.

CO2: Students would be able to know basic English language and communicate with the society.

CO3: Students would be able to know basic Indian constitution.

CO4: Students would be able to stress management by doing Yoga

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

<u>CO</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PSO1</u>	<u>PSO2</u>
CO1	3	2	3		2				2		
CO2	2			3					3		
CO3	3	3	3						2		
CO4	2	2	2		3				1		

Course Contents:

Essential Studies for Professionals-II

Section-A: Employment Enhancement Skills

Module 1: Ratio and Proportion

Ratio, Proportion, Proportional, Comparison of Ratios, Compounded Ratios, Duplicate Ratio, Triplicate Ratio, Variation.

Module 2: Time, Work and Distance

Time, Speed and Distance, Relative Speed

Module 3: Alligation or Mixture

Alligation, Mean price, Rule of Alligation

Module 4: Clocks and Calendar (2 lectures)

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Clocks, Odd days, Leap Year, Ordinary year, Counting of odd days, Day of the week related to odd days.

Module 5: Permutations and Combinations

Factorial n, Permutations, Combinations.

Module-6: Logical Reasoning

- 1) Cube Dice, Miscellaneous Problems
- 2) Data Sufficiency
 - a) Problems on Blood Relation, ages, Numbers
 - b) Logical Test Based on Data Sufficiency
- 3) Non Verbal Reasoning
 - a) Image Formation
 - b) Water –Images
 - c) Mirror Image
 - d) Image completion
 - e) Paper Cutting and Folding

Section B: Yoga, Games and Meditation

Module-1: Asana sitting postures and Karate, Asana lying in supine & prone position and karate, Surya Namaskar, Asana standing posture and Karate, Kriyas, Pranayam and Karate, Meditation and Karate, Meditative posture and Karate, Tratak, Kapalbhathi and Meditation.

Meditation and Stress Management, Meditation, Stretching and Self Defense. Meditation, Kicking and Punching of Karate. (Games and Sports will be evaluated on the basis of the participation and performance in different sports events that the students shall participate in).

Section C: Skill Development for Professionals -II

Course Contents:

Module-1: Listening

Listening to stories, newspaper articles, Oral Comprehension, Dialogue/ Conversation

Module-2: Speaking

Group discussion, debate, Oral Presentation, Just A Minute (JAM)

Language Function Permission – Request, Order

Practice of Phonetics, Pronunciation, Voice modulation, Accent and voice through passage reading

Story-telling, Role play model (telephonic conversation, situation)

Module-3: Reading Comprehension

Read and analyze through passages, diagrams, graphics, technical and non-technical passages

Learn to read Global, inferential, Contextual Comprehension.

Story writing, Passage writing, Essay writing, Rearranging Jumbled Sentences, Word formation: Prefixes and Suffixes, Homonyms and Homophones, Question and Answer – Comprehension Passages.

Module-4: Indian Constitution and Governance

Central State relation, Interstate relation,

Supreme Court-Appointment of Chief Justice, Acting Chief Justice, Qualification, Oath or Affirmation, Tenure of Judge, Removal of Judges, Salaries & allowance, Adhoc Judge, Procedure of the court, write jurisdiction, Power of Judicial review.

High Court-Appointment of Chief Justice, Acting Chief Justice, Qualification, Oath or Affirmation, Tenure of Judge, Removal of Judges, Salaries & allowance, Adhoc Judge, Procedure of the court, write jurisdiction, Power of Judicial review

Duties & Powers of **Attorney & Advocate General** (in brief)

Panchayati Raj- Three tier system, Different committees recommendation

Municipality, Municipal Council & Corporation, Official Languages & related Articles.



UPSC (in brief): Formation, Related Articles, Scope & Power, Duties of **CAG**, Formation **SPSC**, Related Articles, Scope & Power.

Election Commission (in brief)- Related Articles, Power & Function & Provision of Election

Emergency Provisions (in brief)- Related Articles, Conditions Application, Supreme power during emergency.

National Commission for SC/ST/OBC (in brief): Function of the commissions, Special offer & related articles for SC/ST/OBC

Different amendments (in brief) of Indian Constitution & the related articles

Module-5: Data Interpretation level-II

Newspaper reading: The Hindu & Economic Times

Text Books

1. Quantitative Aptitude for Competitive Examinations by R S Aggarwal
2. Introduction to the Constitution of India, by D D Basu
3. The Constitution of India by Dr. B.R. Ambedkar Under Chairmanship of Dr. Rajendra Prasad Including Coloured Preamble, Signatures

References

1. The Constitution of India by Dr. B.R. Ambedkar 2020

Third Semester Syllabus

Sl No.	Type	Subject Code	Topic	L	T	P	S	Credit Points
1.	CC	BCA308	Operating System	3	0	2	0	4
2.	CC	BCA309	Data Structures using C	3	0	2	0	4
3.	CC	BCA310	Data Communication & Networking	3	0	2	0	4
4.	CC	BCA311	Web Technologies	3	0	0	0	3
5.	CC	BCA312	Object Oriented Programming using C++/JAVA	2	0	2	0	3
6.	HSM	HSM203	Management & Accounting	2	0	0	0	2
7.	GSC	BGSC303	ESP & SDP-III	2	0	0	0	2
8.	PTI	INT301	Project-I	0	0	0	1	1
9.	ECA	ECA301	Extra-curricular activities	-	-	-	-	-
Total				18	0	8	1	23

TITLE OF COURSE: OPERATING SYSTEM

COURSE CODE: BCA308

L-T-P: 3-0-0

CREDITS: 3

Pre-requisite: Basic knowledge of programming languages (especially C), elementary data structures and algorithms, computer architecture is needed.

Introduction:

This course examines operating system design concepts, data structures and algorithms, and systems programming basics. The Topics to be covered (tentatively) include: Computer and operating system structures, Process and thread management, Process synchronization and communication, Memory management, Virtual memory, File system, I/O subsystem and device management, selected examples in networking, protection and security.

Course Outcomes (CO):

CO1: Understand the theory and logic behind the design and construction of operating systems.

CO2: You will examine the algorithms used for various operations on operating systems.

CO3: You will differentiate between various operating systems functionalities in terms of performance.

CO4: Become aware of the issues in the management of resources like processor, memory and input-output.

CO5: Know the problems in the design of operating system and study the probable solutions.

CO6: Learn to calculate the performance of CPU scheduling and disk scheduling

CO7: Learn File systems and methods of accessing

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	2	3		2					1	3
CO2	2	2		3				2	2	2	1
CO3	3	2	3			3				2	2
CO4	2	2	2		3		3			2	2
CO5	2					3				2	2
CO6	2			2						1	1
CO7	2			2			2			2	2

Course Contents:

Module 1: Introduction, Operating system structure - Monolithic systems, Layered systems, Virtual machines, Client-Server model.

Module 2: Process Management – process creation, deletion, inter process communication tools: pipe, FIFO, shared memory, process synchronization, synchronization primitives and Classical IPC problems.

Module 3: Process scheduling, Processor Allocation - Allocation Model, Design issues for

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processor allocation algorithms, Threads and Deadlock.

Module 4: Memory Management, paging scheme, segmentation, virtual memory concept, page replacement algorithms, thrashing, working set model, issues in Virtual memory management.

Module 5: File System management. Input output management, Disk scheduling, Case study of UNIX/LINUX.

Text Books

1. Silberschatz, P. Galvin and Greg Gagne, “Operating System Concepts”, Wiley International Company.
2. A.S. Tanenbaum, Modern Operating Systems, Prentice Hall India.

References

1. J. Archer Harris, Operating systems – Schuam’s outlines, Tata Mc Graw Hill.
2. Gary Nutt, Operating Systems – A modern perspective, Pearson Education.

TITLE OF COURSE: OPERATING SYSTEM LAB

COURSE CODE: BCA398

L-T-P: 0-0-2

CREDITS: 1

Pre-requisite: Basic knowledge of programming languages (specially C), elementary data structures and algorithms, computer architecture is needed.

Introduction:

1. To learn and understand system calls related to files, processes, signals, semaphores and Implement system programs based on that.
2. To provide an understanding of the design aspects of operating system.
3. To provide an efficient understanding of the language translation peculiarities by designing a complete translator for a mini language.

Course Outcomes (CO):

The students will have a detailed knowledge of the concepts of process and shared memory, aware of a variety of approaches to process management and main-memory management, including interference, deadlock, scheduling, fragmentation, thrashing, learn the basics behind file systems and input output systems and understand the fundamentals of network and distributed operating systems. Upon the completion of Operating Systems practical course, the student will be able to:

- CO1:** Understand and implement basic services and functionalities of the operating system using system calls.
- CO2:** Use modern operating system calls and synchronization libraries in software/ hardware interfaces.
- CO3:** Understand the benefits of thread over process and implement synchronized programs using multithreading concepts.
- CO4:** Analyze and simulate CPU Scheduling Algorithms like FCFS, Round Robin, SJF, and Priority.
- CO5:** Implement memory management schemes and page replacement schemes.
- CO6:** Simulate file allocation and organization techniques.
- CO7:** Understand the concepts of deadlock in operating systems and implement them in multiprogramming system.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	2	3		2					1	3
CO2	2	2		3				2	2	2	1
CO3	3	3	3			3				2	2
CO4	2	2	2		3		3		2	2	2
CO5	2					3				2	2
CO6	2			3			2			1	1
CO7	2		2							2	2

Course Contents:

Exercise No.1: CPU scheduling

Exercise No. 2: File allocation Strategy

Exercise No. 3: Simulate MVT, MFT (Multiprogramming Fixed and Variable)

Exercise No. 4: Simulate all File Organization Techniques

Exercise No. 5: Simulate Banker's Algorithm for Dead Lock Avoidance

Exercise No. 6: Simulate Banker's Algorithm for Dead Lock Prevention

Exercise No. 7: Simulate all page replacement Strategies

Exercise No. 8: Simulate Paging Technique of Memory Management

Exercise No. 9: Shell programming (cut, grep, sed)

Exercise No. 10: Process

Text Book:

1. Maurice J. Bach, Design of the UNIX Operating System, PHI.

Recommended Systems/Software Requirements:

1. Intel based desktop PC with minimum of 166 MHZ or faster processor with at least 64 MB RAM and 100 MB free disk space.
2. Turbo C or TC3 compiler in Windows XP or Linux Operating System.

TITLE OF COURSE: DATA STRUCTURES USING C

COURSE CODE: BCA309

L-T-P: 3-0-0

CREDITS: 3

Pre-requisite: Basic concepts in mathematics and programming languages.

Introduction:

This course examines data structures and algorithms basics using python. The Topics to be covered

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(tentatively) include: an introduction to programming and problem solving in Python with basic concepts such as conditionals, loops, functions, lists, strings and tuples; Time and space analysis of algorithms; Linear Data structures like array, linked list, stack, queue; Non- linear Data structures like graph and tree; Sorting; Searching and Hashing.

Course Outcomes (CO):

In this course we will study the basic components of data structure and algorithm. Students are expected to be capable of understanding the data structures, their advantages and drawbacks, how to implement them in python, how their drawbacks can be overcome and what the applications are and where they can be used. To reach this goal, the following objectives need to be met:

CO1: Know about basic concepts of python programming.

CO2: To learn about the data structures/ methods/algorithms mentioned in the course with a comparative perspective so as to make use of the most appropriate data structure/ method/algorithm in a program to enhance the efficiency (i.e. reduce the run-time) or for better memory utilization, based on the priority of the implementation

CO3: To implement different types of linear data structure.

CO4: Study the Python dictionaries as well as classes and objects for defining non linear data structure like graph and tree.

CO5: Understand different types of sorting, searching and hashing technique.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	2	3							1	2
CO2	2	2		3				2	2	2	1
CO3	3	3	3							2	2
CO4	2	2	3				3		2	2	3
CO5	2					3				2	2

Course Contents:

Module-1: Basics of C: data types, assignment statements, control flow, strings, lists, functions, simple input output.

Module-2: Algorithm efficiency and analysis, time and space analysis of algorithms – order notations.

Module-3: Linear Data structures–Array, Matrix, Linked List, Stack, Queue and Recursion with their types, different operations and applications.

Module-4: Nonlinear Data structures–Graph, Trees, Minimum spanning tree with their types, different operations and applications.

Module-5: Sorting, Searching and Hashing- Bubble sort and its optimizations, insertion sort, shell sort, selection sort, merge sort, quick sort, heap sort (concept of max heap, application – priority queue), radix sort. Sequential search and binary search. Hashing functions, collision resolution techniques.

Text Books

1. Gilberg and Forouzan: “Data Structure- A Pseudo code approach with C” by Thomson publication
2. “Data structure in C” by Tanenbaum, PHI publication / Pearson publication.
3. Pai: ”Data Structures & Algorithms; Concepts, Techniques & Algorithms ”Tata McGraw Hill.

References



1. “Fundamentals of data structure in C” Horowitz, Sahani & Freed, Computer Science Press.
2. “Fundamental of Data Structure” (Schaums Series) Tata-McGraw-Hill

TITLE OF COURSE: DATA STRUCTURES USING C LAB**COURSE CODE: BCA399****L-T-P: 0-0-2****CREDITS: 1**

Pre-requisite: Basic concepts in mathematics and programming languages.

Introduction:

This course examines data structures and algorithms basics using python. The Topics to be covered (tentatively) include: an introduction to programming and problem solving in Python with basic concepts such as conditionals, loops, functions, lists, strings and tuples; Time and space analysis of algorithms; Linear Data structures like array, linked list, stack, queue; Non- linear Data structures like graph and tree; Sorting; Searching and Hashing.

Course Outcomes (CO):

CO1: Develop problem solving ability using Programming.

CO2: Develop ability to design and analyze algorithms.

CO3: Introduce students to data abstraction and fundamental data structures.

CO4: Develop ability to design and evaluate Abstract Data Types and data structures.

CO5: Apply data structure concepts to various examples and real life applications

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	2	3							1	
CO2	2	2		3				2	2		
CO3	3	2	3								2
CO4	2	2	2				3			2	
CO5	2					3			2		

Course Contents:

Exercises that must be done in this course are listed below:

Exercise No.1: Implementation of array operations

Exercise No. 2: Stacks and Queues: adding, deleting elements

Exercise No. 3: Circular Queue: Adding & deleting elements

Exercise No. 4: Merging Problem: Evaluation of expressions operations on multiple stacks & Queues

Exercise No. 5: Implementation of linked lists: inserting, deleting, and inverting a linked list.

Exercise No. 6: Implementation of stacks & queues using linked lists, Polynomial addition, and Polynomial multiplication

Exercise No. 7: Sparse Matrices: Multiplication, addition.

Exercise No. 8: Recursive and Non-recursive traversal of Trees

Exercise No. 9: Threaded binary tree traversal. AVL tree implementation

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Exercise No. 10: Application of Trees. Application of sorting and searching algorithms

Text Books

1. “Data structures A Programming Approach with C”, D.S.Kushwaha and A.K.Misra, PHI.
2. “Fundamental of Data Structure” (Schaums Series) Tata-McGraw-Hill.

References

1. Samiran Chattopadhyay, Debabrata Ghosh Dastidar and Matagini Chattopadhyay, “Data Structures through C Language”, BPB Publication.
2. “Fundamentals of data structure in C” Horowitz, Sahani & Freed, Computer Science Press.

TITLE OF COURSE: DATA COMMUNICATION & NETWORKING

COURSE CODE: BCA310

L-T-P: 3-0-0

CREDITS: 3

Pre-requisite: Basic knowledge of programming, operating system and computer architecture is needed.

Introduction:

This course is to provide students with an overview of the concepts and fundamentals of data communication and computer networks. Topics to be covered include: data communication concepts and techniques in a layered network architecture, communications switching and routing, types of communication, network congestion, network topologies, network configuration and management, network model components, layered network models (OSI reference model, TCP/IP networking architecture) and their protocols, various types of networks (LAN, MAN, WAN and Wireless networks) and their protocols. The course is supplemented by a practical component covered in CS692 concurrently.

Course Outcomes (CO):

After completing this course the student must demonstrate the knowledge and ability to:

- C01:** Independently understand basic computer network technology.
- C02.** Understand and explain Data Communications System and its components.
- C03.** Identify the different types of network topologies and protocols.
- C04.** Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
- C05.** Identify the different types of network devices and their functions within a network.
- C06.** Understand and building the skills of subnetting and routing mechanisms.
- C06.** Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.
- C07.** 8. Analyze the features and operations of various application layer protocols such as Http, DNS, and SMTP.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	2	3		2				2	1	2
CO2	2			3		2		2		2	1
CO3	3		3			3		2		2	2

CO4	2	2	2		3		3			2	3
CO5	2					3			2	2	2
CO6	2	2		2		2					1
CO7	2			2			2		2	2	

Application:

1. To configure and implement network topology.
2. To configure and implement local area network.
3. To design network and assign IP address
4. Connect Remote computers
5. Analyze the network.

Course Contents:

Module -1: Introduction: Data communications: components, data representation (ASCII,ISO etc.),direction of data flow(simplex, half duplex, full duplex); Networks: distributed processing, network criteria, physical structure (type of connection, topology), categories of network (LAN, MAN,WAN);Internet: brief history, internet today; Protocols and standards; Reference models: OSI reference model, TCP/IP reference model, their comparative study.

Physical layer: Overview of data (analog & digital), signal (analog & digital), transmission (analog & digital) & transmission media (guided & non-guided); TDM, FDM, WDM; Circuit switching: time division & space division switch.

Module -2:Data link layer: Types of errors, framing(character and bit stuffing), error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, Go-Back- N ARQ, Selective repeat ARQ, HDLC;

Medium access sub layer: Point to point protocol, LCP, FDDI, token bus, token ring; Multiple access protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, FDMA, TDMA, CDMA;

Module -3: Network layer: Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing: Internet address, classful address, subnetting; Routing: techniques, static vs. dynamic routing, routing table for classful address; Protocols: ARP, RARP, IP, ICMP, IPV6; Unicast and multicast routing protocols.

Transport layer: Process to process delivery; UDP; TCP; Quality of service: techniques to improve QoS.

Module -4: Application layer: DNS; SMTP, SNMP, FTP, HTTP & WWW; Security: Cryptography, user authentication, security protocols in internet, Firewalls.

Modern topics: ISDN services & ATM; DSL technology, Cable modem, SONET. Wireless LAN: IEEE 802.11; Introduction to blue-tooth, VLAN's, Cellular telephony & Satellite network.

