Department of Computer Science and Application

Atal Bihari Vajpayee Vishwavidyalaya, Bilaspur (C.G.)

Scheme and Syllabus

of

B.Sc. (Hons) Computer Science

(w.e.f. Academic Session 2019-20)

Program Code: BCSH2002

Background/Preamble:

Ministry of Human Resource Development (HRD), Govt. of India, has already initiated the process for developing New Education Policy (NEP) in our country to bring out reforms in Indian education system. University Grants Commission (UGC) participates more actively in developing National Education Policy, its execution and promotion of higher education in our country. The UGC has already initiated several steps to bring equity, efficiency and academic excellence in National Higher Education System. The important ones include innovation and improvement in course- curricula, introduction of paradigm shift in learning and teaching pedagogy, examination and education system. The education plays enormously significant role in 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 produces young minds lacking knowledge, confidence, values and skills. It could be because of complete lack of relationship between education, employment and skill development in conventional education system. The present alarming situation necessitates transformation and/or redesigning of education system, not only by introducing innovations but developing "learner-centric approach in the entire education delivery mechanism and globally followed evaluation system as well. 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 and aims can choose interdisciplinary, intra-disciplinary and skill-based courses. This can only be possible when choice based credit system (CBCS), an internationally acknowledged system, is adopted.

Choice Based Credit System (CBCS)

The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill based courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Therefore, it is necessary to introduce uniform grading system in the entire higher education in India. This will benefit the students to move across institutions within India to begin with and across countries. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on student's performance in examinations, the UGC has formulated the guidelines to be followed.

The choice based credit system not only offers opportunities and avenues to learn core subjects but also exploring additional avenues of learning beyond the core subjects for holistic development of an individual. The CBCS will undoubtedly facilitate us bench mark our courses with best international academic practices. The CBCS has more advantages than disadvantages. 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. For example, Physics with Economics, Microbiology with Chemistry or Environment Science etc. 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.

Outline of Choice Based Credit System:

1. **Core Course:** A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.

2. **Elective Course:** Generally a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/ subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.

   Discipline Specific Elective (DSE) Course: Elective courses may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective. The University/Institute may also offer discipline related Elective courses of interdisciplinary nature (to be offered by main discipline/subject of study).

   Dissertation/Project: An elective course designed to acquire special/advanced knowledge, such as supplement study/support study to a project work, and a candidate studies such a course on his own with an advisory support by a teacher/faculty member is called dissertation/project.

   Generic Elective (GE) Course: An elective course chosen generally from an unrelated discipline/subject, with an intention to seek exposure is called a Generic Elective.

   P.S.: A core course offered in a discipline/subject may be treated as an elective by other discipline/subject and vice versa and such electives may also be referred to as Generic Elective.

3. **Ability Enhancement Courses (AEC)/Competency Improvement Courses/Skill Development Courses/Foundation Course:** The Ability Enhancement (AE) Courses may be of two kinds: AE Compulsory Course (AECC) and AE Elective Course (AEEC). "AECC" courses are the courses based upon the content that leads to Knowledge enhancement. They ((i) Environmental Science, (ii) English/MIL Communication) are mandatory for all disciplines. AEEC courses are value-based and/or skill-based and are aimed at providing hands-on-training, competencies, skills, etc.

AE Compulsory Course (AECC): Environmental Science, English Communication/MIL Communication.

AE Elective Course (AEEC): These courses may be chosen from a pool of courses designed to provide value-based and/or skill-based instruction.

4. Study Webs of Active-learning for Young Aspiring Minds (SWAYAM)

As per 'Digital India' Initiative, MHRD has initiated to develop & make available 'Massive Online Open Courses (MOOCs)' to the learners throughout the country. The Ministry of HRD, has accordingly embarked on a major and new initiative called 'Study Webs of Active Learning for Young Aspiring Minds' (SWAYAM), which will provide one integrated platform and portal for online courses, using information and communication technology (ICT) and covering all higher education subjects and skill sector courses to ensure that the every student in our country has access to the best quality higher education at the affordable cost.

SWAYAM is initiated by Government of India, to take best teaching learning resources to all, including the most disadvantaged. The three cardinal principles of Education Policy viz., access, equity and quality shall be achieved by providing high quality e-content to all learners in the country through SWAYAM. Courses delivered through SWAYAM are available free of cost to the learners, are delivered by best of the teaching fraternity.

The MHRD has developed a detailed "MOOCs Guidelines, 2017" (Page 71-86) and funding for development & delivery of MOOCs is being provided by MHRD through institutions. The courses hosted on SWAYAM are developed in 4 quadrants –

1. **e-Tutorial**: video lecture using audio-video, multi-media, animation and state of the art pedagogy / technology)

2. **e-Text:** specially prepared reading material that can be downloaded / printed

3. **Discussion forum:** for raising doubts and clarifying them on a near real time basis by Course Coordinator or his team

4. **Assignments:** which shall contain; Problems and Solutions that could be in the form of Multiple Choice Questions, Fill in the blanks, Matching Questions, Short Questions, Long Questions, Quizzes, Assignments and solutions, FAQs and providing Clarifications on general misconceptions. Assignments are checked & assessment/ feedback made available to registered students.