Text Books:

1. B. A. Forouzan – “Data Communications and Networking (3rd Ed.) “– TMH
2. A. S. Tanenbaum – “Computer Networks (4th Ed.)” – Pearson Education/PHI



3. W. Stallings – “Data and Computer Communications (5th Ed.)” – PHI/ Pearson Education
4. Zheng & Akhtar, Network for Computer Scientists & Engineers, OUP
5. Black, Data & Computer Communication, PHI
6. Miller, data Communication & Network, Vikas

Reference Books:

1. Kurose and Rose – “Computer networking -A top down approach featuring the internet” Pearson Edu.
2. Leon, Garica, Widjaja – “Communication Networks” – TMH
3. Walrand – “Communication Networks” – TMH.
4. Comer – “Internetworking with TCP/IP, vol. 1, 2, 3(4th Ed.)” – Pearson Education/PHI

TITLE OF COURSE: DATA COMMUNICATION & NETWORKING LAB

COURSE CODE: BCA390

L-T-P: 0-0-2

CREDITS: 1

Pre-requisite: Basic knowledge of programming, operating system and computer architecture is needed.

Introduction:

This practical course provides students with hands on training regarding the design, troubleshooting, modeling and evaluation of computer networks. In this course, students are going to experiment in a real and simulation based test-bed networking environment, and learn about network design and troubleshooting topics and tools such as: network addressing, Address Resolution Protocol, basic troubleshooting tools (like ping, ICMP), IP routing (e.g. RIP), TCP and UDP, DHCP, ACL and many others. Student will have the opportunity to build some simple networking models using the tool and perform simulations that will help them evaluate their design approaches and expected network performance.

Course Outcomes (CO):

The students will have a detailed knowledge network topology, Local area network, IP addressing, familiarization with network simulator, idea about networking devices, network cable and connectors, different types routing protocols, concept of remote access and different types of application layer protocol. Upon the completion of Computer network practical course, the student will be able to:

- CO1:** Learn various network commands.
- CO2:** Understand and implement basic of Network and Network Topology.
- CO3:** To get idea about IP addressing schemes.
- CO4:** Understand the benefits of network.
- CO5:** Configure and simulate various protocols.
- CO6:** Access remote desktop.
- CO7:** Connect to different computer using LAN.
- CO8:** Understand the concepts of access control.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	2	3		2				2	1	
CO2	2			3		2		2			
CO3	3		3			3		2			2



CO4	2	2	2		3		3			2	
CO5	2					3			2		
CO6	2	2		2		2					1
CO7	2			2			2		2	2	

Course Contents:

Exercises that must be done in this course are listed below:

- Exercise No.1: Study of different types of Network cables and practically implements the cross-wired cable and straight through cable using clamping tool.
- Exercise No. 2: Familiarization with some network devices.
- Exercise No. 3: Study of Network IP.
- Exercise No. 4: Connect the computers in LAN.
- Exercise No. 5: Introduction to Packet Tracer.
- Exercise No. 6: Configure network topology using packet tracer.
- Exercise No. 7: Configure network topology using packet tracer to find the routing path by IP Route Command.
- Exercise No. 8: Network Configuration using distance vector routing protocol.
- Exercise No. 9: Configuration of DHCP Protocol
- Exercise No. 10: Telnet Configuration.
- Exercise No. 11: Configuration of Access Control List.

Text Book:

1. B. A. Forouzan – “Data Communications and Networking (3rd Ed.) – TMH

Reference Book:

1. Authorized Self-Study Guide “Interconnecting Cisco Network Devices, Part 1(ICND1), 2nd Edition, January, 2008.

Recommended Systems/Software Requirements:

1. CAT-5/CAT-6 Cables, RJ 45, Cutter, Clamping Tool, Router, Switch and Hub.
2. Intel based desktop PC with minimum of 166 MHZ or faster processor with at least 64 MB RAM and 100 MB free disk space.
3. Turbo C or TC3 compiler in Windows XP or Linux Operating System

TITLE OF COURSE: Web Technologies

COURSE CODE: BCA311

L-T-P: 3-0-0

CREDITS: 3

Pre-requisite: Knowledge is also assumed of basic concepts in markup language, HTML, User interface, and other programming knowledge.

Introduction:

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The course deals with planning the development of information systems. The course deals with concepts, methodologies, techniques and tools required for solving business problems.

To learn and understand basics of Web design. It is a process of conceptualizing, planning, and creating web pages for web site.

Course Outcomes (CO):

The course will teach techniques in data requirements collection and analysis along with methods to model data needs. To reach this goal, the following objectives need to be met:

CO1: Learn the basic tags of HTML

CO2: Know the utility of CSS

CO3: Learn and implementation of JAVASCRIPT

CO4: Learn and implementation of Ajax

CO5: Create websites using WordPress

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	3	2		3					3	3
CO2	3	2		2				3	3	2	1
CO3	3	3	3		2					3	3
CO4	2	2	2				2		2	2	2
CO5	3					3		2		3	

Course Contents:

Module-1:

HTML: Internet standards, WWW Architecture, Generation of dynamic web pages, Generation of static webpages using HTML, Elements of HTML syntax, Head and Body sections, Building HTML documents, Inserting text, images, hyperlinks, Backgrounds and Color Control, meta tags, ordered and unordered lists, Table Handling: Table layout & presentation, constructing tables in a web page, Frames: Developing Web pages using frames, IFrames. Forms and its elements, special tags.

Module-2:

Cascading Style Sheet (CSS): Introduction to CSS, Basic syntax and structure, Inline Styles, Embedding Style Sheets, Linking External Style Sheets, Backgrounds, Manipulating text, Margins and Padding, Border, Positioning using CSS, Selectors, Tag selectors, class selectors, ID Selector, Styling Groups within tags, Formatting Tables and Forms, CSS3 Specific Properties: Alpha Color Space, Opacity, Box Shadow & Border Radius.

Module3:

XML: Introduction to XML, Defining XML tags, their attributes and values, Document type definition, XML Schemas, Document Object model, XHTML Parsing XML Data - DOM and SAX parsers in java

Module-4



Introduction to JSP: The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session tracking, connecting to database in JSP.

Module-5

Introduction to Servlets: Common Gateway Interface (CGI), Lifecycle of a Servlets, deploying a Servlets, The Servlets API, Reading Servlets parameters, Reading initialization parameters, Handling Http Request & Responses, Using Cookies and sessions, connecting to a database using JDBC.

Text Books:

1. Harvey & Paul Deitel & Associates, Harvey Deitel and Abbey Deitel, “Internet and World Wide Web - How To Program”, Fifth Edition, Pearson Education, 2011.
2. Achyut S Godbole and Atul Kahate, “Web Technologies”, Second Edition, Tata McGraw Hill, 2012.
3. Anthony T. Holdener III, Ajax: The Definitive Guide, O’Reilly Media, First edition, 2008.

Reference Books:

1. Thomas A Powell, Fritz Schneider, “JavaScript: The Complete Reference”, Third Edition, Tata McGraw Hill, 2013.
2. David Flanagan, “JavaScript: The Definitive Guide, Sixth Edition”, O’Reilly Media, 2011
3. David Sawyer McFarland, CSS3- The Missing Manual, O’Reilly Media, Third Edition, 2013

TITLE OF COURSE: OBJECT ORIENTED PROGRAMMING USING C++/JAVA

COURSECODE: BCA312

L-T-P: 2-0-0

CREDITS: 2

Prerequisite: Knowledge is assumed of basic concepts in any programming language.

Introduction: This course contains object-oriented programming and able to explain the difference between object-oriented programming and procedural programming. Be able to program using java features such as composition of data types, classes, objects, inheritance and polymorphism, file I/O, exception handling, methods, string and array manipulation, Thread, and Java applets.

Course Outcomes (CO):

This course will serve to broaden the student's understanding of the issues and latest developments in the area of Object-Oriented Programming. To reach this goal, the following objectives need to be met:

CO1: To know different properties of object-oriented programming language, advantages and disadvantages of java over C and C++, to know different steps of java source code compilation and execution

CO2: To know encapsulation, polymorphism, why java is called platform independent programming language.

CO3: To know different access specifiers of java, finalize and garbage collection of java.

CO4: To know the significant of static keyword, String vs StringBuffer class and different methods of String.

CO5: To know different inheritance with examples.

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CO6: To know uses of this, this(), super, super(), abstract class and interface.

CO7: To know member access for packages.

CO8: To know different ways of exception handling.

CO9: To know different ways of implementing concept of multithreading, problems in multithreading and their solutions.

CO10: To know benefits and uses of applet and implementation of applet.

CO11: To know different components of swing, event handling and layouts in swing.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	3	3		3					1	
CO2	3	3		3				3	3		
CO3	3	3	3		3						2
CO4	3	3	3				3		3	2	
CO5	3					3		3			
CO6	3		3								1

Course Contents:

Module-1: Introduction: Different Programming Paradigms, Why use the Object Oriented Paradigm, Object Oriented Principles, Concept of Class, Object, inheritance, encapsulation, and polymorphism

Module-2: An Overview of Java: Advantage of JAVA , Feature of JAVA in object oriented programming Concept of byte-code & JVM, Basic JAVA Syntax, Basic Data Type, Control Statement using Java, Concept of Arrays in JAVA, Concept of Method in JAVA

Module-3: Introducing Class & Method: Objects and classes in java, defining classes Module-4: Building our own Classes: Analyzing the class, Methods to access the data, Method Overloading, Static Method, Constructors, Object Construction, Default Constructors, Constructor Overloading, and Garbage Collection

Module-4: Inheritance & other features: Inheritance, Abstract Classes, Final Classes in JAVA, Access specifiers in java, Method overriding, Interface, Polymorphism in java

Module-5: Packages: Concept of Package in JAVA, Member access for packages

Module-6: Exception Handling: Concept of exception, Exception, Hierarchy, Catching Exceptions, Declaring you own Exception

Module-7: String & Thread: Basic string handling concepts, Discuss Basic method of String, Life Cycle of a Thread, Create, Thread, Thread Methods, Multi Thread

Module-8: Applet & Swing: Concept of Applet, Life Cycle of an Applet, Basic Applet Programming, Concept of Swing , Swing Controls, Event handling And Listener in Swing Swing Layout Manager

Text Books

1. Grady Booch et al, "Object-Oriented Analysis and Design with Applications", 3rd Edition, Pearson Education, 2007.
2. Michael Blaha and James Rumbaugh, "Object-Oriented Modeling and Design with UML", 2nd Edition, Pearson Education, 2005.
3. PatricNaughton , Herbert Schildt, "Java 2 Complete Reference", Tata McGraw Hill, 1999.

References



1. Joshua Bloch, “Effective Java”, Addison-Wesley; 3rd Edition, 2018.
2. Bruce Eckel, “Thinking in Java”, Prentice Hall; 4th Edition, 2006.
3. Erich Gamma, Richard Helm, Ralph Johnson & John Vlissides, “Design Patterns: Elements of Reusable Object-oriented Software”, Pearson Education India, 2004.

TITLE OF COURSE: OBJECT ORIENTED PROGRAMMING USING JAVA LAB

COURSE CODE: BCA392

L-T-P: 0-0-2

CREDITS: 1

Prerequisite: Students must have already registered for the course, basic computation.

Introduction: The model of object-oriented programming: abstract data types, encapsulation, inheritance and polymorphism Fundamental features of an object-oriented language like Java: object classes and interfaces, exceptions and libraries of object collections. How to take the statement of a business problem and from this determine suitable logic for solving the problem; then be able to proceed to code that logic as a program written in Java. How to test, document and prepare a professional looking package for each business project using Javadoc.

Course Outcomes (CO):

Students will also be able to handle software development models through rational method. After completion of course student will be able to generate test cases for software testing.

CO1: Explain what constitutes an object-oriented approach to programming and identify potential benefits of Object-oriented programming over other approaches.

CO2: Explain the benefits of object-oriented design and the types of systems in which it is an appropriate methodology.

CO3: Apply an object-oriented approach to developing applications of varying complexities.

CO4: Augment a class definition using constructors, member functions and custom input/output operators to add functionality to a programming solution.

CO5: Read from and write to files using objects from the standard input output library and custom file operators for future restoration.

CO6: Model specialization using single inheritance and abstract base classes to minimize code duplication.

CO7: Design and compile java programs manipulating strings and text documents.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

<u>CO</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PSO1</u>	<u>PSO2</u>
CO1	3	3	2		3		3			1	2
CO2	3	2		2				3	2	2	2
CO3	2	3			2					1	2
CO4	3	2	2				2	2	1	2	1
CO5	2					2		3		2	2
CO6	2		3					1		2	1
CO7	2	2		3		3			2	2	1

Course Contents:

Module 1: Concepts of object-oriented programming language, Major and minor elements, Object, Class, relationships among objects, aggregation, links, relationships among classes-association, aggregation, using, instantiation, meta-class, grouping constructs.

Module 2: Difference between OOP and other conventional programming – advantages and disadvantages. Class, object, message passing, inheritance, encapsulation, polymorphism.

Module 3: Basic concepts of java programming – advantages of java, byte-code & JVM, data types, access specifiers, operators, control statements & loops, array, creation of class, object, constructor, finalize and garbage collection, use of method overloading, this keyword, use of objects as parameter & methods returning objects, call by value & call by reference, static variables & methods, garbage collection, nested & inner classes, basic string handling concepts- String (discuss charAt() , compareTo(), equals(), equalsIgnoreCase(), indexOf(), length() , substring(), toCharArray() , toLowerCase(), toString(), toUpperCase() , trim() , valueOf() methods) & StringBuffer classes (discuss append(), capacity(), charAt(), delete(), deleteCharAt(), ensureCapacity(), getChars(), indexOf(), insert(), length(), setCharAt(), setLength(), substring(), toString() methods), concept of mutable and immutable string, command line arguments, basics of I/O operations – keyboard input using Buffered Reader & Scanner classes.

Module 4: Super class & subclasses including multilevel hierarchy, process of constructor calling in inheritance, use of super and final keywords with super() method, dynamic method dispatch, use of abstract classes & methods, interfaces. Creation of packages, importing packages, member access for packages.

Module 5: Exception handling basics, different types of exception classes, use of try & catch with throw, Throws & finally, creation of user defined exception classes. Basics of multithreading, main thread, thread life cycle, creation of multiple threads, thread priorities, thread synchronization, inter-thread Communication, deadlocks for threads, suspending & resuming threads.

Module 6: Basics of applet programming, applet life cycle, difference between application & applet programming, parameter passing in applets, concept of delegation event model and listener, I/O in Applets, use of repaint (), getDocumentBase(), getCodeBase() methods, layout manager (basic concept), creation of buttons (JButton class only) & text fields.

List of Experiments

Experiment 1: Write a program that reads the radius of a circle as input taken dynamically while Running and then computes the circumference and area.

Experiment 2: Write a java program to print the following pattern using “for” loops

```
1
2 3
4 5 6
```

Experiment 3: Write a java program to eliminate the duplicate elements from the given set of input elements

Sample input: 1 2 3 4 4 5 3 2

Sample Output: 1 2 3 4 5

Experiment 4: Write a java program to find the nth smallest number in the given set of elements

Sample input 2 4 3 5 8 7 N=3

Sample output: The third smallest element is:4

Experiment 5: Write a java program to sort the elements of the matrix in row wise

Sample input 1 3 2 sample output: 1 2 3

6 5 4 4 5 6

9 7 8 7 8 9

Experiment 6: Write a java program to find the N prime numbers

Sample input:7

Sample output: 2 3 5 7 11 13 17

Experiment 7: Write a program to use concept of packages with access specifiers.



- Experiment 8:** Write a code to implement user defined exception.
- Experiment 9:** Write a program to implement thread in java.
- Experiment 10:** How can you change priority of a thread?
- Experiment 11:** When synchronization problem is occurred in thread program? Explain with code.
- Experiment 12:** Explain the life cycle of Applet with program.
- Experiment 13:** Write down the importance of Applet Program.
- Experiment 14:** Design a swing application to store student data in a file. Use JFrame, JPanel, JLabel, JTextField, JButton to design the application.
- Experiment 15:** Write down the use of use of repaint(), getDocumentBase(),getCodeBase() methods.
- Experiment 16:** Explain use of different events in java.
- Experiment 17:** Explain use of different Layout manager.

Text Book:

1. Grady Booch et al, “Object-Oriented Analysis and Design with Applications”, 3rd Edition, Pearson Education, 2007.
2. Michael Blaha and James Rumbaugh, “Object-Oriented Modeling and Design with UML”, 2nd Edition, Pearson Education, 2005.
3. Patric Naughton, Herbert Schildt, "Java 2 Complete Reference", Tata McGraw Hill, 1999.
4. Joshua Bloch, “Effective Java”, Addison-Wesley; 3rd Edition, 2018.
5. Bruce Eckel, “Thinking in Java”, Prentice Hall; 4th Edition, 2006.
6. Erich Gamma, Richard Helm, Ralph Johnson & John Vlissides, “Design Patterns: Elements of Reusable Object-oriented Software”, Pearson Education India, 2004.

TITLE OF COURSE: MANAGEMENT & ACCOUNTING

COURSE CODE: HSM203

L-T-P: 2-0-0

CREDITS: 2

Pre-requisite: Knowledge is also assumed of basic concepts in Management Accounting.

Introduction:

This course provides the students an understanding of relevance of cost in managerial decision making. This course provides a comprehensive knowledge of classification of cost, apportionment of overheads, process costing, activity-based costing, segmental reporting, preparation of budgets and cost -volume profit analysis for decision making and cost control.

Course Outcomes (CO):

At the end of the course, students are able to

CO1: Explain the concepts of Module costing activity-based costing, apportionment of overheads, process costing, segmental reporting and budgeting.

CO2: Exhibit skills in Identifying, Measuring and analyzing costing data.

CO3: Provide alternative solutions to cost control and related cost management applications in practice.

Mapping of Course Outcomes (CO) and Program Outcomes (PO)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	2	2		2				2		

CO2	2			2				2	3		
CO3	3	2							2		

Course Contents:

Module: 1: Background-Nature of Management Accounting: Financial Analysis- Cash Flow Statement (asperAS3), Financial Statements Analysis

Module: 2: Cost Accumulation –Fundamentals of Job-Order Batch & Process Costing, Variable Costing and Absorption (Full) Costing, Activity Based Costing System

Module: 3: Profit Planning-Cost -Volume- Profit Analysis, Budgeting and Profit Planning, Flexible Budgeting

Module: 4: Cost Control- Standard Costs and quality Costs, Cost Variance Analysis, Revenue and Profit Variance Analysis, Responsibility Accounting Relevant Costing–Introduction– Relevant Costs and Revenues–Cost Concepts– Out sourcing Decision– Decision to accept or reject a special order–Decision to continue or abandon a project.

Module: 5 Total Cost Management – Introduction – TCM and Business competitive edge - TCM Principles and implementation.

Text Books

1. Jiambalvo, James. (2004), Managerial Accounting, 2nd Edition, Wiley India Publications, New Delhi.

References

1. Khan, MY Jain, P K (2000), Management Accounting, 3rd Edition; Tata McGraw Hill, New Delhi.
2. Jain, S P. Narang, K L. (2012), Cost Accounting: Principles and Practice, 23rd. Edition, Kalyani Publishers, Ludhiana.

TITLE OF COURSE: ESP & SDP-III

COURSE CODE: BGSC303

L-T-P: 2-0-0

CREDITS: 2

Pre-requisite: Basic concepts in mathematics and Basic English languages.