UGC and AICTE have issued 'Credit Framework for online learning courses through SWAYAM, Regulation 2016 (http://www.ugc.ac.in/pdfnews/0272836_moocs.pdf); allowing up to 20% Online courses taken through SWAYAM, to be counted for credit. Grades earned by successful students studying in conventional Institutes shall be transferred to the academic record of such Students. The MHRD, with effect from 16th November 2016, has on Trial basis, made public the SWAYAM portal "https://swayam.gov.in".

The proposed scheme and syllabus is as per strict guidelines of UGC and SWAYAM regulation and also based on learning outcome.

Programme Learning Outcomes for B.Sc. (Hons) Computer Science

On completion of this programme, the students are expected to:

PO1: Apply knowledge of computing fundamentals, computing specialization, mathematics, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements.

PO2: Identify, formulate, research literature, and solve complex computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines.

PO3: Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.

PO4: Demonstrate knowledge and understanding of the computing 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.

PO5: Communicate effectively with the computing community, and with society at large, about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.

PO6: Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

PO7: Be able to develop software project in various languages as per the demand of the market.

PO8: Be able to work on research based project.

B.Sc. (Hons) Computer Science

Scheme under CBCS as per UGC guidelines

Semester I

Course Category	Course Category code	Course Code	Subject Name	Credit			TOTAL	Marks							
								Theory				Practical			
				L	P	T		ESE	IA	Total		ESE	IA	Total	
								Max	Max	Max	Min	Max	Max	Max	Min
Core Course (CC)	CC-1	BCS-101	Operating System	5	-	1	6	75	25	100	40	-	-	-	-
	CC-2	BCS-102	Computer System Architecture	5	-	1	6	75	25	100	40	-	-	-	-
Ability Enhancement Compulsory Course (AECC)	AECC-1	BCS-103	English Communication	4	-	-	4	75	25	100	40	-	-	-	-
General Elective (GE)	GE-1 & GE-1(P) (Any One Group)	BCS-104	Group -A Computer Fundamentals	4	-	-	4	75	25	100	40	-	-	-	-
		BCS-105	Computer Fundamentals Lab	-	2	-	2	-	-	-	-	75	25	100	40
		BCS-106	Group -B PC Package	4	-	-	4	75	25	100	40	-	-	-	-
		BCS-107	PC Package Lab	-	2	-	2	-	-	-	-	75	25	100	40
Extra Curricular Activity (ECA)	ECA*	BCS-108	General Interest/Hobby/ Sports/NCC/NSS/ Swachh Bharat internship/ Summer Internship/SWAYAM course/Others Activities	-	2	-	(2)	-	-	-	-	-	100	100	40
				Total Credit-22+2*				Total Theory Marks - 400				Total Practical Marks:100			
														Total Marks:500	

Abbreviations:- L – Lecture, P – Practical, T – Tutorial, ESE – End Semester Exam, IA – Internal Assessment.

ECA:- Additional subject student has to opt ECA, in any two semester from Ist to IVth .

Note: Student can obtain online course of any one subject from the list as per the credit and subject name of the SWAYAM courses, which is to be notified by the department before the commencement of each semester in lieu of any one subject.

Semester II

Course Category	Course Category code	Course Code	Subject Name	Credit			TOTAL	Marks							
								Theory				Practical			
				L	P	T		ESE	IA	Total		ESE	IA	Total	
								Max	Max	Max	Min	Max	Max	Max	Min
Core Course (CC)	CC-3	BCS-201	Programming Fundamentals using C/C++	4	-	-	4	75	25	100	40	-	-	-	-
	CC-3 (P)	BCS-202	Programming Fundamentals using C/C++ Lab	-	2	-	2	-	-	-	-	75	25	100	40
	CC-4	BCS-203	Discrete Structure	5	-	1	6	75	25	100	40	-	-	-	-
Ability Enhancement Compulsory Course (AECC)	AECC-2	BCS-204	Environmental Science	4	-	-	4	75	25	100	40	-	-	-	-
General Elective (GE)	GE-2 & GE-2(P) (Any One Group)	BCS-205	Group - A Digital Electronics	4	-	-	4	75	25	100	40	-	-	-	-
		BCS-206	Digital Electronics Lab	-	2	-	2	-	-	-	-	75	25	100	40
		BCS-207	Group - B Introduction to Programming	4	-	-	4	75	25	100	40	-	-	-	-
		BCS-208	Introduction to Programming Lab	-	2	-	2	-	-	-	-	75	25	100	40
Extra Curricular Activity (ECA)	ECA*	BCS-209	General Interest/Hobby/ Sports/NCC/NSS/ Swachh Bharat internship/ Summer Internship/SWAYAM course/Others Activities	-	2	-	(2)	-	-	-	-	-	100	100	40
				Total Credit- 22+2*				Total Theory Marks - 400				Total Practical Marks:200			
														Total Marks:600	

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Semester III

Course Category	Course Category code	Course Code	Subject Name	Credit			TOTAL	Marks							
								Theory				Practical			
				L	P	T		ESE	IA	Total		ESE	IA	Total	
								Max	Max	Max	Min	Max	Max	Max	Min
Core Course (CC)	CC-5	BCS-301	Internet Technologies	5	-	1	6	75	25	100	40	-	-	-	-
	CC-6	BCS-302	Computer Network	5	-	1	6	75	25	100	40	-	-	-	-
	CC-7	BCS-303	Data Structure	4	-	-	4	75	25	100	40	-	-	-	-
	CC-7 (P)	BCS-304	Data Structure Lab	-	2	-	2	-	-	-	-	75	25	100	40
Skill Enhancement Course (SEC)	SEC-1	BCS-305	HTML Programming	1	1	-	2	75	25	100	40	-	-	-	-
General Elective (GE)	GE-3 (Any One)	BCS-306	Operation Research	5	-	1	6	75	25	100	40	-	-	-	-
		BCS-307	E-Commerce	5	-	1	6	75	25	100	40	-	-	-	-
Extra Curricular Activity (ECA)	ECA*	BCS-308	General Interest/Hobby/ Sports/NCC/NSS/ Swachh Bharat internship/ Summer Internship/SWAYAM course/Others Activities	-	2	-	(2)	-	-	-	-	-	100	100	40
				Total Credit- 24+2*				Total Theory Marks - 500				Total Practical Marks:100			
														Total Marks:600	

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ECA:- Additional subject student has to opt ECA, in any two semester from Ist to IVth .

Note: Student can obtain online course of any one subject from the list as per the credit and subject name of the SWAYAM courses, which is to be notified by the department before the commencement of each semester in lieu of any one subject.

Semester IV																
Course Category	Course Category code	Course Code	Subject Name	Credit			TOTAL	Marks								
								Theory				Practical				
				L	P	T		ESE	IA	Total		ESE	IA	Total		
								Max	Max	Max	Min	Max	Max	Max	Min	
Core Course (CC)	CC-8	BCS-401	Artificial Intelligence	5	-	1	6	75	25	100	40	-	-	-	-	
	CC-9	BCS-402	Software Engineering	5	-	1	6	75	25	100	40	-	-	-	-	
	CC-10	BCS-403	Database management Systems	5	-	1	6	75	25	100	40	-	-	-	-	
Skill Enhancement Course (SEC)	SEC-2	BCS-404	Oracle (SQL\PL-SQL)	1	1	-	2	75	25	100	40	-	-	-	-	
General Elective (GE)	GE-4 & GE-4(P) (Any One Group)	BCS-405	Group - A Programming in Python	4	-	-	4	75	25	100	40	-	-	-	-	
		BCS-406	Programming in Python Lab	-	2	-	2	-	-	-	-	75	25	100	40	
		BCS-407	Group - B Introduction to Database System	4	-	-	4	75	25	100	40	-	-	-	-	
		BCS-408	Introduction to Database System Lab	-	2	-	2	-	-	-	-	75	25	100	40	
Extra Curricular Activity (ECA)	ECA*	BCS-409	General Interest/Hobby/ Sports/NCC/NSS/ Swachh Bharat internship/ Summer Internship/SWAYAM course/Others Activities	-	2	-	(2)	-	-	-	-	-	100	100	40	
				Total Credit- 24+2*				Total Theory Marks - 500				Total Practical Marks:100				
																Total Marks:600

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ECA:- Additional subject student has to opt ECA, in any two semester from Ist to IVth .

Note: Student can obtain online course of any one subject from the list as per the credit and subject name of the SWAYAM courses, which is to be notified by the department before the commencement of each semester in lieu of any one subject.

Semester V																
Course Category	Course Category code	Course Code	Subject Name	Credit			TOTAL	Marks								
								Theory				Practical				
				L	P	T		ESE	IA	Total		ESE	IA	Total		
								Max	Max	Max	Min	Max	Max	Max	Min	
Core Course (CC)	CC-11	BCS-501	Theory of Computation	5	-	1	6	75	25	100	40	-	-	-	-	
	CC-12	BCS-502	Programming in JAVA	5	-	1	6	75	25	100	40	-	-	-	-	
	CC-12 (P)	BCS-503	Programming in JAVA Lab	-	2	-	2	-	-	-	-	75	25	100	40	
Discipline Specific Elective (DSE)	DSE-1 (Any One)	BCS-504	Numerical Methods	5	-	1	6	75	25	100	40	-	-	-	-	
		BCS-505	Microprocessor													
	DSE-2 (Any One group)		Group -A													
		BCS-506	Machine Learning	4	-	-	4	75	25	100	40	-	-	-	-	
		BCS-507	Machine Learning Lab	-	2	-	2	-	-	-	-	75	25	100	40	
			Group -B													
		BCS-508	Introduction to Data Science	4	-	-	4	75	25	100	40	-	-	-	-	
		BCS-509	Introduction to Data Science Lab	-	2	-	2	-	-	-	-	75	25	100	40	
Total Credit- 26								Total Theory Marks - 400				Total Practical Marks:200				
Total Marks:600																

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Note: Student can obtain online course of any one subject from the list as per the credit and subject name of the SWAYAM courses, which is to be notified by the department before the commencement of each semester in lieu of any one subject.