Introduction:

This course examines economy, governance. The Topics to be covered, (tentatively): Economic Affairs, Quantitative Aptitude, Reasoning, Ancient & Medieval History.

Course Outcomes (CO):

In this course we will study the basic components of Indian economy and Reasoning. Students are expected to be capable of understanding their advantages and drawbacks, how to implement them it all over the country, how their drawbacks can be overcome and what the applications are and where they can be used. To reach this goal, the following objectives need to be met:

CO1: Understand the values of tax payment and mutual Fund

CO2: Understand the values of literature, languages etc.

CO3: Understand Working & Policies, Money Market & Capital Market.

CO4: Know about different short cut techniques to solve any kind of aptitudes.

CO5: Know about different short cut techniques to solve any kind of reasoning.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	3	2	2	3	2	1		2		
CO2		2			2			2			



CO3	2	3							2		
CO4	1	2	2		1	1		2			
CO5		1				3		1			

Course Contents:

Section A: Employment Enhancement Skills-III

Module-1: GK & CA, National income: Concept of GDP, GNP, NNP both in FC & MP, PCI

Tax: Concept of TAX, objective of TAX, Direct & Indirect Tax, Progressive, Regressive & Proportional tax.

Module-2: Market structure: Perfect competition, monopoly, oligopoly, duopoly, monopony, duopoly, Oligopoly. SEBI, IRDA, NHB –Working & Policies, Money Market & Capital Market, functions of Banks & Types of accounts, cheques & loans, Mutual Fund, Banking Terminologies.

Module-3: Science, Technology, Literature (with current updates): Monuments, sculptures, Literature, Languages, Visual arts – paintings etc. Performing arts – classical and folk dances, puppetry etc. ,Religious diversity, Satellite, GPS, SIM, GSM, CDMA, Indian Regional Navigation Satellite System (IRNSS), NAVIC,WIFI, SIM, GPRS, ISRO, NASA.

Module-4: Ancient & Medieval History at a glance: From Indus valley civilization to Pre-Foreign (British, Dutch, French) Invasion. Current Affairs.

Section B: Skill Development for Professional – III

Module-1: Quantitative Aptitude: Basic concept of SI & CI, different formulas & their applications, concept of Growth & Contraction of Business. Data Interpretation- Tables, pie chart, histogram, Bar chart, solution tricks & techniques. Quant Review- Miscellaneous problems from different chapters & short cuts. Indices & Surds- Basic concept, Formulae & their applications, Finding out the square roots, Elimination of Surds, Equation solve. Quadratic Equation- Polynomials, degree, powers, Equation & factors Solution. Progression- Concept of AP, GP & HP

Module-2: Reasoning:

Syllogism: a) Logical Venn diagram b) The If Else Statement

Puzzles a) Seating Arrangement b) Classification c) Seating Arrangement with Blood relations

Machine Input-Output: a) Pattern Based I/O

Inequality: a) Coded Inequality, b) Jumbled Inequality, c) Conditional inequality

Sentence: a) Sentence Corrections b) Fill the blanks with appropriate words/articles/ preposition/ verbs/adverbs/conjunction. **d)** Reading Comprehension (Advance Level)d) Vocabulary

Module-3: Advanced Data Interpretation level-III

Newspaper reading: The Hindu & Economic Times

Text Books

1. Quantitative Aptitude for Competitive Examinations by R S Aggarwal
2. The Indian Economy ...An Analysis of Economic Survey 2019-20 & Budget 2020-21by Sanjiv Verma
3. Indian Financial System by Sujatra Bhattacharyya

References

1. Indian Economy for Civil Services, Universities and Other Examinations by Ramesh Singh
Indian Financial System, by Pathak PEARSON publisher

Fourth Semester Syllabus

Sl No.	Type	Subject Code	Topic	L	T	P	S	Credit Points
1.	CC	BCA413	Management Information System	3	0	0	0	3
2.	CC	BCA414	E-Commerce	3	0	0	0	3
3.	CC	BCA415	Web Development with ASP.NET	3	0	2	0	4
4.	CC	BCA416	Discrete Mathematics	3	0	0	0	3
5.	CC	BCA417-	Computer Graphics & Multimedia Technology	3	0	2	0	4
6.	PE/SE	----	Professional/Specialization Elective-I	3	0	0	2	3
7.	GSC	BGSC404	ESP & SDP-IV	2	0	0	0	2
8.	PTI	INT402	Project-II	0	0	0	1	1
9.	ECA	ECA401	Extra-curricular activities	-	-	-	-	-
Total				20	0	4	3	23

Students can opt any Professional/ Specialization Elective Course in 4th Semester from the following:

Professional Specific Elective Courses-I:

Subject Code	Topic
BDA401	Fundamental of Big Data Analytics
CC401	Introduction to Cloud Computing
AIML401	Introduction to Artificial Intelligence

TITLE OF COURSE: MANAGEMENT INFORMATION SYSTEM

COURSE CODE: BCA413

L-T-P: 3-0-0

CREDITS: 3

Pre-requisite: Knowledge is also assumed of basic concepts in connection between information systems (IS) and business performance.

Introduction:

The use of information and communication technologies (ICT) by individuals and organizations dominates

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the business world. There is a fundamental change going on in the way that organizations run businesses and interact with each other. New types of infrastructure and applications are developed and utilized such as ERP (enterprise resource planning), IOS (inter- organizational systems), RFID (radio frequency identification), CRM (customer relationship management), to name a few. The aim of the course is to enable students to assess the opportunities and problems that managers in a wide range of organizations face as they attempt to use these IT applications to add value to their businesses. It also aims to help students understand transformational changes within and across industries. These changes have strategic implications for many businesses

Course Outcomes (CO):

This course will serve a fundamental change going on in the way that organizations run business and interact with each other:

At the end of the course, you will be able to:

CO1: Explain basic concepts for IT/IS management

CO2: Discuss organizational, business and strategic issues surrounding IT/IS.

CO3: Analyze and evaluate uses of strategic IT/IS in practice.

CO4: Understand and articulate fundamental concepts of information technology management.

CO5: Assess and apply IT to solve common business problems.

CO6: Suggest and defend effective solutions to business problems, and design a database application to solve a business problem.

CO7: Discuss the ethical aspects of information technology use in the organization and its governance issues.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3			2				2	2		
CO2	2					2	1	2			
CO3	2	3							2		
CO4	1		2		1						
CO5	1	1									
CO6	2		2								
CO7	1				1		1		2		

Course Contents:

Module-1 Management Information System (MIS): Definition, Characteristics, Subsystems of MIS (Activity and Functional subsystems), Structure of MIS; Reasons for failure of MIS. Understanding Major Functional Systems: Marketing & Sales Systems, Finance & Accounting Systems, Manufacturing & Production Systems, Human Resource Systems, Inventory Systems; their sub systems, description and organizational levels.

Module-2: Decision Support Systems (DSS): Definition, Relationship with MIS, Evolution of DSS, Characteristics, classification, objectives, components, applications of DSS.

Module-3: ERP, CRM, SCM:

ERP (Enterprise Resource Planning):



a) Concepts of ERP, architecture of ERP, Generic modules of ERP, Applications of ERP, and concept of XRP (extended ERP)

b) Features of commercial software like SAP, Oracle Apps, MS Dynamics NAV, People soft.

CRM (Customer Relationship Management)

a) Concepts of CRM, Features of CRM (acquisition and retention)

b) Features of commercial software like I2-Rhythm, SIEBEL

SCM (supply Chain Management):

a) Concepts of SCM, drivers of SCM, inbound & outbound

b) Definition, brief description and applicability of: e-Procurement, e-Tailing, e-Logistics, e collaboration, e-integration.

c) Case studies for ERP, CRM, SCM

Module-4: Database Management Systems (DBMS) [e.g. MS-Access/ Oracle/ MS SQL Server / My SQL etc.]

a) What is a DBMS. Need for using DBMS. Concepts of tables, records, attributes, keys, integrity constraints, 3-schema architecture, data independence.

b) SQL: DDL & DML concepts, SQL commands [ANSI standard].

Module-5: Organization and Computer Networks

Introduction, Basics of computer systems, Basic Network Terminologies, Definitions and Application, The Intranet and the Extranet.

Module-6: Data Warehousing and Data Mining

Concepts of Data warehousing, data mart, meta data, multidimensional modeling, Online Analytical Processing (OLAP), Online Transaction Processing (OLTP), Knowledge Management System (KMS), Active Knowledge Management Server (AKMS) Features of commercial software like Informatics Data mining concepts, knowledge discovery v. data mining, data mining applications. Case studies on data warehousing / data mining.

Text Books

1. Dan W. Paterson, Introduction to Artificial Intelligence & Expert System, PHI./Pearson Education.
2. Davis & Olson, Management Information System, Tata McGraw Hill
3. Kroenke, D. M., Gemino, A., & Tingling, P. (201 6). *Experiencing MIS* (4th Canadian Edition). Toronto: Pearson. ISBN-13: 9780134078434

References

1. ISRD, Introduction to Database Management Systems, Tata McGraw Hill
3. Leon : ERP, Leon Tech Press
4. Loney & Koch: The Oracle 9i Complete Reference, Oracle Press
5. Mahadeo Jaiswal & Monica Mittal : Management Information Systems, OUP

TITLE OF COURSE: E-COMMERCE

COURSE CODE: BCA414

L-T-P: 3-0-0

CREDITS: 3

Pre-requisite: Knowledge is also assumed of basic concepts in connection between information systems (IS) and business performance.

Introduction:



This course provides the students with an overview of the basic principles of electronic commerce and the related concepts, which are reflected in current environment of the global economy. In the course, the student will develop a deeper understanding of the critical attributes of a successful participant in today's ever-changing markets.

Course Outcomes (CO):

At the end of the course, you will be able to:

CO1: Understand the basic concepts of E-commerce

CO2: Demonstrate a retailing in E-commerce by using the effectiveness of market research

CO3: Describe Internet trading relationships including Business to Consumer, Business-to-Business, Intra organizational

CO4: Describe about Consumer Search and Resource Discovery

CO5: Describe the key features of Internet, Intranets and Extranets and explain how they relate to each other

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

<u>CO</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PSO1</u>	<u>PSO2</u>
CO1	3			2				2	2		
CO2	2					2	1	2			
CO3	2	3							2		
CO4	1		2		1						
CO5	1	1									

Course Contents:

Module-1: Business Environment and Dependence on IT

Introduction to Business Informatics, Organizational Structure and Design,

Dependence on Technology, Integrating Technology with Business Environment, IT and Corporate Strategy, Sustaining a Competitive Edge through application of IT in Management Functions.

Module-2: E-Commerce

Definition, Objectives, Components, Advantages and disadvantages, Scope, E-Commerce Models, E-Commerce Opportunities for Industries, Growth of E-Commerce, e-Commerce Applications- E-Marketing, E-Customer Relationship Management, E-Supply Chain Management, E-Governance, E-Buying, E-Selling, E-Banking, E-Retailing.

Module-3: E-Payments and Security issues in E-Commerce

Introductions, Special features, Types of E-Payment Systems (EFT, E-Cash, E-Cheque, Credit/Debit Card, Smart Card, Digital Tokens and Electronic Purses/ Wallets), Security risk of E-Commerce, Types of threats, Security Tools, Cyber Laws, Business Ethics



Module-4: ERP

Introduction, Needs and Evolution of ERP Systems, ERP Domain, ERP Benefits, ERP and Related Technologies, Relevance to Data Warehousing and Data Mining, ERP Drivers, Evaluation Criterion for ERP product, ERP Life Cycle: Adoption decision, Acquisition, Implementation, Use & Maintenance, Evolution and Retirement Phases, ERP Units, ERP Success & Failure Factors

Module-5: Information Systems

Introduction, Categories of System: Open, Closed, Physical, Abstract, Dynamic, Static etc., Types of Information Systems: TPS, MIS, DSS, OLAP, OLTP, Expert System, Internet Based Systems, Learning Management Systems, Business Process Re-Engineering.

Text Books:

1. Ravi Kalakota, "Electronic Commerce: A Manager's Guide", Addison-Wesley Professional, Edition 2012.
2. Henry C. Lucas, Information Technology for Management, McGraw Hill, International Edition, July 2001.
3. Kenneth C. Laudon & Jane P. Laudon, Management Information System, Global Edition, Pearson Education, 2009.
4. ERP: A Managerial Perspective Book Description, Sadagopan S, Tata McGraw Hill, 2013

Reference Books:

1. Dr. K Abirami Devi & Dr. M Alagammai, "E-Commerce Essentials", Margham Publication, 2012.
2. Kenneth C. Laudon, Karol Traver, "E-Commerce 2014", Prentice Hall Publication, 2013.
3. Enterprise Resource Planning Systems System, Lifecycle, Electronic Commerce and Risk by Daniel E.O. Leary, 2011
4. Waman Jawadekar, Management Information System: Text and Cases, Tata McGraw Hill, June 2009.

TITLE OF COURSE: WEB DEVELOPMENT WITH ASP.NET

COURSE CODE: BCA415

L-T-P: 3-0-0

CREDITS: 3

Pre-requisite: Knowledge is also assumed of basic concepts in HTML, CSS, and Other programming knowledge.

Introduction:

To learn and understand Web design. It is a process of conceptualizing, planning, and building a collection of electronic files that determine the layout, color, text styles, structure, graphics, images, and use of interactive features that deliver pages to your site.

Course Outcomes (CO):

CO1: Learn the technologies of the .NET framework

CO2: Know the object oriented aspects of C#

CO3: Be aware of application development in .NET

CO4: Learn web based applications on .NET (ASP.NET)

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

<u>CO</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PSO1</u>	<u>PSO2</u>
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CO1	3	2	1	2	1	2	2	2	1	2	1
CO2	2	2			3	1				2	2
CO3	1	1		1	1		1	2	3	3	2
CO4	2		1		2	2			2	2	2
CO5	2	2	2	3	2	2	2	3	3	1	2

Course Contents:

Module-1: Introduction to ASP.NET: Introduction of ASP.NET, .Net framework, Compile Code, Code Behind and Inline Coding, The Common Language Runtime, Object Oriented Concepts, Event Driven Programming.

Module-2: Server Control: Post back, Data binding, Grid View, List Box, Data list, Data binding Events, Repeater, Form view, Web Server Control, Html Server Control (basic HTML Server Control), Validation Control, Master Page, Themes & CSS.

Module-3: Database Access: Introduction about ADO.NET, Introduction about Provider, Adapter, Reader, Command Builder, Database Access using ADO.NET

Module-4: Client Server Communication: Communications with Web Browser, Response Object, Cookies, Query String, Session Management and Scope of Variable.

Module-5: Advance ASP.NET: Web.config, Sitemappath Server Control, User Control, User Profile. Web Services: Basics of Web Services, Interacting with web services.

Module-6: Error Handling : Unstructured Error, Structured Error, Error handling in Database

Text Books

1. Stephen Walthert “ASP.NET 4.5 unleashed”, SAMS
2. ASP.NET 4.5, Black Book

References Books

1. The Complete Reference ASP.NET, Matthew MacDonald, TMH

TITLE OF COURSE: WEB DEVELOPMENT WITH ASP.NET LAB

COURSE CODE: BCA495

L-T-P: 0-0-2

CREDITS: 1

Pre-requisite: Knowledge is also assumed of basic concepts in HTML, CSS, and Other programming knowledge.

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Introduction:

To learn and understand Web design. It is a process of conceptualizing, planning, and building a collection of electronic files that determine the layout, color, text styles, structure, graphics, images, and use of interactive features that deliver pages to your site.

Course Outcomes (CO):

CO1: Apply critical thinking and problem solving skills required to successfully design and implement a web site.

CO2: Demonstrate the ability to analyze, identify and define the technology required to build and implement a web site.

CO3: Apply critical thinking and problem solving skills required to successfully design and implement a web site.

CO4: Demonstrate the ability to analyze, identify and define the technology required to build and implement a web site.

CO5: Demonstrate knowledge of artistic and design components that are used in the creation of a web site.

CO6: Utilize and apply the technical, ethical and interpersonal skills needed to function in a cooperative environment.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	2	1	2	1	2	2	2	1	2	1
CO2	2	2			3	1				2	2
CO3	1	1		1	1		1	2	3	3	2
CO4	2		1		2	2			2	2	2
CO5	2	2	2	3	2	2	2	3	3	1	2

Course Contents:

1. Concepts of networking, Web and HTML. Introduction with Web, Network, Website, Server, Client side, Server side and other terms related to basic website designing concept. Introduction with HTML language.
2. Introduction with .net. Introduction of Microsoft .net, Explain features and phases of the object-oriented approach. (C#) Basic Syntax, Reading and writing to a console, Data Types, Type Conversion, Variables, Constants.
3. SQL Server, Introduction with SQL Server, Role of a Database Server, SQL language, Working With Database (Table concepts), SQL query (Data Definition Language, Data Manipulation Language, Data Control Language)
4. Database Integration in ASP.NET Connectivity between web pages and data base with the help of Internal and external data source.

Exercises that must be done in this course are listed below:

Exercise No.1: Create a form in HTML for entering value for some specific fields. (Registration Page)

Exercise No.2: Create table in SQL for storing data of registration page. (Using sql query) Exercise

No.3: Create a webpage to show the data which is entered in sql tables through registration page.

Exercise No. 4: Create a web page to file upload option, so user can upload document on web.



Exercise No. 5: Create a webpage to show the uploaded document.

Exercise No. 6: assemble all the web page to create a website for a specific organization. (Minor project).

Exercise No. 7: Create master page for previous developed pages.

Exercise No. 8: Apply validators for all fields which are used in previous developed pages.

Exercise No. 9: Major project.

Text Book:

1. Learning Web Design, Book by Jennifer Niederst Robbins
2. NET 4.5 Programming Black Book, Kogent learning solutions inc.

Recommended Systems/Software Requirements:

1. Desktop PC with minimum of 166 MHZ or faster processor with at least 1 GB RAM and 160 GB disk
2. Visual studio 2012, Microsoft sql server 2008 R2

TITLE OF COURSE: DISCRETE MATHEMATICS

COURSE CODE: BCA416

L-T-P: 3-0-0

CREDITS: 3

Pre-requisite: The readers are expected to have a reasonably good understanding of elementary algebra and arithmetic

Introduction:

To develop logical thinking and its application to computer science (to emphasize the importance of proving statements correctly and de-emphasize the hand-waving approach towards correctness of an argument). The subject enhances one's ability to reason and ability to present a coherent and mathematically accurate argument.

Course Outcomes (CO):

Upon successful completion of this course, students should be able to:

CO1: Write an argument using logical notation and determine if the argument is or is not valid.

CO2: Demonstrate the ability to write and evaluate a proof or outline the basic structure of and give examples of each proof technique described.

CO3: Understand the basic principles of sets and operations in sets. And Prove basic set equalities.

CO4: Apply counting principles to determine probabilities.