Semester VI																
Course Category	Course Category code	Course Code	Subject Name	Credit			TOTAL	Marks								
								Theory				Practical				
				L	P	T		ESE	IA	Total		ESE	IA	Total		
								Max	Max	Max	Min	Max	Max	Max	Min	
Core Course (CC)	CC 13	BCS-601	Design and Analysis of Algorithms	5	-	1	6	75	25	100	40	-	-	-	-	
	CC 14	BCS-602	Computer Graphics	5	-	1	6	75	25	100	40	-	-	-	-	
Discipline Specific Elective (DSE)	DSE-3 (Any one)	BCS-603	Research based Project Work / Dissertation	-	6	-	6	-	-	-	-	100	-	100	40	
		BCS-604	Application based Project Work / Dissertation	-	6	-	6	-	-	-	-	100	-	100	40	
	DSE-4 (Any One group)	BCS-605	Group -A Big Data Analytics	4	-	-	4	75	25	100	40	-	-	-	-	
		BCS-606	Big Data Analytics Lab	-	2	-	2	-	-	-	-	75	25	100	40	
		BCS-607	Group -B Soft Computing	4	-	-	4	75	25	100	40	-	-	-	-	
		BCS-608	Soft Computing Lab	-	2	-	2	-	-	-	-	75	25	100	40	
							Total Credit- 24			Total Theory Marks - 300				Total Practical Marks:200		
														Total Marks:500		
							Grand Total Credit – 146							Grand Total Marks : 3400		

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Note: Student can obtain online course of any one subject from the list as per the credit and subject name of the SWAYAM courses, which is to be notified by the department before the commencement of each semester in lieu of any one subject.

BCS-101 OPERATING SYSTEMS

Core Course: 01 **Marks: 100**
Total Credit: 06

Course Outcome: At the end of course, Students will be able to

- Demonstrate need for operating system and different types of operating system.
- Apply suitable techniques for management of different resources.
- Use processor, memory, storage and file system commands.
- Understand the process management policies and scheduling of processes by CPU.
- Evaluate the requirement for process synchronization and coordination handled by operating system.

UNIT-I

Introduction:

Definition, Basic Functions of Operating System, Types of Operating System, Micro Kernel and Monolithic Operating System, Operating-System Operations, Operating system services, System Call.

UNIT-II

Process Management:

Process, Process State, Process Control Block, Process Scheduling, CPU Scheduling: Scheduling criteria, scheduling algorithms; Inter-process communication.
Classical IPC problems: Producer Consumer problem, Peterson's Solution, Dinning Philosophers problem, Semaphores. Deadlock: Necessary Conditions, deadlock handling methods: Deadlock Prevention, Deadlock detection and recovery, Deadlock avoidance, Bankers Algorithm.

UNIT-III

Memory Management:

Contiguous Memory allocation, Paging, Segmentation, Virtual Memory, Demand Paging, Page Replacement, Thrashing.

UNIT-IV

File Management:

File Concept, Access Methods, Directory Structure, File System Structure, File System Implementation, Directory Implementation, Allocation Methods, Free-space Management, and Recovery.

UNIT-V:

I/O Management:

I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O to Hardware Operations, Disk Structure, Disk Scheduling, Disk Management.

TEXT/REFERENCE BOOKS:

1. "An Introduction to Operating Systems", H. M. Dietal, Addition Wiley.
2. "Modern Operating Systems", Andrew S Tanenbaum.
3. "Operating System Concepts", 2nd Edition - Peterson &Silberschatz, Addison Wiley.
4. "Operating Systems", Mardrick and Donovan, Mcgraw Hill.
5. "Principles of Operating Systems", Ullman, Galgotia Publications.
6. "Operating System Concepts", Galvin &Silberschatz, Addison Wiley, (Latest Edition)

BCS-102 COMPUTER SYSTEM ARCHITECTURE

Core Course: 02 **Marks: 100**
Total Credit: 06

Course Outcome: At the end of course, Students will be able to

- Introduce the basic organization of computer system.
- Describe control unit operations and conceptualize instruction level parallelism.
- Demonstrate and perform computer arithmetic operations on integer and real numbers.
- Categorize memory organization and explain the function of each element of a memory hierarchy.
- Identify and compare different methods for computer I/O mechanisms

UNIT-I
Introduction to Computer Organization:
Von Neumann Architecture, Harvard Architecture, Functional Units and Components in Computer Organization, Instruction Codes, Computer Registers, Computer Instructions, Instruction cycle.

UNIT-II
Central Processing Unit:
Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, RISC, CISC.

UNIT-III
Pipeline & Vector Processing:
Basic Concepts in Pipelining, Speed-Up, Throughput, Efficiency, Instruction pipeline, Arithmetic pipeline, Vector Processing, Instruction Pre-Fetch and Branch Handling, Data Buffering, Internal Forwarding, Data Dependent Hazards.

UNIT-IV
Memory Organization:
Memory Hierarchy, Main memory, Auxiliary memory, Associative memory, Cache memory, Virtual memory, Memory Management Hardware.

UNIT-V
Input-Output Organization:
Peripheral Devices, I/O Interface, Programmed I/O, Interrupt-Driven I/O, Direct memory Access, Memory mapped I/O.

TEXT BOOKS:
1. "Computer System Architecture", M Moris Mano, 3rd Edition, PHI / Pearson, 2006.
2. "Computer Organization and Architecture", William Stallings 7th Edition, PHI/Pearson, 2006.

REFERENCE BOOKS:
1. "Computer Organization", Car Hamacher, ZvonksVranesic&SafwatZaky, 5th Edition, TMH, 2002.
2. "Computer Architecture and Organization", John P. Hayes, TMH International Editions, 1998.
3. "Computer Architecture and Organization", Raj Kamal, Nicholas Carter, 2nd Edition, TMH Education, 2009

4. "Introduction to computer architecture", Stones S. Galgotia Publication
5. "Computer Organization and Architecture design for Performance", 4th edition - W. Stallings, PHI
6. "Computer Engineering - Hardware Design", M. Morris Mano, PHI
7. "Computer Architecture and parallel processing", Kai Hwang & Faye Briggs, McGraw hill, 1985

BCS-103 ENGLISH COMMUNICATION

Ability Enhancement Compulsory Course (AECC) -01 **Marks: 100**
Total Credit: 04

Course Outcome: At the end of course, Students will be able to

- Communicate effectively and appropriately in real-life situation.
- Use English effectively for study purpose across the curriculum.
- Develop and integrate the use of the four language skills i.e. Reading, Listening, Speaking, Writing.
- Revise and reinforce structure already learnt.
- Understand the usage of grammar.

Unit-I
Fundamental of Communication:
Definition, Importance, Process, Form of Communication, Dimension of Communication, Channels of Communication, Barriers of Communication, Qualities of a good communicator.

Unit-II
Verbal and Non-Verbal Communication:
Audio/Visual Communication, Effective Speaking, Interpersonal Communication, Non-Verbal Communication: Kinesics, Proxemics, Paralanguage, Activity: Short Classroom presentation.

Unit-III
Listening Skill and Self-Assessment:
Definition and Importance, Intelligent Listening, Barriers of Listening and qualities of overcoming barriers, SWOT analysis.

Unit-IV
Writing Skills:
Use of Grammars, brief description & detailed Illustrations, Business correspondence, Presentations, Report Writing, Projects, notice and Circulars.

Unit-V
Communication Skills:
Effective Use of Communication Skills(Practical Approach) Basics of Phonetics, Presentation Skill-Do's and Don'ts, Extempore, Debate, Role Plays, Interview, Group Discussion.

TEXT/ REFERENCES BOOKS:

1. P K Agrawal and AK Mishra, Business Communication, SahityaBhawan Publication.
2. Vinod Mishra and Narendra Sukla, Business Communication, SBPD Publishing House.
3. N Gupta and P Mahajan, Business Communication, SahityaBhawan Publication.

BCS-104 COMPUTER FUNDAMENTALS

Generic Elective (GE): 01 **Marks: 100**
Total Credit: 04

Course Outcome: At the end of course, Students will be able to

- Understand the concept of input and output devices and the basic terminologies used in the computer.
- Understand the Programming, flow chart symbols, complete and correct flow chart algorithms, create a program based on a flow chart.
- Identify categories of programs, system software and applications. Organize and work with files and folders
- Utilize the Internet Web resources and evaluate on-line e-business system.
- Solve common business problems using appropriate Information Technology applications and systems.

UNIT-I
Introduction to Computer:
Concept of data and information, History of computer, Generation and Classification of computers, Organization of computers, Input and output devices, Storage devices.

UNIT-II
Introduction to Programming:
Introduction and evolution of programming language, types of programming language, characteristics of a good programming language, programming paradigms: procedural oriented and object oriented programming. Planning the computer program: algorithm, representation of algorithms, flowchart, flowchart symbols, advantages and limitations of flowchart, Pseudo code: definition, pseudo codes for basic control structures, advantages and limitations of pseudo code.

UNIT-III
Software & its types:
Software and its need, types of software: system software, application software, utility software, firmware, middleware; Software development life cycle (SDLC).
Software Engineering: Definition, need, goal, principles.

UNIT-IV
Introduction to Internet:
Definition, history of internet, basic services of internet, uses of internet, internet search engine; Internet security: firewall, encryption.

UNIT-V
Application of IT:
IT in business, Industry, home, education, entertainment, science, engineering and medicine. Ecommerce, M-commerce.

Latest IT trends: Artificial intelligence, Data mining, Cloud computing, Big Data.

TEXT/REFRENCEBOOKS:

1. "Computer Fundamentals", P.K. Sinha, BPB Publication
2. "Fundamental of computer ", V. Rajaraman, PHI Publication
3. "Introduction to information technology", V. Rajaraman, PHI Publication
4. "Information Technology today" , S. Jaiswal
5. "Fundamental of IT", Leon and Leon , Leon Tec world
6. "Introduction to Information Technology", Aksoy and Denardis, Cengage learning.

BCS-105 COMPUTER FUNDAMENTALS LAB

Generic Elective (GE-01):(P) **Marks: 100**
Total Credit: 02

Course Outcome: At the end of course, Students will be able to

- Learn Modern office activities and their software requirements.
- Create a new Word document and formatting a document using MS-WORD.
- Create an electronic spreadsheet using MS-Excel, familiarize oneself with Excel's basic and advance features.
- Create a slide show presentation and explore the Microsoft Office PowerPoint environment.

Practical exercises based on MS Office/ Open Office tools using document preparation and spreadsheet handling packages.