CO5: Demonstrate an understanding of relations and functions and be able to determine their properties.

CO6: Demonstrate different traversal methods for trees and graphs. Model problems in Computer Science using graphs and trees.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	3	3	3	3				3	1	
CO2	2	3	3	3					3		2
CO3	3			2					2		
CO4	2			3						2	
CO5				2					3		

CO6				3					3		1
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Course Contents:

Module 1: Sets and Counting Techniques

Sets, Relation and Function: Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum and Product of Functions, Bijective functions, Inverse and Composite Function, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem. Principles of Mathematical Induction: The Well-Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic. Basic counting techniques-inclusion and exclusion, pigeon-hole principle, permutation and combination, Disjunctive and Conjunctive Normal Form.

Module 2: Propositional Logic

Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers. Proof Techniques: Some Terminology, Proof Methods and Strategies, Forward Proof, Proof by Contradiction, Proof by conditional.

Module 3: Algebraic Structures and Morphism

Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Congruence Relation and Quotient Structures, Free and Cyclic Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation

Module 4: Advanced Algebraic Structure and Boolean Algebra

Rings, Integral Domain and Fields. Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function.

Module 5: Graphs and Trees

Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Eulerian and Hamiltonian Walks, chromatic number, Graph Colouring, Colouring maps and Planar Graphs, Colouring Vertices, Colouring Edges, List Colouring, Perfect Graph, definition properties and Example, rooted trees, trees and sorting, weighted trees and prefix codes, Bi-connected component and Articulation Points, Shortest distance methods.

Text Books

1. Satya narayana & shyam Prasad: discrete mathematics and graph theory, PHI
2. Kishor shinde: Discrete Structure, Everest publishing house
3. Hari Parihar&Ritu Agarwal, discrete mathematical structures, ashirwad

TITLE OF COURSE: COMPUTER GRAPHICS & MULTIMEDIA TECHNOLOGY

COURSE CODE: BCA417

L-T-P: 3-0-0

CREDITS: 3

Pre-requisite: Knowledge is also assumed of basic concepts in data structures, programming languages, and basic mathematics.

Introduction:

Computer Graphics course presents an introduction to computer graphics designed to give the student an overview of fundamental principles. It covers the fundamental concepts in creating graphical images on the computer. Computer graphics uses ideas from Art, Mathematics, and Computer Science to create images. Course work stresses the reduction of concepts to practice in the form of numerous programming

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assignments. The course will include an overview of common graphics hardware, 2D and 3D transformations and viewing, and basic raster graphics concepts such as scan-conversion and clipping. Methods for modeling objects as polygonal meshes or smooth surfaces, and as rendering such as hidden-surface removal, shading, illumination, and shadows will be investigated.

Multimedia course provides mainstreaming the technological media within what is called “Multimedia” is the pattern which led to infinite applications of computer technologies. The concept of this technology came into being with the appearance of sound cards, then compact disks, then came the use of digital camera, then the video which made computer an essential educational tool. Nowadays, multimedia expanded to become a field on its own.

Course Outcomes (CO):

After completion of the course, students will able:

CO1: To know and be able to understand the core concepts of computer graphics.

CO2: To know and be capable of using OpenGL to create interactive computer graphics.

CO3: To know and be able to understand a typical graphics pipeline.

CO4: To know and be able to make interactive graphics applications in C++ using one or more graphics application programming interfaces.

CO5: To know and be able to demonstrate an understanding of the use of object hierarchy in graphics applications.

CO6: To know and be able to write program functions to implement visibility detection.

CO7: To know and be able to make pictures with their computer.

CO8: To know and be able to describe the general software architecture of programs that use 3D computer graphics

CO9: To know the pictorial representation of various points in an image

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3		3	3	2	3	3	3	3	1	
CO2	2	3			3				2		2
CO3	2	2	2	1	3	2	1		3	2	
CO4	3		2		2	3		3	1		1
CO5	2	1		2	3	3	2	1		1	
CO6	3				2						2
CO7				2	3		3				1
CO8					2		2	3			
CO9				1	3	1				1	



Course Contents:

Module-1: Introduction to computer graphics & graphics systems

Overview of computer graphics, representing pictures, preparing, presenting & interacting with pictures for presentations; Visualization & image processing; RGB color model, direct coding, lookup table; storage tube graphics display, Raster scan display, 3D viewing devices, Plotters, printers, digitizers, Light pens etc.; Active & Passive graphics devices; Computer graphics software.

Scan conversion

Points & lines, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generation algorithm; Ellipse generating algorithm; scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm.

Module-2: 2D transformation & viewing

Basic transformations: translation, rotation, scaling; Matrix representations & homogeneous coordinates, transformations between coordinate systems; reflection shear; Transformation of points, lines, parallel lines, intersecting lines. Viewing pipeline, Window to viewport co-ordinate transformation, clipping operations, point clipping, line clipping, clipping circles, polygons & ellipse.

3D transformation & viewing

3D transformations: translation, rotation, scaling & other transformations. Rotation about an arbitrary axis in space, reflection through an arbitrary plane; general parallel projection transformation; clipping, viewport clipping, 3D viewing

Module-3: Curves

Curve representation, surfaces, designs, Bezier curves, B-spline curves, end conditions for periodic B-spline curves, rational B-spline curves. Hidden surfaces, Depth comparison, Z-buffer algorithm, Back face detection, BSP tree method, the Painter's algorithm, scan-line algorithm; Hidden line elimination, wire frame methods, fractal - geometry. Color & shading models Light & color model; interpolative shading model; Texture.

Module-4: Multimedia

Introduction to Multimedia: Concepts, uses of multimedia, hypertext and hypermedia; Image, video and audio standards. Audio: digital audio, MIDI, processing sound, sampling, compression. Video: MPEG compression standards, compression through spatial and temporal redundancy, inter-frame and intra-frame compression. Animation: types, techniques, key frame animation, utility, morphing. Virtual Reality concepts.

Text Books

1. Hearn, Baker – “Computer Graphics (C version 2nd Ed.)” – Pearson education
2. Z. Xiang, R. Plastock – “Schaum's outlines Computer Graphics (2nd Ed.)” – TMH
3. D. F. Rogers, J. A. Adams – “Mathematical Elements for Computer Graphics (2nd Ed.)” – TMH
4. Mukherjee, Fundamentals of Computer graphics & Multimedia, PHI
5. Sanhker, Multimedia –A Practical Approach, Jaico

References

1. Buford J. K. – “Multimedia Systems” – Pearson Education
2. Andleigh & Thakrar, Multimedia, PHI
3. Mukherjee Arup, Introduction to Computer Graphics, Vikas
4. Hill, Computer Graphics using open GL, Pearson Education

TITLE OF COURSE: COMPUTER GRAPHICS & MULTIMEDIA TECHNOLOGY LAB

COURSE CODE: BCA497

L-T-P: 0-0-2

CREDITS: 1



Pre-requisite: Knowledge is also assumed of basic concepts in data structures, programming languages, and basic mathematics.

Introduction:

This course presents an introduction to computer graphics designed to give the student an overview of fundamental principles. It covers the fundamental concepts in creating graphical images on the computer. Computer graphics uses ideas from Art, Mathematics, and Computer Science to create images. Course work stresses the reduction of concepts to practice in the form of numerous programming assignments. The course will include an overview of common graphics hardware, 2D and 3D transformations and viewing, and basic raster graphics concepts such as scan-conversion and clipping. Methods for modeling objects as polygonal meshes or smooth surfaces, and as rendering such as hidden-surface removal, shading, illumination, and shadows will be investigated.

Course Outcomes (CO):

After completion of the course, students will able:

CO1: To know and be able to understand the core concepts of computer graphics.

CO2: To know and be capable of using OpenGL to create interactive computer graphics.

CO3: To know and be able to understand a typical graphics pipeline.

CO4: To know and be able to make interactive graphics applications in C++ using one or more graphics application programming interfaces.

CO5: To know and be able to demonstrate an understanding of the use of object hierarchy in graphics applications.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3		3	3	2	3	3	3	3	1	
CO2	2	3			3				2		2
CO3	2	2	2	1	3	2	1		3	2	
CO4	3		2		2	3		3	1		1
CO5	2	1		2	3	3	2	1		1	

Course Contents:

Experiments:

1. Study of basic graphics functions defined in “graphics.h”
2. Write a program to draw a any geometrical figure.
3. Write a program to draw a line using Bresenham’s algorithm
4. Write a program to draw a line using DDA algorithm
5. Write a program to draw a line using Mid point algorithm
6. Write a program to draw a circle using Midpoint algorithm
7. Write a program to draw a Ellipse using Midpoint algorithm

Recommended Systems/Software Requirements:

1. Intel based desktop PC with minimum of 166 MHZ or faster processor with at least 64 MB RAM and 100 MB free disk space.
2. Turbo C or TC3 compiler in Windows XP or Linux Operating System.

Text Books

1. Hearn, Baker – “Computer Graphics (C version 2nd Ed.)” – Pearson education
2. Z. Xiang, R. Plastock – “Schaum’s outlines Computer Graphics (2nd Ed.)” – TMH
3. D. F. Rogers, J. A. Adams – “Mathematical Elements for Computer Graphics (2nd Ed.)” TMH
4. Sanhker, Multimedia –A Practical Approach, Jaico

References

1. Buford J. K. – “Multimedia Systems” – Pearson Education
2. Andleigh & Thakrar, Multimedia, PHI
3. Mukherjee Arup, Introduction to Computer Graphics, Vikas
4. Hill, Computer Graphics using open GL, Pearson Education

TITLE OF COURSE: ESP & SDP-IV

COURSE CODE: BGSC404

L-T-P: 2-0-0

CREDITS: 2

Pre-requisite: Basic concepts in mathematics and economics.

Introduction:

This course examines Taxes in India and market structure. The Topics to be covered (tentatively) include: National income, Market structure, Science & Technology, Logical Reasoning.

Course Outcomes (CO):

In this course we will study the basic components of upcoming Science & technology. Students are expected to be capable of understanding the Indian Tax system, their advantages and drawbacks, how to implement in Indian Economy, how their drawbacks can be overcome and what the applications are and where they can be used. To reach this goal, the following objectives need to be met:

CO1: Know about many books and authors.

CO2: Gain knowledge about important dances & festivals of Indian states.

CO3: Understand the values of Important about banks like payment banks, small banks & license system.

CO4: Know about many learning techniques.

CO5: Know about different short cut techniques to solve any kind of aptitudes.

CO6: Know about different short cut techniques to solve any kind of reasoning.

CO7: Know about different short cut techniques to solve any kind of communicating problems.

CO8: Know about different short cut techniques to solve any kind of societal problems.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3		3	3	2	3	3	3	3		
CO2	2	1			3				2		
CO3	2	2	2	1	1	2	1		3		
CO4	1		2		2	3		1	1		
CO5	2	1		2	3	1	2	1			

CO6	3				2						
CO7				2	1		3				
CO8					2		2	3			
CO9				1	3	1					

Course Contents:

Section A: Employment Enhancement Skills-IV

Module-1: GK & CA, Modern History & National Movement. Indian Geography at a glance (Physical, Regional & Economic)

Tax: Concept of TAX, objective of TAX, Direct & Indirect Tax, Progressive, Regressive & Proportional tax.

Module-2: Calendar etc. capitals of countries, currency of countries, important dates, Sports football, hockey etc. recent events & awards too.

Module-3: Important books & authors, Important Hydropower dams, atomic power plants, important national parks, Minister & portfolio & constituencies, Population census, Persons in news - most famous, popular recent only,

Module-5: Important dances & festivals of Indian states, International Head Quarters & world organization, important president & pm elected from various countries

Module-6: Important about banks like payment banks, small banks & license system, Awards, Sports, Books & author, National & International affairs.

Section B: Skill Development for Professional – IV

Module-1: Quantitative Aptitude: Permutation & Combination. Probability- basic concepts of probability, different theorems & applications, binomial, poisson & normal Distributions. Geometry- Concept of different shapes like triangle, quadrilateral, rectangle, square, circle etc. different theorems & their applications. Mensuration- Formulae on triangles, square, Rhombus, parallelogram, sphere, circle, cone, pyramid etc. Application based problem solving. Coordinate Geometry- Locus, Straight lines, Circle etc

Module-2: Reasoning:

Puzzles: Seating Arrangement

- Circular seating arrangement
- Square seating Arrangement
- Line Arrangement, Calendar and Clock, Miscellaneous Problems

Sentence: a) Sentence Corrections b) Fill the blanks with appropriate words/articles/ preposition/ verbs/adverbs/conjunction. d) Reading Comprehension (Advance Level)d) Vocabulary

Logical Reasoning: Alphanumeric series, Analogies, Artificial Language, Blood Relations, Calendars, Cause and Effect, Clocks, Coding-Decoding, Critical path, Cubes and cuboids. Data Sufficiency, Decision Making, Deductive Reasoning/Statement Analysis, Dices, Directions



Embedded Images, Figure Matrix, Input-Output, Mirror and Water Images, Odd One Out, Picture Series and Sequences, Paper Folding, Puzzles, Pattern Series and Sequences, Order & Ranking, Seating Arrangements, Shape Construction, Statement and Assumptions, Statement and Conclusions, Syllogism

Module-4: Advanced Data Interpretation level-IV

Newspaper reading: The Hindu & Economic Times

Text Books

1. The Oxford Handbook of Tax System in India: An Analysis of Tax Policy and Governance (Oxford Handbooks) by Mahesh C. Purohit, Vishnu Kanta Purohit
2. Taxation of Income from Non Resident Indian under Direct Tax Law - 2019 Edition by Ram Dutt Sharma

References

1. Marketing Management | marketing cases in the Indian context | Fifteenth Edition | By Pearson by Philip Kotler, Keven Lane Keller
2. A Modern Approach to Logical Reasoning, by R.S. Aggarwal



Fifth Semester Syllabus

Sl No.	Type	Subject Code	Topic	L	T	P	S	Credit Points
1.	CC	BCA518	Design and Analysis of Algorithms	3	0	0	0	3
2.	CC	BCA519	Network Programming and Administration	3	0	2	0	4
3.	CC	BCA520	Database Management System	3	0	2	0	4
4.	CC	BCA521	Web Programming with PHP	3	0	2	0	4
5.	PE/SE	----	Professional/Specialization Elective-II	3	0	0	2	3
6.	PE/SE	----	Professional/Specialization Elective-III	3	0	0	2	3
7.	GSC	BGSC505	ESP & SDP-V	2	0	0	0	2
8.	PTI	INT503	Industrial Training/Project-III	0	0	0	1	1
9.	CC	BCA592	Android Programming Lab	0	0	2	0	1
10.	ECA	ECA501	Extra-curricular activities	-	-	-	-	-
Total				20	0	8	5	25

Students can opt any Professional/ Specialization Elective Course in 5th Semester from the following:

Professional Specific Elective Courses-II:

Subject Code	Topic
DS401	Data Mining & Data Warehousing
CC503	Cloud Adaptation and Migration
AIML503	Computer Vision

Professional Specific Elective Courses-III:

Subject Code	Topic
DS503	Data Science with Python
BC401	Blockchain Technology
IS401	Introduction to Cryptography

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TITLE OF COURSE: DESIGN AND ANALYSIS OF ALGORITHMS

COURSE CODE: BCA518

L-T-P: 3-0-0

CREDITS: 3

Pre-requisite: Basic concepts in mathematics and programming languages.

Introduction:

This course covers basic concepts of design and analysis of algorithm. The Topics to be covered (Tentatively) include: Complexity Analysis, Divide and Conquer, Priority queue, Dynamic Programming, Branch and Bound, Backtracking, Greedy Method, Disjoint set manipulation, Lower bound Theory, Graph traversal algorithm, Network Flow, String matching problem, Amortize Analysis, Matrix Manipulation Algorithm, Notion of NP-completeness and Approximation Algorithms.

Course Outcomes (CO):

The objective of the course is to get an overview of design and analysis of algorithms with an emphasis on the resource utilization in terms of time and space. Various techniques in development of algorithms will be implemented, so that the effect of problem size and architecture design on the efficiency of the algorithm is appreciated. Proving the correctness of the algorithms is one of the objectives for this course.

To reach this goal, the following objectives need to be met:

CO1: Understand the different complexity analysis according different problem. You will examine the algorithms used for various operations on operating systems.

CO2: Visualize different types of algorithm techniques. Become aware of the issues in the management of resources like processor, memory and input-output.

CO3: Know about lower bound concept of sorting techniques and different disjoint set manipulation.

CO4: Understand how to traverse a graph and the maximum flow of a network and also pattern matching of a text.

CO5: Understand the basic principle of different classes of problems like P, NP, and NP-complete.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

<u>CO</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PSO1</u>	<u>PSO2</u>
CO1	3			2		2		2	2	2	
CO2	2	2	2					2	1		2
CO3	2	3		2	1		1		2	2	
CO4	1								1		2
CO5	1	1	2			3			1	2	



Course Contents:

Module-1:

Complexity Analysis of an algorithm, Different Asymptotic notations – their mathematical significance

Module-2:

Basic method, use, Examples of Divide and Conquer algorithm, Dynamic Programming, Greedy Method, Branch and bound methods, Backtracking and their complexity.

Module-3:

Basic concept of Lower Bound Theory, Disjoint set manipulation, Amortized Analysis.

Module-4:

Basic method and example of Graph traversal algorithm, String matching problem, Network Flow, Matrix Manipulation Algorithm.

Module-5:

Basic concept of Notion of NP-completeness, Approximation Algorithms.

Text Books

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest & C. Stein, “Introduction to Algorithms”, 3rd ed, PHI.
2. Biswajit Bhowmik, “Design and analysis of algorithm”, 2nd edition, katson publication.

References

1. E. Horowitz and Shani “Fundamentals of Computer Algorithms”, 2nd ed, Orient Black Swan.
2. A. Aho, J. Hopcroft and J. Ullman “The Design and Analysis of computer Algorithms”, Pearson.

TITLE OF COURSE: NETWORK PROGRAMMING & SYSTEM ADMINISTRATION

COURSE CODE: BCA519

L-T-P: 3-0-0

CREDITS: 3

Pre-requisite: Knowledge is also assumed of basic concepts in data structures, programming languages, and computer architecture.

Introduction:

This course introduces computer network programming involves writing computer programs that enable processes to communicate with each other across a computer network.

Course Outcomes (CO):

This course will serve to broaden the student's understanding of the issues and latest developments in the area of Network Programming. To reach this goal, the following objectives need to be met:

CO1: To master the terminology and concepts of the OSI reference model and the TCP-IP reference model.