MS Word

1. Prepare **a grocery list** having four columns (Serial number, the name of the product, quantity and price) for the month of April, 06.
   - Font specifications for Title (Grocery List): 14-point Arial font in bold and italics.
   - The headings of the columns should be in 12-point and bold.
   - The rest of the document should be in 10-point Times New Roman.
   - Leave a gap of 12-points after the title.

2. Create a **telephone directory**.
   - The heading should be 16-point Arial Font in bold.
   - The rest of the document should use 10-point font size.
   - Other headings should use 10-point Courier New Font.
   - The footer should show the page number as well as the date last updated.

3. Design a **time-table form** for your college.
   - The first line should mention the name of the college in 16-point Arial Font and should be bold.
   - The second line should give the course name/teacher's name and the department in 14-point Arial.
   - Leave a gap of 12-points.
   - The rest of the document should use 10-point Times New Roman font.
   - The footer should contain your specifications as the designer and date of creation.

4. XYZ Publications plans to release a new book designed as per your syllabus. Design the **First page of the book** as per the given specifications.
   - The title of the book should appear in bold using 20-point Arial font.
   - The name of the author and his qualifications should be in the center of the page in 16-point Arial font.
   - At the bottom of the document should be the name of the publisher and address in 16-point Times New Roman.
   - The details of the offices of the publisher (only location) should appear in the footer.

5. Create the following one page documents.
   - Compose a note inviting friends to a get-together at your house, including a list of things to bring with them.
   - Design a certificate in landscape orientation with a border around the document.

- Design a Garage Sale sign.
- Make a sign outlining your rules for your bedroom at home, using a numbered list.

6. Create the following documents:
   - A newsletter with a headline and 2 columns in portrait orientation, including at least one image surrounded by text.
   - Use a newsletter format to promote upcoming projects or events in your classroom or college.

7. Convert following text to a table, using comma as delimiter
   Type the following as shown (do not bold).

Color, Style, Item
Blue, A980, Van
Red, X023, Car
Green, YL724, Truck
Name, Age, Sex
Bob, 23, M
Linda, 46, F
Tom, 29, M

8. Enter the following data into a table given on the next page.

Salesperson	Dolls	Trucks	Puzzles
Kennedy, Sally	1327	1423	1193
White, Pete	1421	3863	2934
Pillar, James	5214	3247	5467
York, George	2190	1278	1928
Banks, Jennifer	1201	2528	1203
Atwater, Kelly	4098	3079	2067
Pillar, James	5214	3247	5467
York, George	2190	1278	1928
Banks, Jennifer	1201	2528	1203
Atwater, Kelly	4098	3079	2067

Add a column Region (values: S, N, N,S,S,S) between the Salesperson and Dolls columns to the given table Sort your table data by Region and within Region by Salesperson in ascending order:
In this exercise, you will add a new row to your table, place the word "Total" at the bottom of the Salesperson column, and sum the Dolls, Trucks, and Puzzles columns.

9. Wrapping of text around the image.

MS Excel

1. Enter the Following data in Excel Sheet

REGIONAL SALES PROJECTION

State	Qtr1	Qtr2	Qtr3	QTR4	Qtr Total	Rate	Amount
Delhi	2020	2400	2100	3000		15	
Punjab	1100	1300	1500	1400		20	
U.P.	3000	3200	2600	2800		17	
Haryana	1800	2000	2200	2700		15	
Rajasthan	2100	2000	1800	2200		20	
TOTAL							
AVERAGE							

(a) Apply Formatting as follow:

i. Title in TIMES NEW ROMAN
ii. Font Size - 14
iii. Remaining text - ARIAL, Font Size -10
iv. State names and Qtr. Heading Bold, Italic with Gray Fill Color.
v. Numbers in two decimal places.
vi. Qtr. Heading in center Alignment.
vii. Apply Border to whole data.

(b) Calculate State and Qtr. Total
(c) Calculate Average for each quarter
(d) Calculate Amount = Rate * Total.

2. Given the following worksheet

	A	B	C	D
1	Roll No.	Name	Marks	Grade
2	1001	Sachin	99	
3	1002	Sehwag	65	
4	1003	Rahul	41	
5	1004	Sourav	89	
6	1005	HarBhajan	56	

Calculate the grade of these students on the basis of following guidelines:

If Marks	Then Grade
>=80	A+
>= 60 < 80	A
>= 50 < 60	B
< 50	F

3. Given the following worksheet

A	B	C	D	E	F	G

1	**Salesman**		**Sales in (Rs.)**				
2	No.	Qtr1	Qtr2	Qtr3	Qtr4	Total	Commission
3	S001	5000	8500	12000	9000		
4	S002	7000	4000	7500	11000		
5	S003	4000	9000	6500	8200		
6	S004	5500	6900	4500	10500		
7	S005	7400	8500	9200	8300		
8	S006	5300	7600	9800	6100		

Calculate the commission earned by the salesmen on the basis of following Candidates:

If Total Sales	**Commission**
< 20000	0% of sales
> 20000 and < 25000	4% of sales
> 25000 and < 30000	5.5% of sales
> 30000 and < 35000	8% of sales
>= 35000	11% of sales

The total sales is sum of sales of all the four quarters.

4. A company XYZ Ltd. pays a monthly salary to its employees which consists of basic salary, allowances & deductions. The details of allowances and deductions are as follows:

- HRA Dependent on Basic
  30% of Basic if Basic <=1000
  25% of Basic if Basic>1000 & Basic<=3000
  20% of Basic if Basic >3000

- DA Fixed for all employees, 30% of Basic

- Conveyance Allowance Rs. 50/- if Basic is <=1000
  Rs. 75/- if Basic >1000 & Basic<=2000
  Rs. 100 if Basic >2000

- Entertainment Allowance NIL if Basic is
  <=1000 Rs. 100/- if Basic > 1000

Deductions

- Provident Fund 6% of Basic

- Group Insurance Premium Rs. 40/- if Basic is <=1500
  Rs. 60/- if Basic > 1500 & Basic<=3000
  Rs. 80/- if Basic >3000

Calculate the following:

Gross Salary = Basic + HRA + DA + Conveyance + Entertainment

Total deduction = Provident Fund + Group Insurance Premium

Net Salary= Gross Salary – Total Deduction

5. Create Payment Table for a fixed Principal amount, variable rate of interests and time in the format below:

No. of Instalments	5%	6%	7%	8%	9%
3	XX	XX	XX	XX	XX
4	XX	XX	XX	XX	XX
5	XX	XX	XX	XX	XX
6	XX	XX	XX	XX	XX

6. Use an array formula to calculate Simple Interest for given principal amounts given the rate of Interest and time

Rate of Interest	8%
Time	5 Years

Principal	Simple Interest
1000`	?
18000	?
5200	?

7. The following table gives year wise sale figure of five salesmen in Rs.

Salesman	2000	2001	2002	2003
S1	10000	12000	20000	50000
S2	15000	18000	50000	60000
S3	20000	22000	70000	70000
S4	30000	30000	100000	80000
S5	40000	45000	125000	90000

(a) Calculate total sale year wise.

(b) Calculate the net sale made by each salesman

(c) Calculate the maximum sale made by the salesman

(d) Calculate the commission for each salesman under the condition.

(i) If total sales >4,00,000 give 5% commission on total sale made by the salesman.

(ii) Otherwise give 2% commission.

(e) Draw a bar graph representing the sale made by each salesman.

(f) Draw a pie graph representing the sale made by salesman in 2000.

8. Enter the following data in Excel Sheet

PERSONAL BUDGET FOR FIRST QUARTER

Monthly Income (Net): 1,475

EXPENSES	JAN	FEB	MARCH	QUARTER TOTAL	QUARTER AVERAGE
Rent	600.00	600.00	600.00		
Telephone	48.25	43.50	60.00		
Utilities	67.27	110.00	70.00		
Credit Card	200.00	110.00	70.00		
Oil	100.00	150.00	90.00		
AV to Insurance	150.00				
Cable TV	40.75	40.75	40.75		
Monthly Total					

Calculate Quarter total and Quarter average.

(a) Calculate Monthly total.
(b) Surplus = Monthly income - Monthly total.
(c) What would be total surplus if monthly income is 1500.
(d) How much does telephone expense for March differ from quarter average.
(e) Create a 3D column graph for telephone and utilities.
(f) Create a pie chart for monthly expenses.

9. Enter the following data in Excel Sheet

TOTAL REVENUE EARNED FOR SAM'S BOOKSTALL

Publisher name	1997	1998	1999	2000	total
A	Rs. 1,000.00	Rs. 1100.00	Rs. 1,300.00	Rs. 800.00	
B	Rs. 1,500.00	Rs. 700.00	Rs. 1,000.00	Rs. 2,000.00	
C	Rs.700.00	Rs. 900.00	Rs. 1,500.00	Rs. 600.00	
D	Rs. 1,200.00	Rs. 500.00	Rs. 200.00	Rs. 1,100.00	

(a) Compute the total revenue earned.
(b) Plot the line chart to compare the revenue of all publisher for 4 years.
(b) Chart Title should be _Total Revenue of Sam's Bookstall (1997-2000)'
(c) Give appropriate categories and value axis title.

10. Generate 25 random numbers between 0 & 100 and find their sum, average and count. How many no. are in range 50-60.

Note: List of experiments may be changed by the concern teacher.

BCS-106 PC PACKAGE

Generic Elective (GE): 01 **Marks: 100**
Total Credit: 04

Course Outcome: At the end of course, Students will be able to

- Identify the parts of the Windows operating system and uses of common Windows OS elements.
- Learn Modern office activities and their software requirements.
- Create a new Word document and formatting a document using MS-WORD.
- Create an electronic spreadsheet using MS-Excel, familiarize oneself with Excel's basic and advance features.
- Create slide show presentation concepts and explore the Microsoft Office PowerPoint environment.
- Use Microsoft Office programs to create personal, academic and business documents following current professional and/or industry standards

UNIT-I

Introduction: Overview of Windows Operating System, Basic Operations- How to start a computer, login, How to logoff, hibernate, shutdown etc.

Personalizing Desktop- Desktop Background, Icon, Screen Saver,Themes, Setting date & time, Task bar.

Files & Folders – Create, Copy, Rename, Moving & Delete, Create & Using Shortcuts, Recycle Bin.