CO2: To master the concepts of protocols, network interfaces, and design/performance issues in local area networks and wide area networks,

CO3: To be familiar with wireless networking concepts,



CO4: To be familiar with contemporary issues in networking technologies,
CO5: To be familiar with network tools and network programming

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	3			2			2	2	2	
CO2	2	2	2	2	2			2	1		2
CO3	2					1		2	2	1	
CO4	1	2	2				1		1		1
CO5	2		2			3		1	1	2	

Course Contents:

Module-1: History / OSI model; Unix commands, High level UDP and TCP/IP; UDP sockets, tftp; Sorcerer's Apprentice

Module-2: Linux basics, C system calls, fork, Signals, Byte ordering, misc. inet functions

Module-3: TCP sockets (SOCK_STREAM); Client / server model; Daemons, Fall 2018 Career Fair - lecture canceled

Module-4: select (I/O Multiplexing); Bonjour (Zeroconf) / Service Discovery, TCP 3 Way Handshake, TCP States, TCP Close, Non-Blocking I/O, TCP congestion control, ACK, windows, ECN

Module-5: Threads, Application Layer Protocols; Telnet; FTP, IRC,

Module-6: Broadcasting, IPv4/IPv6 addressing, DNS, gethost*(), nslookup, Bit Torrent/ DHT / P2P

Module-7: Socket Options, Out of Band Sockets

Module-8: HTTP, Security Basics, Security Basics II

Module-9: SSL, RPISEC Guest Lecture

Module-10: gRPC, IPFS / QUIC, SDNs/ OpenFlow / Mininet, Buffer Bloat

Text Books

1. The Practice of System and Network Administration, Second Edition Thomas A. Limoncelli, Christina J. Hogan, Strata R. Chalup

References

1. Advanced Linux Networking, Roderick W. Smith, Addison-Wesley Professional (Pearson Edu).
2. Linux Network Administrator's Guide, Tony Bautts, Terry Dawson, Gregor N. Purdy, O'Reilly, Third Edition, 2005

TITLE OF COURSE: NETWORK PROGRAMMING & SYSTEM ADMINISTRATION LAB

COURSE CODE: BCA599

L-T-P: 0-0-2

CREDITS: 1

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Prerequisite: Students must have already registered for the course, basic computation, linux.

Introduction:

This course provides an intensely practical introduction to basic Unix Systems Management, which involves both administration and programming. The Linux Operating System will be used extensively throughout this course for lecture/tutorial examples and importantly during laboratory classes. In addition to system administration, TCP/IP network service administration and the use of scripting languages will be introduced.

Course Outcomes (CO):

This course is an option course so it is not required to contribute to the development of program learning outcomes (PLOs) though it may assist your achievement of several PLOs.

This course will serve to broaden the student's understanding of the issues and latest developments in the area of Network Programming.

CO1: To master the terminology and concepts of the OSI reference model and TCP-IP reference model.

CO2: To master the concepts of protocols, network interfaces, and design/performance issues in local area networks and wide area networks,

CO3: To be familiar with wireless networking concepts

CO4: To be familiar with contemporary issues in networking technologies

CO5: To be familiar with network tools and network programming

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3						1	2	2	3	2
CO2	2			2			2	2	3	2	3
CO3	2	2		2					2	1	2
CO4	1					1	2		2	2	3
CO5	1	1							2	2	2

Course Contents:

Module-1: Server/Client Installation over VMware Environment

Module-1: Packet Analysis by using TCPDUMP and WIRESHARK

Module-2: Network Practice with Packet Tracer

Module-3: System Administration: User/Group management, File System Management

Module-4: Network Configuration: Start/Stop network Service, network interface configuration

Module-5: Firewall Configuration

Module-6: DNS and DHCP Configuration and Troubleshooting

Module-7: Web and Proxy Server Configuration and Troubleshooting

Module-8: Basic Mail Server Configuration and Troubleshooting

Module-9: SAMBA, NFS, CUPS and FTP configuration and Troubleshooting

Module-10: Webmin/SSH configuration

Text Books

1. The Practice of System and Network Administration, Second Edition Thomas A. Limoncelli, Christina

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J. Hogan , Strata R. Chalup

2. Advanced Linux Networking, Roderick W. Smith, Addison-Wesley Professional (Pearson Edu), 2002.

3. Linux Network Administrator's Guide, Tony Bautts, Terry Dawson, Gregor N. Purdy, O'Reilly, Third Edition, 2005



TITLE OF COURSE: DATABASE MANAGEMENT SYSTEM

COURSE CODE: BCA520

L-T-P: 3-0-0

CREDITS: 3

Pre-requisite: The proper understanding of data structures and algorithms and Discrete Mathematics.

Introduction:

Database Management Systems (DBMS) consists of a set of interrelated data and a set of programs to access that data. They underpin any computer system and are therefore fundamental to any program to study in computer science. An understanding of DBMS is crucial in order to appreciate the limitations of data storage and application behavior and to identify why performance problems arise. Students who complete this course are expected to develop the ability to design, implement and manipulate databases. Students will apply and build databases for various day to day real life scenarios and real life applications. The course will by and large be structured but will introduce open-ended data base problems.

Course Outcomes (CO):

This course will serve to broaden the student's understanding of the issues and latest developments in the area of Database Management System and its maintenance. To reach this goal, the following objectives need to be met:

CO1: Ability to build normalized databases.

CO2: Knowledge of Entity Relationship Modeling.

CO3: Familiarity with SQL, embedded SQL and PLSQL.

CO4: Familiarity with query processing and query optimization techniques.

CO5: Understanding of transaction processing.

CO6: Ability to handle recovery and concurrency issues.

CO7: Familiarity with ODBC, JDBC

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

<u>CO</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PSO1</u>	<u>PSO2</u>
CO1	3	3			3	2			3		
CO2	2					1	3				
CO3	3	2	1			2		3	1		
CO4	2	2		1	2	2					
CO5	3					1	2				
CO6	2			3		2			2		
CO7		2	2				2	1			

Course Contents:

Module 1:



Introduction to DBMS- Concept & overview of DBMS, Data Models & database Language, Database Administrator, Database Users, architecture of DBMS, Three levels of abstraction.

Module 2

Entity Relationship Model – Basic concepts, Design Issues, Entity-Relationship Diagram, Weak Entity Sets, and Extended E-R features.

Relational Model- Structure of relational Databases, Relational Algebra, Relational Algebra Operations, Views and Modifications of the Database.

Module 3:

SQL and Integrity Constraints: Concept of DDL, DML, DCL, Basic Structure, Set operations, Aggregate Functions, Null Values, Domain Constraints, Referential Integrity Constraints, Assertions, views, nested Sub queries.

Module 4:

Relational Database Design: -Functional Dependency, Different anomalies in designing a Database, Normalization using functional dependencies, Decomposition, Boyce-Codd Normal Form, 3NF, Normalization using multi-valued dependencies, 4NF, 5NF.

Module 5:

Transaction: -Transaction concept, transaction model, serializability, transaction isolation level, Transaction atomicity and durability, transaction isolation and atomicity. Concurrency control and recovery system: Lock based protocol, dead lock handling, time stamp based and validation based protocol, failure, Classification, storage, recovery algorithm, recovery and atomicity, backup.

Module 6:

Internals of RDBMS:-Physical data structures, Query optimization: join algorithm, Statistics and cost based optimization.

Module 7:

File Organization & Index Structures:-File & Record Concept, Placing file records on Disk, Fixed and Variable sized Records, Types of Single-Level Index (primary secondary, clustering), Multilevel Indexes, Dynamic Multilevel Indexes using B tree and B+ tree.

Text Books

1. Silberschatz, Korth and Sudarshan, “Database System Concepts”, 6thEdition, McGraw Hill 2010
2. Elmasri and Navathe, “Fundamentals of Database Systems”, 6thEdition, Pearson, Addison- Wesley, 2010.

References

1. C.J. Date, “An Introduction to Database Systems”, 8thEdition, Addison-Wesley, 2003.
2. Ramakrishnan &Gherke, Database Management Systems, 2nd Edn., McGraw.
3. Connolly and Begg, “Database Systems”, 4th Edn., Addison-Wesley, 2005
4. Toby, Lightstone and Jagadish, “Database Modeling and Design”, 5thEdn, Elsevier, 2011

TITLE OF COURSE: DATABASE MANAGEMENT SYSTEM LAB

COURSE CODE: BCA590

L-T-P: 0-0-2

CREDITS: 1

Pre-requisite: Knowledge is also assumed of basic concepts of DBMS.

Introduction:

At the end of the semester, the students should have clearly understood and implemented the following:

1. Stating a database design problem.

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2. Preparing ER diagram
3. Finding the data fields to be used in the database.
4. Selecting fields for keys.
5. Normalizing the database including analysis of functional dependencies.
6. Installing and configuring the database server and the front end tools.
7. Designing database and writing applications for manipulation of data for a standalone and shared database including concepts like concurrency control, transaction roll back, logging, report generation etc.
8. Get acquainted with SQL. In order to achieve the above objectives, it is expected that each students will chose one problem. The implementation shall being with the statement of the objectives to be achieved, preparing ER diagram, designing of database, normalization and finally manipulation of the database including generation of reports, views etc. The problem may first be implemented for a standalone system to be used by a single user. All the above steps may then be followed for development of a database application to be used by multiple users in a client server environment with access control. The application shall NOT use web techniques. One exercise may be assigned on creation of table, manipulation of data and report generation using SQL.

Course Outcomes (CO):

- CO1:** Ability to build normalized databases.
CO2: Knowledge of Entity Relationship Modelling.
CO3: Familiarity with query processing and query optimization techniques.
CO4: Understanding of transaction processing.
CO5: Ability to handle recovery and concurrency issues.
CO6: Familiarity with ODBC, JDBC.
CO7: Familiarity with SQL, embedded SQL

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	3			3	2			3		
CO2	2					1	3				
CO3	3	2	1			2		3	1		
CO4	2	2		1	2	2					
CO5	3					1	2				
CO6	2			3		2			2		
CO7		2	2				2	1			

Course Contents:

Exercises that must be done in this course are listed below:

Exercise No.1:

ER Model: An entity-relationship model (ERM) is an abstract and conceptual representation of data. Entity-relationship modeling is a database modeling method, used to produce a type of conceptual schema or semantic data model of a system.

Exercise No. 2:

EER Model: In computer science, the enhanced entity-relationship (EER) model is a high-level or

conceptual data model incorporating extensions to the original entity-relationship (ER) model, used in the design of databases. It was developed by a need to reflect more precisely properties and constraints that are found in more complex databases.

Exercise No. 3:

Relational Model: The relational model for database management is a database model based on first-order 4predicate logic, first formulated and proposed in 1969 by E.F. Codd. The model uses the concept of a mathematical relation, which looks somewhat like a table of values -as its basic building block, and has its theoretical basis in set theory and first-order predicate logic.

Exercise No. 4:

1 NF: First normal form (1NF or Minimal Form) is a normal form used in database normalization. A relational database table that adheres to 1NF is one that meets a certain minimum set of criteria. These criteria are basically concerned with ensuring that the table is a faithful representation of a relation and that it is free of repeating groups.

Exercise No. 5:

2 NF: Second normal form (2NF) is a normal form used in database normalization. 2NF was originally defined by E.F. Codd in 1971. A table that is in first normal form(1NF) must

Exercise No. 6:

3 NF: The Third normal form (3NF) is an important form of database normalization. 3NF is said to hold if and only if both of the following conditions hold: • The relation R (table) is in second normal form (2NF) • Every non-prime attribute of R is non-transitively dependent (i.e. directly dependent) on every candidate key of R.

Exercise No. 7:

BCNF: A relation R is in Boyce-Codd normal form (BCNF) if and only if every determinant is a candidate key. 4The definition of BCNF addresses certain (rather unlikely) situations which 3NF does not handle.

Exercise No. 8:

SQL-1: In this Lab., we discuss basic SQL operations like creating a table, deleting a table, changing the schema of the table, primary key and foreign key constraints on a table and creating indexes on tables.

Exercise No. 9:

SQL-2: Its scope includes efficient data insert, query, update and delete, schema creation and modification, and data access control. In this lab., we discuss SQL operations for populating the tables like inserting into a table, deleting values from a table, and updating the content of the tables.

Text Books

1. Silberschatz, Korth and Sudarshan, “Database System Concepts”, 6thEdition,McGraw Hill, 2010
2. Elmasri and Navathe, “Fundamentals of Database Systems”, 6thEdition, Pearson, Addison Wesley,2010
3. Ivan Bayross, “The programming language of oracle”, 5thEdition, BPB Publication 2016

References

1. “Database Systems: A Practical Approach to design, Implementation and Management”. Thomas Connolly, Carolyn Begg; Third Edition, Pearson Education.
2. "Fundamentals of Database Systems" Elmasri, Navathe, Pearson Education.
3. Bipin C Desai, An Introduction to Database Systems, Galgotia. Publications Pvt Limited, 2001
4. “An Introduction to Database Systems”, C.J.Date, Pearson Education.
5. “A first course in Database Systems”, Jeffrey D. Ullman, Jennifer Windon, Pearson, Education.
6. “Data Management: databases and organization”, Richard T. Watson, Wiley.
7. “Data Modeling Essentials”, Graeme C. Simxion, Dreamtech.
8. Introduction to Data Base Management, Naveen Prakash, Tata McGraw Hill
9. “Oracle 10g manuals”.

TITLE OF COURSE: WEB PROGRAMMING WITH PHP

COURSE CODE: BCA521

L-T-P: 3-0-0

CREDITS: 3

Pre-requisite: Knowledge is also assumed of basic concepts in computer networks and programming languages.

Introduction:

This course will enable students to

1. Illustrate the Semantic Structure of HTML and CSS
2. Compose forms and tables using HTML and CSS
3. Design Client-Side programs using JavaScript and Server-Side programs using PHP
4. Infer Object Oriented Programming capabilities of PHP
5. Examine JavaScript frameworks such as jQuery and Backbone

Course Outcomes (CO):

After studying this course, students will be able to

CO1: Adapt HTML and CSS syntax and semantics to build web pages.

CO2: Construct and visually format tables and forms using HTML and CSS.

CO3: Develop Client-Side Scripts using JavaScript and Server-Side Scripts using PHP to generate and display the contents dynamically.

CO4: Appraise the principles of object oriented development using PHP.

CO5: Inspect JavaScript frameworks like jQuery and Backbone which facilitates developer to focus on core features.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3		2						2	3	
CO2	2				2		2	2	1		2
CO3	2	3		2					2	2	
CO4	1		2			1		2	2		3
CO5	1		2	1	1		2		2	2	1

Course Contents:

Module-1: Introduction to PHP, Installing Web servers, PHP configuration in IIS & Apache Web server. Data types in PHP, Variables, Constants, operators and Expressions. PHP Operator: Conditional Structure - if, switch case & Looping Structure - for, while, do while, foreach.

Module-2: Introduction to Arrays: Initialization of an array, Iterating through an array, Sorting arrays, Array Functions, Functions: Defining and Calling Functions, Passing by Value and passing By references, Inbuilt Functions: String Function, Math Function, Date Function and Miscellaneous Function.



Module-3: Working with Forms: Get and Post Methods, Query strings, HTML form controls and PHP, Maintaining User State: Cookies, Sessions and Application State. Working with Files: Opening and Closing Files, Reading and Writing to Files, Getting Information on Files.

Module-4: PHP Database Connectivity: Introduction to MYSQL, Creating database and other operations on database, connecting to a database, Use a particular database, Sending query to database, Parsing of the query results, Checking data errors.

Module-5: JavaScript: JavaScript Variables and Data Types, Statement and Operators, Control Structure, Functions, Executing deferred scripts, Objects, Messaging in a JavaScript, Dialog Boxes, Alert Boxes, Confirm Boxes, Prompt Boxes, JavaScript with HTML, Events, Events Handlers, Forms, Forms array, Forms Handling and Validations.

Module-6: Introduction to AngularJS, AngularJS core concepts: way data binding Angular Modules Controller, Scopes and Views, Controllers, scope and root Scope, scope communication, emit, broadcast dependency Injection

Module-7: Introduction to ReactJS, React Components: React component Render function, Component API, Component lifecycle, State, Props, Mixins, JSX

Module-8: Introduction to Node JS Introduction to Node JS, Advantages of Node JS, Node JS Modules: Functions, Buffer, Module, Modules Types, Node Package Manager: What is NPM, Installing Packages Locally, Installing package globally, Traditional Web Server Model Node, js Process Model

Text Books:

1. Steven Holzner, “The Complete Reference - PHP”, Tata McGraw Hill, 2008
2. Tim Converse, Joyce Park “PHP Bible”, 2nd Edition
3. Dave W. Mercer, Allan Kent, Steven D. Nowicki, David Mercer, Dan Squier, Wankyu Choi with HeowEide-Goodman, Ed Lecky-Thompson, Clark Morgan “Beginning PHP5”

Reference Books:

1. PHP and MySQL Web Development (Developer's Library) 5th Edition, Luke Welling Laura Thomson, 2016
2. Mike McGrath, “PHP & MySQL in easy Steps”, Tata McGraw Hill, 2012.
3. David Sklar and Adam Trachtenberg, PHP Cookbook, Third Edition, O'Reilly Media, 2014.

TITLE OF COURSE: WEB PROGRAMMING WITH PHP LAB

COURSE CODE: BCA591

L-T-P: 0-0-2

CREDITS: 1

Pre-requisite: Knowledge is assumed of basic concepts in computer networks and programming languages.

Introduction:

To learn and understand Web design. It is a process of conceptualizing, planning, and building a collection of electronic files that determine the layout, color, text styles, structure, graphics, images, and use of interactive features that deliver pages to your site.

Course Outcomes (CO):

CO1: Apply critical thinking and problem-solving skills required to successfully design and

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implement a web site.

CO2: Demonstrate the ability to analyze, identify and define the technology required to build and implement a web site.

CO3: Apply critical thinking and problem-solving skills required to successfully design and implement a web site.

CO4: Demonstrate the ability to analyze, identify and define the technology required to build and implement a web site.

CO5: Demonstrate knowledge of artistic and design components that are used in the creation of a web site.

CO6: Utilize and apply the technical, ethical and interpersonal skills needed to function in a cooperative environment.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

<u>CO</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PSO1</u>	<u>PSO2</u>
CO1	3		2						2	3	
CO2	2				2		2	2	1		2
CO3	2	3		2					2	2	
CO4	1		2			1		2	2		3
CO5	1		2	1	1		2		2	2	1
CO6	1		2		2			1	1	1	

Course Contents:

1. Concepts of networking, Web and HTML. Introduction with Web, Network, Website, Server, Client side, Server side and other terms related to basic website designing concept. Introduction with HTML language.
2. Introduction with .net. Introduction of Microsoft .net, Explain features and phases of the object-oriented approach. (C#) Basic Syntax, Reading and writing to a console, Data Types, Type Conversion, Variables, Constants.
3. SQL Server, Introduction with SQL Server, Role of a Database Server, SQL language, Working with Database (Table concepts), SQL query (Data Definition Language, Data Manipulation Language, Data Control Language)
4. Hands on C# language. Introduction of C# and programing basic of C#, Programs on different problems in C#. Introduction with core PHP, Core PHP introduction and programing concepts. Quick start with PHP programs. Database Integration in PHP.

Exercises that must be done in this course are listed below:

Exercise No. 1: a. Install and configure PHP, web server and MYSQL.

b. Write a program to print "Welcome to PHP".

Exercise No. 2: Write a simple PHP program using expressions and operators.

Exercise No. 3: Write a PHP program to demonstrate the use of Decision making control structures using-

a. If statement

b. If-else statement

c. Switch statement

Exercise No.4: Create a form in PHP for entering value for some specific fields. (Registration Page)

Exercise No.5: Create table in SQL for storing data of registration page. (Using sql query)

Exercise No.6: Create a webpage to show the data which is entered in sql tables through registration page.

Exercise No. 7: Create a web page to file upload option, so user can upload document on website.

Exercise No. 8: Create a webpage to show the uploaded document.

Exercise No. 9: assemble all the web page to create a website for a specific organization. (Minor project).

Exercise No. 10: Create master page for previous developed pages.

Exercise No. 11: Apply validators for all fields which are used in previous developed pages.

Exercise No. 12: Major project.

Text Book:

1. Learning Web Design, Book by Jennifer Niederst Robbins
2. Professional PHP 6, **Publisher:** Wiley

Recommended Systems/Software Requirements:

Desktop PC with minimum of 166 MHZ or faster processor with at least 1 GB RAM and 160 GB disk space. Visual studio 2012, Microsoft sql server 2008 R2

TITLE OF COURSE: ESP & SDP-V

COURSE CODE: BGSC505

L-T-P: 2-0-0

CREDITS: 2

Pre-requisite: Basic concepts in mathematics and English Language.

Introduction:

This course examines basic English language and math. The Topics to be covered (tentatively): The course is on Competitive exam preparation, logical reasoning, English sentence correction, English, Grammar correction, basic arithmetic, Vocabulary, Verbal Reasoning.

Course Outcomes (CO):

In this course we will study the basic components of math and English language. Students are expected to be capable of understanding the better communication, their advantages and drawbacks, how to implement them in daily life, how their drawbacks can be overcome and what the applications are and where they can be used. To reach this goal, the following objectives need to be met:

CO1: Students would be able to know Competitive exam preparation.

CO2: Students would be able to implement verbal and non-verbal communication.

CO3: By analyzing the logic of any arithmetic structure able to solve problem.

CO4: To become an efficient math and English language.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	3	2		3				2		
CO2	2			2					2		
CO3	2	3	2						2		



CO4	1	2	2		1				1		
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Course Contents:

Section A: Employment Enhancement Skills-V Stream wise Competitive Exam Preparation

Module-1: Programming in C.

Module-2: Programming and Data Structures

Module-3: Digital Logic Design

Module-4: Operating System

Module-5: Database Management Systems

Section B: Skill Development for Professional-V

Module-1: Vocabulary: Vocabulary questions test the candidate's knowledge in English like primary meanings of words, idioms, and phrases, secondary shades of meaning, usage, associated words, antonyms, etc.

Module-2: Grammar: Grammar-based questions test the candidate's capability to mark and correct grammatical errors. Prepositions use of modifiers, subject-verb agreement, parallel construction, phrasal verbs, redundancy, etc.

Module-3: Verbal Reasoning: Verbal Reasoning questions are designed to test the candidate's potential to identify relationships or patterns within sentences or a group of words.

Module-4: Inequalities, Coding – Decoding, Syllogisms, Ranking/ Ordering, Blood Relations, Directions, Input-Output, Seating Arrangement, Puzzles, Decision Making, Analogy, Odd-Man out, Word Formation, Digit Sequence, Critical Reasoning, Statements & Assumptions, Statement & Conclusion, Strong Argument & Weak Arguments.

Learning Materials:

1. Fastrack objective Arithmetic: Arihant
2. Quantitative aptitude for Competitive exam (4th Edition): TATA Mc Graw Hill
3. Quantitative aptitude for Competitive exam (3rd Edition): PEARSON
4. Engineering mathematics-Pearson

TITLE OF COURSE: ANDROID PROGRAMMING LAB

COURSE CODE: BCA592

L-T-P: 0-0-2

CREDITS: 1

Pre-requisite: Knowledge is assumed of programming language, OPSS concepts, JAVA /KOTLIN.

Introduction:

Android software development is the process by which applications are created for devices running the Android operating system. Google states that "Android apps can be written using Kotlin and Java

languages" using the Android software development kit, while using other languages is also possible.

Course Outcomes (CO):

CO1: Demonstrate the Understanding of fundamental of Android Programming. (Understand)

CO2: Build their ability to develop software with reasonable complexity on mobile platform. (Apply)

CO3: Discover the life cycles of Activities, Applications, intents and fragments. (Evaluate)

CO4: Design the Android apps by using Java Concepts. (Create)

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3		2						2	3	
CO2	2				2		2	2	1		2
CO3	2	3		2					2	2	
CO4	1		2			1		2	2		3

Exercises that must be done in this course are listed below:

1. Create “Hello World” application. That will display “Hello World” in the middle of the screen in the emulator. Also display “Hello World” in the middle of the screen in the Android Phone.
2. Create an application with login module. (Check username and password).
3. Create spinner with strings taken from resource folder (res >> value folder) and on changing the spinner value, Image will change.
4. Create a menu with 5 options and selected option should appear in text box.
5. Create a list of all courses in your college and on selecting a particular course teacher-incharge of that course should appear at the bottom of the screen.
6. Create an application with three option buttons, on selecting a button colour of the screen will change.
7. Create and Login application as above. On successful login, pop up the message.
8. Create an application to Create, Insert, update, Delete and retrieve operation on the database.
9. Create “Hello World” application using Flutter SDK.
10. Create an android App for simple arithmetic operations using Flutter SDK.

Text Book / Reference:

1. Android: A Programming Guide by J.F. DiMarzio

2. Hello, Android: Introducing Google's Mobile Development Platform by Ed Burnett
3. Programming android by Zigurd Mednieks

Recommended Systems/Software Requirements:

- OS: Windows 8/8.1/10/11 (64-bit)
- CPU: 2nd generation Intel CPU (Sandy Bridge) or newer, AMD CPU with support for a Windows Hypervisor
- Memory: 8 GB RAM
- Free storage: 8 GB
- Screen resolution: 1280 x 800

Sixth Semester Syllabus

Sl No.	Type	Subject Code	Topic	L	T	P	S	Credit Points
1.	CC	BCA622	Software Project Management	3	0	2	0	4
2.	HSM	HSM604	Human Resource Development and Organizational Behavior	3	0	0	0	3
3.	PE/SE	----	Professional/Specialization Elective-IV	3	0	0	2	3
4.	GSC	BGSC606	ESP & SDP-VI	2	0	0	1	2
5.	PTI	INT604	Industrial Training/Project-IV	0	0	0	1	1
6.	CC	CSC681	Grand Viva	0	0	0	0	2
Total				11	0	2	4	15

Students can opt any Professional/ Specialization Elective Course in 6th Semester from the following:

Professional Specific Elective Courses-IV:

Subject Code	Topic
BDA503	Big Data Integration & Modeling
CC504	Cloud Architecture & Development Model
AIML502	Machine Learning Techniques

TITLE OF COURSE: SOFTWARE PROJECT MANAGEMENT

COURSE CODE: BCA622

L-T-P: 3-0-0

CREDITS: 3

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Pre-requisite: Basic knowledge of Software Engineering and Software Project Management.

Introduction: This course is strongly suggested for any student planning to take an internship in Computer Science. After an overview of the phases of the software lifecycle, current methodologies, tools, and techniques being applied to each phase will be discussed in depth with localized exercises given to reinforce learning of concepts.

Introduction: This course is strongly suggested for any student planning to take an internship in Computer Science. After an overview of the phases of the software lifecycle, current methodologies, tools, and techniques being applied to each phase will be discussed in depth with localized exercises given to reinforce learning of concepts.

Course Outcomes: This course will serve to broaden the student's understanding of the issues and latest developments in the area of software development and maintenance. To reach this goal, the following objectives need to be met:

CO1: Describe software process maturity framework.

CO2: Explain conventional software management and software economics.

CO3: Discuss software projects and project planning.

CO4: Analyze project tracking and control.

CO5: Assess the role of project closure analysis.

CO6: Successful Projects - What they have in common

CO7: Teams - Effective management and how to be an effective member

CO8: Risks - What are they and how they can affect a project?

CO9: Plan-Driven process and methodologies, including classic and agile methodologies

CO10: Process - Choosing and adapting to the project

CO11: Estimation and Scheduling - How to get it right, and what can happen if you don't

CO12: beyond the initial project - Product evolution, process improvement, and quality frameworks

Mapping of Course Outcomes (CO) and Program Outcomes (PO)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	3	2		3		3		3		2
CO2	3			1				2	2	2	
CO3	2	2							1		
CO4	3						1				3
CO5	1						3			2	

Course

Contents:

Module-1: Project Evaluation And Project Planning: Importance of Software Project Management – Activities Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.

Module-2: Project Life Cycle and Effort Estimation: Software process and Process Models, Choice of Process models, mental delivery, Rapid Application development, Agile methods, Extreme



Programming, SCRUM, Managing interactive processes, Basics of Software estimation, Effort and Cost estimation techniques, COSMIC Full function points, COCOMO II A Parametric Productivity Model, Staffing Pattern.

Module-3: Activity Planning And Risk Management: Objectives of Activity planning, Project schedules, Activities, Sequencing and scheduling, Network Planning models, Forward Pass & Backward Pass techniques, Critical path (CRM) method, Risk identification, Assessment, Monitoring, PERT technique, Monte Carlo simulation – Resource Allocation, Creation of critical patterns, Cost schedules.

Module-4: Project Management And Control: Framework for Management and control, Collection of data Project termination, Visualizing progress, Cost monitoring, Earned Value Analysis- Project tracking, Change control- Software Configuration Management – Managing contracts – Contract Management.

Module-5: STAFFING IN SOFTWARE PROJECTS: Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham-Hackman job characteristic model – Ethical and Programmed concerns – Working in teams – Decision making – Team structures – Virtual teams – Communications genres – Communication plans.

Text Books

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.

Reference Books

1. Robert K. Wysocki “Effective Software Project Management” – Wiley Publication, 2011.
2. Walker Royce: “Software Project Management”- Addison-Wesley, 1998.
3. Gopalaswamy Ramesh, “Managing Global Software Projects” – McGraw Hill Education (India), Fourteenth Reprint 2013.

TITLE OF COURSE: SOFTWARE PROJECT MANAGEMENT LAB

COURSE CODE: BCA692

L-T-P: 0-0-2

CREDITS: 1

Pre-requisite: Basic idea of Software Engineering.

Introduction:

The Software Project Management Lab provides a deep insight into the importance of project planning in the software industry. Project management is simply the planning, organizing and managing of tasks and resources to accomplish a defined objective, usually with constraints on time and cost.

Course Outcomes (CO):

This course will serve to broaden the student's understanding of the issues and latest developments in the area of software development and maintenance. To reach this goal, the following objectives need to be met:

CO1: Describe software process maturity framework and discuss

CO2: Explain conventional software management and software projects and project planning.

CO3: Analyze project tracking and control and assess the role of project closure analysis.

CO4: To provide a broad introduction to the field of operations management and explain the concepts, strategies, tools and techniques for managing the transformation process that can lead to

competitive advantage.

CO5: Conceptualize supply chain designs, which are aligned with business models for manufacturing and service companies

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	3		3						2	
CO2	3		3		3						2
CO3	3	3		3							
CO4	3		3		3					3	
CO5	3	3		3							1

Course Contents:

Module 1:Create Project Plan

Specify project name and start (or finish) date. ▪ Identify and define project tasks. ▪ Define duration for each project task. ▪ Define milestones in the plan ▪ Define dependency between tasks

Module 2:Create Project Plan contd.

Define project calendar. ▪ Define project resources. ▪ Specify resource type and resource rates ▪ assign resources against each task ▪ Baseline the project plan

Module 3:Execute and Monitor Project Plan

Update % Complete with current task status. ▪ Review the status of each task. ▪ Compare Planned vs Actual Status ▪ Review the status of Critical Path ▪ Review resources assignment status

Module 4:Generate Dashboard and Reports

Dashboard (Project Overview, Cost Overview, Upcoming Tasks), Resource Reports (Over-allocated Resources, Resource Overview),Cost Reports (Earned Value Report, Resource Cost Overview, Task Cost Overview)

Text Books

- 1.Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.
2. Robert K. Wysocki Effective Software Project Management – Wiley Publication, 2011.

References

1. Watts S. Humphrey: An Introduction to the Team Software Process, 1st Edition, Addison- Wesley International Publications, 2000.
2. Watts S. Humphrey, A Discipline to Software Engineering, 1stEdition, Pearson Education, 2008.
3. Pankaj Jalote, Software Project Management in Practice, 1st Edition, Pearson Education, 2011
4. Chris Kemerer, Software Project Management Readings and Cases, 1st Edition, Pearson Edu, 2011

TITLE OF COURSE: HUMAN RESOURCE DEVELOPMENT AND ORGANIZATIONAL BEHAVIOR
COURSE CODE: HSM604

L-T-P: 3-0-0
CREDITS: 3

Pre-requisite: Basic knowledge of general Management

Introduction:

The main objective of this course is to help the students to acquire and develop skill to take rational decisions. People have always been regarded as important in managing organizations.

Course Outcomes (CO):

During the study of this course,

CO1: student would come to know about the theory and application of human resource management, the broad range of influences acting on human resource management, about the human resources planning and policies through its information system, training and development of human capital of the organization.

CO2: This course emphasis on the knowledge of performance assessment methods, improvements and resultant in terms of employee service condition reviews. Compensation and workers participation in management including the discipline matters and strategic human resources management

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

<u>CO</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PSO1</u>	<u>PSO2</u>
CO1			3		3	1		3	3		
CO2			2		2	3		2	1		

Course Contents:

Module 1: Introduction:

Human resources in Organizations, role of Human Resource Management; the historical background, personnel Management, Human Resource Development, Typical Organizational setup of a Human Resource Management department.

Module 2: Human Resource Planning:

Supply and Demand Forecasting methods, Manpower Inventory, Career Planning, Succession Planning, Personnel Policy, Human Resource Information System (HRIS), Recruitment and Selection: Process, Sources, Methods of selection, Interviewing Method, Skills and Errors Performance Appraisal Systems: Purpose, Methods, Appraisal instruments, 3600 Appraisal HR Score Card, Errors in appraisal, Potential Appraisal, Appraisal Interview.

Module 3: Human Resource Development:

Policy and Programs, Assessment of HRD Needs, HRD, Methods: Training and Non-Training. Compensation Management: Wages- Concepts, Components; System of Wage Payment, Fringe Benefits, Retirement Benefit.

Module 4: Workers' Participation in Management:

Concept, Practices and Prospects in India, Quality Circles and other Small Group Activities. Discipline Management: Misconduct, Disciplinary action, Domestic Enquiry, Grievance Handling

Module 5: Strategic HRM:

Meaning, Strategic HRM vs Traditional HRM, SHRM Process, Nature of e-HRM, e-Recruitment & Selection ,e-Performance Management, e-Learning

Text Books



1. Agarwala T.-Strategic Human Resource Management, OUP
2. Aswathappa,K.-Human Resource Management, Tata McGraw Hill

References

JyothiP. &Venkatesh, D. N.-Human Resource, Management

TITLE OF COURSE: ESP & SDP- VI

COURSE CODE: BGSC606

L-T-P: 2-0-0

CREDITS: 2

Pre-requisite: Basic concepts in mathematics and English Language.

Introduction:

This course examines basic English language and math. The Topics to be covered (tentatively): The course is on Competitive exam preparation, logical reasoning, English sentence correction, English, Grammar correction, basic arithmetic, Vocabulary, Verbal Reasoning.

Course Outcomes (CO):

In this course we will study the basic components of math and English language. Students are expected to be capable of understanding the better communication, their advantages and drawbacks, how to implement them in daily life, how their drawbacks can be overcome and what the applications are and where they can be used. To reach this goal, the following objectives need to be met:

CO1: Students would be able to know Competitive exam preparation.

CO2: Students would be able to implement verbal and non-verbal communication.

CO3: By analyzing the logic of any arithmetic structure able to solve problem.

CO4: To become an efficient math and English language.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	2	3		3				3		
CO2	2			2					2		
CO3	2	3	1						3		
CO4	3	1	2		1				1		

Course Contents:

Section A: Employment Enhancement Skills-VI

Stream wise Competitive Examination Preparation

Module-1: Software Engineering.

Module-2: Computer Networks

Module-3: Computer Organization & Architecture

Section B: Skill Development for Professional-VI

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Module-1

Revision and Advanced Problems in Quantitative Aptitude

- 1) Numbers (+, -, x, etc), Percentages, Ratio, Partnership, Linear Equations, Profit & Loss
- 2) Averages, Mixtures & Allegations, Number System, Time and Work
- 3) Simple & Compound Interest, Other / Misc Quantitative Apt., Indices and Surds, Quadratic Equations
- 4) Permutations & Combinations, Probability, Geometry, Mensuration
- 5) Data Interpretation, Various Charts, Diagrams, Tables

Module-2

Revision and Advanced Problems in Reasoning

- 1) Coding, Series & Numbers, Blood Relations, Analogy
- 2) Cubes, Data Sufficiency, Non-Verbal Reasoning
- 3) Syllogisms, Puzzles, Machine I/O, Inequality
- 4) Seating Arrangement, Calendar / Clock
- 5) Statements, Other / Misc Logical Reasoning, Decision Making (Ethics)

Module-3

Revision and Advanced Questions in Verbal English

- 1) Grammar,
- 2) Clauses,
- 3) Spotting errors,
- 4) Sentence Correction,
- 5) Blanks,
- 6) Reading Comprehensions,
- 7) Vocabulary

Newspaper reading: The Hindu & Economic Times.

Learning Materials:

1. Fastrack objective Arithmetic: Arihant
2. Quantitative aptitude for Competitive exam (4th Edition): TATA Mc Graw Hill
3. Quantitative aptitude for Competitive exam (3rd Edition): PEARSON
4. Engineering mathematics-Pearson

Professional Specific Elective Courses-I:

TITLE OF COURSE: FUNDAMENTAL OF BIG DATA ANALYTICS

COURSE CODE: BDA401

L-T-P: 3-0-0

CREDITS: 3

Pre-requisite: Should have knowledge of one Programming Language (Java preferably), Practice of SQL (queries and sub queries), exposure to Linux Environment.

Introduction:

The course enables students to Understand the Big Data Platform and its Use cases, provide an overview of Apache Hadoop, Provide HDFS Concepts and Interfacing with HDFS, Understand Map Reduce Jobs,

provide hands on Hadoop Eco System, Apply analytics on Structured, Unstructured Data, Exposure to Data Analytics with R.

Course Outcomes (CO):

The students will be able to:

CO1: Identify Big Data and its Business Implications

CO2: List the components of Hadoop and Hadoop Eco-System

CO3: Access and Process Data on Distributed File System

CO4: Manage Job Execution in Hadoop Environment

CO5: Develop Big Data Solutions using Hadoop Eco System

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	3	1	3					3	2	
CO2	3		3		1				2		2
CO3	2		2			3			3	3	
CO4	3		3		3	2	3		1		2
CO5	3		1					1	3	1	

Course Contents:

Module-1: Introduction to Big Data and Hadoop: Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analyzing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Infosphere BigInsights and Big Sheets.

Module-2: HDFS (Hadoop Distributed File System) The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures.

Module-3: Map Reduce Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.

Module-4: Hadoop Eco System Pig: Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators. Hive: Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions. HBase: HBasics, Concepts, Clients, Example, Hbase Versus RDBMS. Big SQL: Introduction

Module-5: Machine Learning: Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with BigR.

Textbooks:

1. Tom White "Hadoop: The Definitive Guide" Third Edit on, O'reily Media, 2012.
2. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.

Reference Books:

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013)
3. Tom Plunkett, Mark Hornick, "Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle Enterprise and Oracle R Connector for Hadoop", McGraw-Hill/Osborne Media (2013), Oracle press



TITLE OF COURSE: INTRODUCTION TO CLOUD COMPUTING

COURSE CODE: CC401

L-T-P: 3-0-0

CREDITS: 3

Pre-requisite: Knowledge is also assumed of basic concepts of Virtualization utilization in big data handling.

Introduction:

The course enables students to understand the virtualization technology, Applications along with cloud computing concepts and services.

Course Outcomes (CO):

The students will be able to know the basics of virtualization technology, hypervisors and cloud computing concepts

CO1: Understand what Cloud Computing is.

CO2: Understand what Virtualization is.

CO3: Understand Cloud Types and Cloud Service Deployment Models (IaaS*, PaaS*, SaaS*).

CO4: Learn How to Create Virtual Machines (VM) using Hypervisors (type-2).

CO5: Understand Computer Networks and IP Addressing.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	3	3		3				3		
CO2	3			3	2				3	3	
CO3	2	3	2		3				2		2
CO4	3	3	3		3				3	2	
CO5			3					3	3		2

Course Contents:

Module-1: Overview: introduction to cloud computing, OS and Virtualization, VM, advantage of Virtualization, Virtualization and cloud and its overlapping, service driven model, advantage of cloud computing: marketing point of view, types of services, business value, business impact of cloud, technological value of cloud, end user benefits, change for provider and administrator, pros and cons of cloud model, anatomy of cloud, solution component, service catalog, user self-service portal, service request management, provisioning, optimized infrastructure, chargeback, benefit of cloud, delivery and deployment model, different cloud architecture: public, private and hybrid and its pros and cons, delivery models. Cloud transformation roadmap, history of cloud, Client-server, cluster, grid models, cloud vs grid and their relationship, cluster and cloud, utility computing and evolution of cloud computing, cloud computing.

Module-2: Introduction to Virtualization. Overview of Virtualization: Need of Virtualization, traditional IT Infrastructure, shortcoming of physical infrastructure, benefit of Virtualization, comparison of traditional IT infrastructure with virtualized infrastructure.

Module-3: Virtualization: Implementing Virtualization, typical hardware / software server stack and its logical equivalence, pre/post virtualization server stack, types of virtualization, area and technology based classification, history of virtualization, time sharing system, IBM mainframe and Power virtualization, Extending Virtualization to x86 and its hardware support, impact of Virtualization: cost and manageability impact.



Module-4: Server and Storage Virtualization. Types of Server Virtualization, simulation, Hardware Assisted Virtualization, Hypervisors, Ring levels on x86 processors, types of Hypervisors, IBM PowerVM Hypervisors, common consideration in server Virtualization, Desktop Virtualization: Benefits Constraints and Types. Anatomy of server Virtualization, three major layers in Xen server, storage Virtualization overview: benefit and types, features of logical layers, Host level storage Virtualization, host-based mirroring, storage level Virtualization, network based storage Virtualization.

Module-5: Network and Application Virtualization. Network Virtualization overview: VPN, VLAN, challenges in using application in traditional install, use and update model, solution for challenges, Architecture, benefits of Application Virtualization.

Module-6: Cloud Implementation, Deployment and Delivery Models. Cloud Deployment models: Public, Private, Hybrid, pros and cons of each architecture, cloud deployment decision factors, Business IT Control, Business critical application, data and transaction security, compliance and audit, balance of CAPEX and OPEX, workload characteristics, workload lifespan preferences, Industry segment- SME and Large enterprises, Data Freedom, software characteristics, time to deploy, Public Cloud: factor matrix, advantage, disadvantage, Public Cloud: Factor Matrix, advantage and disadvantage, Hybrid Cloud: factor matrix, advantage, disadvantage, Overview of Cloud delivery models, infrastructure, IT Layers, IaaS Overview, features, cloud bursting, multi tenancy, resource pooling, PaaS: overview, component, example, SaaS: advantage, example.

Module-7: Case Study on Virtualization and Cloud workloads. Case study overview, customer IT landscape, function of data center, trigger for virtualization, preparation for virtualization, server selection, server sizing, server criticality, provisioning, proximity and locality, transition tool for virtualization, cost savings, cloud workload overview, workload characterization, factor s, suitable workload for cloud, private cloud solution, types of workload, advantage, mission. critical workload, mixed workload, production only workload for hybrid cloud, industry specific workload, non-suitable workload: public, private cloud, possible workload by cloud.

Text Books:

1. Introduction to Virtualization and Cloud Computing (IBM ICE Publication).

Reference Books:

1. “ Distributed and Cloud Computing “ By Kai Hawang , GeoffreyC.Fox, Jack J. Dongarra Pub: Elsevier
2. Cloud Computing, Principal and Paradigms, Edited By RajkumarBuyya, JemesBroberg, A. Goscinski, Pub.- Wiley
3. Kumar Saurabh, “Cloud Computing”, Wiley Pub
4. Krutz , Vines, “Cloud Security “ , Wiley Pub
5. Velte, “Cloud Computing- A Practical Approach”, TMH Pub

Title of Course: INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Course Code: AIML401

L-T-P: 3-0-0

Credits: 3

Pre-requisite: Knowledge is also assumed of basic concepts on Mathematics, Strong experience of programming languages, writing algorithm for finding patterns and learning.

Introduction:

In this course we will study the basic components of an intelligent system, their functions, mechanisms, policies and techniques used in their implementation and examples.

Course Outcomes (CO):

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The students will have a detailed knowledge of
CO1:The concepts of artificial intelligence,
CO2:Various applications of AI in different fields,
CO3:Aware of a variety of approaches to AI techniques

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	3	2		3				2	2	
CO2	2			2					2		2
CO3	2	3	1						2	2	
CO4	1	2	2		2				1		1

Course Contents:

Module-1 (Introduction to AI): Definitions, Goals of AI, AI Approaches, AI Techniques, Branches of AI, Applications of AI. Introduction of Intelligent Systems: Agents and Environments, Good Behavior: the concept of Rationality, The Nature of Environments, The structure of Agents, How the components of agent programs work.

Module-2 (Problems Solving, Search and Control Strategies)

Solving Problems by Searching, Study and analysis of various searching algorithms. Implementation of Depth-first search, Problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform-cost search, Depth-first search, Depth-limited search, Iterative deepening depth-first search, Bi-directional search Informed (Heuristic) Search Strategies: Greedy best-first search A* search: Minimizing the total estimated solution cost, Conditions for optimality: Admissibility and consistency, Optimality of A*, Memory-bounded heuristic search, Heuristic Functions, Generating admissible heuristics from sub problems: Pattern databases, Learning heuristics from experience. Beyond Classical Search: Local Search Algorithms and Optimization Problems: Hillclimbing search Simulated annealing, Local beam search, Genetic algorithms, Local Search in Continuous Spaces, Searching with Non-deterministic Actions: AND-OR search trees, Searching with Partial Observations. Adversarial Search and Constraint Satisfaction Problems, Study of min-max algorithm Adversarial Search: Games, Optimal Decisions in Games, The mini-max algorithm, Optimal decisions in multiplayer games, Alpha-Beta Pruning, Move ordering , Imperfect Real-Time Decisions, Evaluation functions, Cutting off search, Forward pruning, Search versus lookup, Stochastic Games, Evaluation functions for games of chance, Partially Observable Games Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Variations on the CSP formalism, Constraint Propagation: Inference in CSPs, Backtracking Search for CSPs, Local Search for CSPs, Alpha-beta pruning and CSP, Implementation aspects of minimax algorithm and CSP.

Module- 3 (Knowledge Representations Issues, Predicate Logic, Rules)

Knowledge representation, KR using predicate logic, KR using rules. Reasoning System - Symbolic, Statistical: Reasoning, Symbolic reasoning, Statistical reasoning.

Module-4 (Quantifying Uncertainty, Learning Systems)

Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Bayes' Rule and Its Use, Representing Knowledge in an Uncertain Domain, Other Approaches to Uncertain Reasoning, Rule-based methods for uncertain reasoning, representing vagueness: Fuzzy sets and fuzzy logic, Study of fuzzy logic and Decision trees, Implementation aspects of Decision trees. Learning from Examples: Forms of Learning, Supervised Learning, Learning Decision Trees, The decision tree representation, Expressiveness of decision trees, inducing decision trees from examples.

Module-5 (Expert Systems)



Introduction, Knowledge acquisition, Knowledge base, working memory, Inference engine, Expert system shells, Explanation, Application of expert systems. Fundamentals of Neural Networks: Introduction and research history, Model of artificial neuron, Characteristics of neural networks, learning methods in neural networks, Singlelayer neural network system, Applications of neural networks. Fundamentals of Genetic Algorithms: Introduction, Encoding, Operators of genetic algorithm, Basic genetic algorithm.

Text Books

1. Rich, Elaine Knight, Kevin, Artificial Intelligence, Tata McGraw Hill.
2. Luger, George F, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education.

References

1. Nilsson, Nils J, Artificial Intelligence, Morgan Kaufmann.
2. Russell, Stuart J. Norvig, Peter, AI: A Modern Approach, Pearson Education.

Professional Specific Elective Courses-II:

TITLE OF COURSE: DATA MINING & DATA WAREHOUSING

COURSE CODE: DS401

L-T-P: 3-0-0

CREDITS: 3

Pre-requisite: Knowledge is also assumed of basic concepts in data base management system, and mathematics.

Introduction:

The recent years have generated explosive expansion of digital data stored in computer databases as well as increased pressure on companies to keep competitive advantage. This has put Data Mining (DM) as a key method for extracting meaningful information from the flood of digital data collected by businesses, government, and scientific agencies.

Course Outcomes (CO):

This course will serve to broaden the student's understanding of the issues and latest developments in the area of data mining. To reach this goal, the following objectives need to be met:

CO1: To understand the basic principles, concepts and applications of data warehousing and data mining

CO2: To introduce the task of data mining as an important phase of knowledge recovery process.

CO3: Ability to do Conceptual, Logical, and Physical design of Data Warehouses OLAP applications and OLAP deployment.

CO4: Have a good knowledge of the fundamental concepts that provide the foundation of data mining.

CO5: Design a data warehouse or data mart to present information needed by management in a form that issuable for management client.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

Detailed Syllabus for Bachelor of Computer Application (Session: 2022-23)

<u>CO</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PSO1</u>	<u>PSO2</u>
CO1	3			3						2	
CO2	3	3		3							3
CO3	3	3	3		3				3	2	3
CO4	3										2
CO5	3				3					3	

Course Contents:

Module 1:

Overview of Data warehousing, Strategic information and the need for Data warehousing, Defining a Data warehouse, Evolution of Data warehousing, Data warehousing and Business Intelligence.

Module 2:

The Building Blocks of Data warehouse, Defining features – Subject-oriented data, Integrated data, Time-variant data, Nonvolatile data, Data granularity, Data warehouses and Data marts, Architectural Types – Centralized, Independent data marts, Federated, Hub-and-Spoke, Data mart bus, Overview of components - Source Data, Data Staging, Data Storage, Information Delivery, Metadata, and Management and Control components. Definition and architecture in the areas of Data acquisition, Data storage, and Information delivery Distinguishing characteristics – Different objectives and scope, Data content, Complex analysis for faster response, Flexible and Dynamic, Metadata-driven etc Architectural Framework – supporting flow of data, and the Management and Control module Technical architecture – Data acquisition, Data storage, and Information delivery.

Module 3:

Business Requirements and Data warehouse: Dimensional nature of Business data and Dimensional Analysis, Dimension hierarchies and categories, Key Business. Metrics (Facts), Requirement Gathering methods and Requirements Definition Document (contents). Distinction between architecture and infrastructure, understanding of how data warehouse infrastructure supports its architecture Components of physical infrastructure, Hardware and Operating systems for data warehouse, Database Software, Collection of Tools, Data warehouse Appliances – evolution and benefits. Business Requirements and Data Design – Structure for Business Dimensions and Key Measurements, Levels of detail. Business Requirements and the Architecture plan, Business Requirements and Data Storage Specifications, Business Requirements and Information Delivery Strategy.

Module 4:

Understanding the importance of Metadata, Metadata types by functional areas – Data acquisition, Data storage, and Information delivery, Business Metadata – overview of content and examples, Technical Metadata – overview of content and examples, Metadata Requirements, Sources of Metadata, Metadata management – challenges, Metadata Repository, Metadata, integration and standards.

Module 5:

Concepts of Data warehouse architecture – Definition and architecture in the areas of Data acquisition, Data storage, and Information delivery, Distinguishing characteristics – Different objectives and scope, Data content, Complex analysis for faster response, Flexible and Dynamic, Metadata-driven etc Architectural Framework – supporting flow of data, and the Management and Control module.

Technical architecture – Data acquisition, Data storage, and Information delivery. Design decisions, Basics of Dimensional modeling, E-R modeling versus Dimensional modeling, The STAR schema – illustration, Dimension Table, Fact Table, Factless Fact Table, Data granularity, STAR schema keys – Primary, Surrogate, and Foreign, Advantages of the STAR schema, STAR schema examples. Overview of ETL, Requirements of ETL and steps Data extraction – identification of sources and techniques Data transformation – Basic tasks, Transformation types, Data integration and consolidation, Transformation for dimension attributes, Data loading – Techniques and processes, Data refresh versus update, Procedures for Dimension tables, Fact tables : History and incremental loads ETL Tool options.

Module 6:

Distinction between architecture and infrastructure, Understanding of how data warehouse infrastructure supports its architecture Components of physical infrastructure, Hardware and Operating systems for data warehouse, Database Software, Collection of Tools, Overall concept of Online Analytical Processing (OLAP), OLAP definitions and rules, OLAP characteristics Major features and functions of OLAP – General features, Dimensional analysis, Hypercubes, Drill Down and Roll Up, Slice and Dice, Rotation, Uses and Benefits Familiarity with OLAP models – Overview of variations, MOLAP, ROLAP, HOLAP, DOLAP, Database OLAP, Web OLAP. Web-enabled Data Warehouse – adapting data warehouse for the web Web-based information delivery – Browser technology for data warehouse and Security issues OLAP and Web – Enterprise OLAP, Web-OLAP approaches, OLAP Engine design. Data warehouse Appliances – evolution and benefits

Module 7:

Overview of Data mining – Definition, Knowledge Discovery Process (Relationships, Patterns, Phases of the process), OLAP versus Data mining, Some aspects of Data mining – Association rules, Outlier analysis, Predictive analytics etc), Concepts of Data mining in a Data warehouse environment, Major Data Mining techniques – Cluster Detection using R Language, Decision Trees, Memory-based Reasoning, Link Analysis, Neural, Networks, Genetic Algorithms etc, Data Mining Applications in industry – Benefits of Data mining using R Language, Discussion on applications in Customer Relationship, Management (CRM), Retail, Telecommunication, Biotechnology, Banking and Finance etc.

Textbooks:

1. Data Mining Technology, Third Edition by Arun K Pujari, Universities Press, India
 2. Data Warehousing Fundamentals for IT Professionals, Second Edition by Paulraj Ponniah, Wiley India
 3. Alex Berson, Stephen J. Smith, “Data Warehousing Data Mining & OLAP”, Tata McGraw- Hill
- References

References:

1. Data Warehousing, Data Mining, & OLAP – Second Edition by Alex Berson and Stephen J. Smith, Tata McGraw Hill
2. Data warehouse Toolkit by Ralph Kimball, Wiley India
3. Gajendra Sharma, “Data Mining Data Warehousing and OLAP”, S.K.KATARIA & SONS

TITLE OF COURSE: CLOUD ADAPTATION AND MIGRATION

COURSE CODE: CC503

L-T-P SCHEME: 3-0-0

COURSE CREDITS: 3

Pre requisites: For this course it's assumed that you have a working knowledge of Cloud Computing and Cloud principles

Introduction:

In this course we will study the important terminology and familiar with cloud adaptation, cloud migrations, some of the constraints that cloud avoid cloud migration, legacy hardware and software architecture.

Course Outcomes (CO):

From this course students will be able to learn about intra cloud data adaptation and inter cloud data migration. Students will also get some sense to implement data migration techniques from this course.

CO1: Have a greater visibility of some of the key points of a Cloud Migration.

CO2: Be able to confidently assess the requirements for your migration.

CO3: Get Knowledge about data migration techniques

CO4: Understand about Intra cloud data adaptation.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	3	2		3				2		2
CO2	2	2	1	2					3	2	
CO3	2	3	2						2		1
CO4	1	2	2					2	3	2	

Course Contents:

Module-1(Cloud computing definition and use cases): Introduction – Component of CC – Comparing CC with Virtualization, Grids, Utility Computing, client- server model, P-to-P Computing - Key Drivers for Cloud Computing - Cloud computing Service delivery model, Cloud Types – Private, Public and Hybrid. Introduction to cloud computing & its application. Goal of cloud adaptation and migration. Various use cases of cloud computing.

Module-2 (Adopting the cloud): Instantaneous provisioning of computing resources, tapping into an infinite storage capacity, cost-effective pay-as-you-use billing models. Handling sensitive data, aspects of cloud security, assessing governance solutions. Adoption of Public cloud by SMBs- Public Cloud Adoption phase for SMBs- Vendor liability and Management Adoption process of Public clouds by Enterprises – Managed Private clouds Migrating Application to the cloud – Impact of Shared Resources and Multi-Tenancy on cloud Applications – Phases during Migration an Application to An IaaS Cloud

Module-3: Introduction, definition, cloud adaptation architecture, adaptation techniques, decision engine architecture, adaptation in cloud resource configuration, VM- adaptation

Module-4 (Migration Framework): Re-architecting applications for the cloud, integrating the cloud with existing applications, avoiding vendor lock-in, planning the migration and selecting a vendor.

Module-5 (Migration Planning & Discovery): Identifying and mitigating risk, The 6 R's of cloud migration, asset and application discovery, licensing, data sovereignty, and governance.

Module-6 (Mobile Cloud computing): Introduction, Definition, Architecture, Benefits, challenges in mobile and at cloud shield.

Text Books

1. Cloud Migration from on-premise data center to AWS by Charista Keiko



2. Cloud Computing: Concepts, Technology & Architecture by Richardo Puttini, Thomas Erl, and Zaigham Mahmood

TITLE OF COURSE: COMPUTER VISION

COURSE CODE: AIML503

L-T-P: 3-0-0

CREDITS: 3

Pre-requisite: Knowledge is also assumed of basic concepts of data structure and algorithm, image processing, programming concepts and linear algebra.

Introduction:

This course examines development of algorithms and techniques to analyze and interpret the visible world around us. The Topics to be covered (tentatively) include:

- Digital Image Formation and low-level processing
- Depth estimation and Multi-camera views
- Feature Extraction
- Image Segmentation
- Pattern Analysis
- Motion Analysis
- Shape from X

Course Outcomes (CO):

CO1: Understanding of the fundamental concepts related to multi-dimensional signal processing, feature extraction, pattern analysis visual geometric modeling, stochastic optimization etc.

CO2: Knowledge of these concepts is necessary in this field, to explore and contribute to research and further developments in the field of computer vision.

CO3: Applications range from Biometrics, Medical diagnosis, document processing, mining of visual content, to surveillance, advanced rendering etc.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

<u>CO</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PSO1</u>	<u>PSO2</u>
CO1	3	3		3						2	3
CO2	3	3	3	3	3						3
CO3	3		3		3	3				3	3

Course Contents:

Module 1: Introduction: Introduction to Computer Vision, Case study: Face Recognition.

Module 2: Digital Image Formation and low-level processing: Overview and State-of-the-art, Fundamentals of Image Formation, Transformation: Orthogonal, Euclidean, Affine, Projective, etc; Fourier Transform, Convolution and Filtering, Image Enhancement, Restoration, Histogram Processing.

Module 3: Depth estimation and multi-camera views: Perspective, Binocular Stereopsis: Camera and Epipolar Geometry; Homography, Rectification, DLT, RANSAC, 3-D reconstruction framework; Auto-calibration. apparel

Module 4: Feature Extraction: Edges - Canny, LOG, DOG; Line detectors (Hough Transform), Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, GLOH, Scale-Space Analysis- Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT.

Module 5: Image Segmentation: Region Growing, Edge Based approaches to segmentation, Graph-Cut, Mean-Shift, MRFs, Texture Segmentation; Object detection.

Module 6: Pattern Analysis: Clustering: K-Means, K-Medoids, Mixture of Gaussians, Classification: Discriminant Function, Supervised, Un-supervised, Semi-supervised; Classifiers: Bayes, KNN, ANN models; Dimensionality Reduction: PCA, LDA, ICA; Non-parametric methods.

Module 7: Motion Analysis: Background Subtraction and Modeling, Optical Flow, KLT, Spatio-Temporal Analysis, Dynamic Stereo; Motion parameter estimation.

Module 8: Shape from X: Light at Surfaces; Phong Model; Reflectance Map; Albedo estimation; Photometric Stereo; Use of Surface Smoothness Constraint; Shape from Texture, color, motion and edges.

Text Books

1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited 2011.
2. Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, 2003

References

1. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.
2. K. Fukunaga; Introduction to Statistical Pattern Recognition, Second Edition, Academic Press, Morgan Kaufmann, 1990.

Professional Specific Elective Courses-III:

TITLE OF COURSE: DATA SCIENCE WITH PYTHON

COURSE CODE: DS503

L-T-P: 3-0-0

CREDITS: 3

Pre-requisite: This course is intended for learners who have a basic knowledge of programming in any language (Java, C, C++, Pascal, Fortran, Javascript, PHP, python, etc.).

Introduction:

This course will introduce the learner to the basics of the python programming environment, including fundamental python programming techniques such as lambdas, reading and manipulating csv files, and the numpy library. The course will introduce data manipulation and cleaning techniques using the popular python pandas data science library and introduce the abstraction of the Series and DataFrame as the central data structures for data analysis, along with tutorials on how to use functions such as groupby, merge, and pivot tables effectively. By the end of this course, students will be able to take tabular data, clean it, manipulate it, and run basic inferential statistical analyses.

Course Outcomes (CO):

After Completion of this course student able to understand:

CO1: Basic process of data science

CO2: Python and Jupyter notebooks



CO3: An applied understanding of how to manipulate and analyze unsaturated datasets

CO4: Basic statistical analysis and machine learning methods

CO5: How to effectively visualize results

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3				3				3		
CO2	3			3	2				3		
CO3	2	3	2						2		
CO4	3	1	3		3				3		
CO5	3			2				3	1		

Course Contents:

Module 1: Data Science, Jupyter Notebook System, Python Functions, Python Types and Sequences, Python More on Strings

Module 2: Python Demonstration: Reading and Writing CSV files, Python Dates and Times, Advanced Python Objects, map (), Advanced Python Lambda and List Comprehensions, Advanced Python Demonstration: The Numerical Python Library (NumPy).

Module 3: The Series Data Structure, querying a Series, The Data Frame Data Structure, Data Frame Indexing and Loading, querying a Data Frame, Indexing Data frames, Missing Values.

Module 4: Merging Data frames, Pandas Idioms, Group by, Scales, Pivot Tables, Date Functionality.

Module 5: introduced to a variety of statistical techniques such as distributions, sampling and t-tests, Distributions, More Distributions, Hypothesis Testing in Python.

Text Books

1. Learning Python, 5th Edition by Mark Lutz, O'Reilly Media, 2013. ISBN 978-1-4493-5573-9
2. Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython by Wes McKinney, O'Reilly Media, 2012. ISBN 978-1-4493-1979-3

Reference:

1. Clean Code: A Handbook of Agile Software Craftsmanship by Robert C. Martin, Prentice Hall, 2008. ISBN 000-0-1323-5088-2
2. The Linux Command Line: A Complete Introduction by William E. Shotts, Jr., No Starch Press, 2012. ISBN 978-1-5932-7389-7

TITLE OF COURSE: BLOCKCHAIN TECHNOLOGY

COURSE CODE: BC401

L-T-P: 3-0-0

CREDITS: 3

Pre-requisite: Basic concepts in networking.

Introduction:

This course describes basic blockchain technology in networking system. The Topics to be covered (tentatively) include: an introduction to blockchain, Crypto asset or Digital asset, Ethereum Blockchain,

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Bitcoin & Blockchain, Decentralized Systems and Ethereum Blockchain.

Course Outcomes (CO):

In this course we will study the basic components of blockchain. Students are expected to be capable of understanding the cryptocurrency, their advantages and drawbacks, how to implement them in blockchain, how their drawbacks can be overcome and what the applications are and where they can be used. To reach this goal, the following objectives need to be met:

CO1: Students would be able to design & implement any blockchain properly.

CO2: Students would be able to implement any problem by writing their own algorithm in blockchain.

CO3: By analyzing, students would be able to implement public private key combination in security.

CO4: To become an efficient blockchain developer.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	3	3		3				3		2
CO2	2			2				3	2	3	
CO3	2	1	2						1		2
CO4	3	3	3		2				3	1	

Course Contents:

Module-1: Basic introduction about blockchain in digital world, Crypto asset or Digital asset, Self Sovereign Identity, Smart Contract, Decentralized Business Model, Device to device communication in blockchain

Module-2: Network Security, Different type of network attack, Warm hole attack, byzantine attack, network based attack etc, Trust based Secure routing schemes.

Module-3: Bitcoin & Blockchain : Blockchain Structure, Basic Operations, Beyond Bitcoin, Gas , minor's role in blockchain.

Module-4: Ethereum Blockchain : Smart Contracts, Ethereum Structure, Ethereum Operations, Incentive Model in blockchain.

Module-5: Cryptography and crypto currency: Algorithms & Techniques Public-Key Cryptography, Public key and private key combinations in Blockchain security, Hashing, Transaction Integrity, Securing Blockchain.

Module-6: Decentralized Systems: Consensus Protocol, Practitioner's Perspective Decentralized Governance, Robustness, Forks.

Text Books

1. The Blockchain Developer: A Practical Guide for Designing, Implementing, Publishing, Testing, and Securing Distributed Blockchain-based Projects, by Elad Elrom, ISBN-13: 978-1484248461, ISBN-10: 1484248465

References

1. Blockchain Technology Explained: The Ultimate Beginner's Guide about Blockchain Wallet, Mining, Bitcoin, Ethereum, Litecoin, Zcash, Monero, Ripple, Dash, IOTA and Smart Contracts, by Alan T. Norman



TITLE OF COURSE: INTRODUCTION TO CRYPTOGRAPHY

COURSE CODE: IS401

L-T-P: 3-0-0

CREDITS: 3

Pre-requisite: Basic concepts in Networking and security.

Introduction:

This course examines data security in networking. The Topics to be covered (tentatively) include: an introduction to networking by cryptography, Basic symmetric-key encryption, Message integrity, Public key cryptography, Public key cryptography, Protocols.

Course Outcomes (CO):

In this course we will study the basic components of cryptography. Students are expected to be capable of understanding the cryptography, their advantages and drawbacks, how to implement them in python, how their drawbacks can be overcome and what the applications are and where they can be used. To reach this goal, the following objectives need to be met:

CO1: Students would be able to design & implement basic concept of cryptography properly.

CO2: Students would be able to implement any problem by writing their own algorithm.

CO3: By analyzing the logic of any algorithm, students would be able to implement crypto-data set.

CO4: To become an efficient crypto-data programmer.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

<u>CO</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PSO1</u>	<u>PSO2</u>
CO1	3	3	3		3				3		2
CO2	3			3					3	2	
CO3	3	3	3						3		3
CO4	3	3	3		3				3	2	

Course Contents:

Module-1: Basics overview of cryptography, Data security in networking, using cryptography in real world.

Module-2: Basic symmetric-key encryption, One time pad and stream ciphers, perfect secrecy and the one time pad, semantic security and stream ciphers, Block ciphers: Feistel networks and iterated Even-Mansour ciphers

Module-3: Message integrity: definition and applications, Collision resistant hashing, Merkle-Damgard and Davies-Meyer. MACs from collision resistance. Authenticated encryption: security against active attacks.

Module-4: Public key cryptography: Arithmetic modulo primes, Cryptography using arithmetic modulo primes, vanilla key exchange (Diffie-Hellman); the CDH and discrete-log assumptions, Public key encryption, semantically secure ElGamal encryption, CCA security, RSA and Rabin functions. Encrypt with trapdoor permutations.

Module-5: Digital signatures: definitions and applications. How to sign using RSA. Hash based signatures, certificates, certificate transparency, certificate revocation.

Module-6: Protocols: Identification protocols, Password protocols, salts; one time passwords (S/Key and SecurID), challenge response authentication, Authenticated key exchange and SSL/TLS session setup, Zero knowledge protocols, Cryptography in the age of quantum computers, Grover's algorithm and symmetric crypto, Shor's algorithm and public key crypto, post-quantum crypto: signatures and key

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exchange

Text Books

1. “Cryptography Kindle Edition” by WAGmob WAGmob; 1.0 edition (2 August 2013)
2. “Serious Cryptography: A Practical Introduction to Modern Encryption” Kindle Edition Jean-Philippe Aumasson

References

1. “The Handbook of Applied Cryptography” by Menezes, van Oorschot, and Vanstone

Professional Specific Elective Courses-IV:

TITLE OF COURSE: BIG DATA INTEGRATION & MODELING

COURSE CODE: BDA503

L-T-P: 3-0-0

CREDITS: 3

Pre-requisite: Completion of Intro to Big Data is recommended

Introduction:

Nowadays, huge volume of data is collected from many heterogeneous data sources which are generating data in real-time with different qualities — which is called Big Data. The big data integration is very challenging especially after the traditional data integration techniques failed to handle it.

Course Outcomes (CO):

The students will be able to:

CO1: Retrieve data from example database and big data management systems

CO2: Describe the connections between data management operations and the big data processing patterns needed to utilize them in large-scale analytical applications.

CO3: Identify when a big data problem needs data integration

CO4: Execute simple big data integration and processing on Hadoop and Spark platforms

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	3	3		3				3	2	
CO2	2			2					2		2
CO3	1	2					2		3	3	
CO4	3		1		1	3			1		2

Course Contents:

Module-1: introduction to big data integration and processing, big data modeling and management, why is big data processing different? What is data retrieval? querying two relations, subqueries, querying relational data with postgres.

Module-2: Retrieving Big Data: Querying JSON Data with MongoDB, Aggregation Functions, Querying Aerospike, Querying Documents in MongoDB, Exploring Pandas Data Frames.

Module-3: Big Data Integration: Overview of information integration, A Data integration Scenario, Integration for Multichannel Customer Analytics, Big Data Management and Processing Using Splunk and Datameer, why splunk?, Connected Cars with ford's OpenXC and Splunk, Big Data Management and Processing using Datameer, Installing splunk Enterprise on Windows, Installing splunk enterprise on Linux, Exploring Splunk Queries.

Module-4: Processing Big Data: Big Data Processing Pipelines, Some High-Level Processing Operations in Big Data Pipelines, Aggregation Operations in Big Data Pipelines, Typical Analytical Operations in Big Data Pipelines, Overview of Big Data Processing Systems, The Integration and Processing Layer, Introduction to Apache Spark, Getting Started with Spark, WordCount in Spark.

Module-5: Big Data Analytics using Spark: Spark Core: Programming In Spark using RDDs in Pipelines, Spark Core: Transformations, Spark Core: Actions, Spark SQL, Spark Streaming, Spark MLLib, Spark GraphX, Exploring SparkSQL and Spark DataFrames, Analyzing Sensor Data with Spark Streaming.

Textbooks:

- 1.Data Integration Blueprint And Modeling: Techniques For A Scalable And Sustainable Architecture (Paperback) (Ibm Press) 1st Edition By Anthony David Giordano
- 2.Managing Data In Motion: Data Integration Best Practice Techniques And Technologies (The Morgan Kaufmann Series On Business Intelligence) 1st Edition By April Reeve

Reference Books:

1. Principles of Data Integration 1st Edition by AnHai Doan, Alon Halevy , Zachary Ives

TITLE OF COURSE: CLOUD ARCHITECTURE & DEVELOPMENT MODEL

COURSE CODE: CC504

L-T-P: 3-0-0

CREDITS: 3

Pre-requisite: Knowledge is also assumed of basic concepts of grid computing and cloud computing introduction.

Introduction:

The objective is to study the architecture and deployment models to develop a private cloud using the open standards tools such as open stack. Cloud is the future of computing. It is about outsourcing of IT services and infrastructure to make them accessible remotely via the Internet. Utilizing cloud-computing models boosts not only productivity but also provide a competitive edge to organizations. The growing popularity of cloud computing has given rise to different types of cloud service deployment models and strategies. Therefore, today there exists a variety of enterprise cloud solutions depending on the degree of desired outsourcing needs.

Course Outcomes (CO):

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

CO1: Understand the architecture and deployment model of cloud computing.

CO2: Understand the architecture and components related to open stack.

CO3: Understand other open standards tools for deploying a private cloud such as Eucalyptus.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	3	3		2				3		2



CO2	2			3					2	2	
CO3	3		2						3		1

Course Contents:

Module-1: Definition of cloud computing, Delivery Models, Conceptual reference model, Cloud Computing solution components.

Module-2: Cloud computing Architecture: The conceptual reference model, Service Deployment, Cloud service management, cloud taxonomy, IBM CC RA, Common cloud management platform. Case Study: IBM Smart Cloud Entry, VMware vCloudDirector.

Module-3: Cloud vendor selection: SLA, Security and privacy, periodic update and maintenance, data location and Jurisdiction, Measurability, Pricing, Interoperability and lock in, Exit process, track record.

Module-4: Open Stack: Definition, Advantages, Releases, Architectural overview, Different components of Open Stack, Open stack- Hypervisors, Network Services, Storage- Block Storage, Object Storage, Choosing Storage Backends, Commodity Storage Backend Technologies: swift, Ceph, Gluster, LVM, ZFS.

Module-5: Advance concepts in Openstack: Multiserver Openstack, Tenant model architecture, Cloud orchestration using OpenStack using OpenStack Heat and Ubuntu Juju. Eucalyptus: Introduction, Features and Functionality, Architecture, Basic and Advanced Components. Eucalyptus vs Openstack. OpenNebula: Introduction, Features and Functionality, Architecture, Basic and Advanced Components. OpenNebula vs Openstack

Text Books:

1. Raj Kumar Buyya, James Broberg, Andrezei M. Goscinski (2011), Cloud Computing: Principles and paradigms.
2. Rittinghouse, John, W, Cloud computing: Implementation, management and security

Reference Book:

1. Barrie Sosinsky (2011), Cloud Computing Bible, Wiley.
2. Bumgardner, V. C. (2016). OpenStack in action. Manning Publications Company.

TITLE OF COURSE: MACHINE LEARNING TECHNIQUES

COURSE CODE: AIML502

L-T-P: 3-0-0

CREDITS: 3

Pre-Requisites: Fundamental knowledge of computer science principles and skills, probability and statistics theory, and the theory and application of linear algebra are required.

Introduction:

Machine learning uses interdisciplinary techniques such as statistics, linear algebra, optimization, and computer science to create automated systems that can sift through large volumes of data at high speed to make predictions or decisions without human intervention.

Course Outcomes (CO):

By the end of the course, students should be able to

CO1: Differentiate various Learning Approaches, and to interpret the Concepts of Supervised Learning.

CO2: Compare the different dimensionality reduction techniques.

CO3: Apply theoretical foundations of Decision Trees to identify best split and Bayesian Classifier to Label data points.

CO4: Illustrate the working of classifier models Like SVM, Neural Networks and Deep Neural Networks Classifier Model for typical Machine Learning Applications.

CO5: Illustrate and apply clustering algorithms and identify Its applicability in real life problems.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO1	3	3	3	3					3	2	3
CO2	3	3	3	3					3	2	2
CO3	3	3	3	3		3			3	2	
CO4	3	3	3	3					3		1
CO5	3	3	3	3					3	3	2

Course Contents:

Module-1: Introductions, Basic definitions, types of learning, hypothesis space and inductive bias, evaluation, cross-validation

Module-2: Linear regression, Decision trees, overfitting

Module-3: Instance based learning, Feature reduction, Collaborative filtering-based recommendation, Probability and Bayes learning

Module-4: Logistic Regression, Support Vector Machine, Kernel function and Kernel SVM

Module-5: Neural network, Perceptron, multilayer network, backpropagation, introduction to deep neural network

Module-6: Computational learning theory, PAC learning model, Sample complexity, VC Dimension, Ensemble learning

Text Books

1. Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997.
2. Introduction to Machine Learning Edition 2, by EthemAlpaydin

References

1. Baldi, P. and Brunak, S. (2002). Bioinformatics: A Machine Learning Approach. Cambridge, MA: MIT Press.