Accessories – MS Paint, Notepad, WordPad, Windows Media Player, Calculator, Games, Math Input Panel.

Using Control Panel – How to Install Program in Windows 8.1, How to uninstall Program, How to Install and Uninstall Fonts in Windows 8.1, Enhance the performance of computer, Using Disk Clean-up, Using Disk Derangement, Using Windows Update, Protecting your computer against viruses.

Using Internet in Windows: Basic Operations using Internet Browser, Working with browsers, Search Engines, Searching information on Wikipedia, , Online Ticket Booking, Apply for PAN Card, How to apply for online Passport, How to Apply for online Aadhar Card, Pay electricity bill, How to pay service tax online, Booking gas refill online, Downloading Ebooks.

UNIT-II

MS Word Basics:

Modern office activities and their software requirements, Introduction to Office Automation Suit, Elements of office suit & area of use, Word-processing, Spreadsheet, Presentation graphics, Database, Introduction and comparison of various office suites like Apache Open Office, Libre Office, Calligra Suite, WPS office, KOffice, Google Docs

MS Word Basics: Introduction to MS Office (2013), Introduction to MS Word, Features & area of use, Various versions of MS Office and their requirements, Working with MS Word, Menus & Commands, Customize the Ribbon, Toolbars & Buttons, Shortcut Menus, Wizards & Templates, Creating a New Document, Different Page layouts, Different Page View, Applying various Text Enhancements- Fonts, Styles, Text Attributes, Formatting Your Text and Documents: Auto format, Paragraph Formatting, Page Formatting, Line spacing, Margins, Borders and Shading, Tabs, Indents, Text Editing using various features, Bullets and Numbering, Working with Styles, How to add a Style in text, How to remove style in Gallery, How to Create a New Style, How to Modify a Style, Printing & various print options , Working with Headers and Footers, How to Add Header and footer.

UNIT-III

MS Word Advanced:

Advanced Features of MS Word : Spell Check, Thesaurus, Find & Replace, Auto texts, Auto Correct, Symbols, Working with Columns, Tabs, Indents, Margins & Space management in Document, Column, Section Breaks, Adding References, Using footnote and endnote in documents, Using Themes, Watermarks, inserting Equations & Symbols,

Taking and inserting Screen shots in Documents, Mail Merge: Mail Merge in MS Word, Mail Merge concept, Envelops, Mailing Labels, Importing data, exporting to and from various formats.

Macros in MS Word: Macro introduction and their use, recording macros, Editing macros, running a macro.

UNIT-IV

MS Excel:

MS Excel Spreadsheet Basics & features, Concepts of Workbook & Worksheets, Getting started, Creating a new worksheet, Using Wizards, Various Data Types, Selecting cells, Entering and editing text, Entering and editing Numbers, Removing & Resizing of Columns & Rows, Entering and Editing Formulas, Referencing cells, moving cells, copying cells, sorting cell data, inserting rows, inserting columns, Inserting cells, deleting parts of a worksheet, clearing parts of a worksheet, different view of worksheets.

Formatting: Page setup, Cell Formatting, changing column widths and Row heights, Auto format , changing font sizes and Attributes, Centering text across columns, using border buttons and Commands, changing colors and shading, hiding rows and columns, Working with Data & Ranges, Column Freezing, Labels, Hiding, Splitting, Merge Cells.

Charts: Chart parts and terminology, chart wizard, different types of charts, printing charts, deleting charts, linking in spreadsheet, Printing of Workbook & Worksheets with various options.

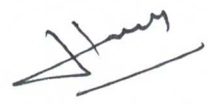
UNIT-V

MS PowerPoint:

Introduction & area of use, Working with MS PowerPoint, Creating a New Presentation, Working with Presentation, Using Wizards, Slides & its different views, Inserting, Deleting and Copying of Slides, Working with Notes, Handouts, Columns, Lists, Adding Graphics, shapes, screenshots, SmartArt, Charts in presentation, Sounds and Movies to a Slide, Working with PowerPoint Objects Designing, Presentation of a Slide Show, change Slide backgrounds, Change Slide Size, Using Animation, Transitions in presentation, Advanced Slide options Manual & Automatic, Printing Presentations, Notes, Handouts with print options, Slide Master, Handout Master, Notes Master.

TEXT/REFERENCE BOOKS:

1. Mastering MS Office 2000, Professional Edition by Counter, BPB Publication.
2. MS Office 2000 Training Guide by Maria, BPB Publication.
3. PC Software, Ravi Taxalli , BPB.
4. Computer Fundamental by P. K. Sinha.



BCS-107 PC PACKAGE LAB

Generic Elective (GE-01): P **Marks: 100**
Total Credit: 02

Course Outcome: At the end of course, Students will be able to

- Learn Modern office activities and their software requirements.
- Create a new Word document and formatting a document using MS-WORD.
- Create an electronic spreadsheet using MS-Excel, familiarize oneself with Excel's basic and advance features.
- Create a slide show presentation and explore the Microsoft Office PowerPoint environment.

Practical exercises based on MS Office/ Open Office tools using document preparation and spreadsheet handling packages.

MS Word

1. Prepare **a grocery list** having four columns (Serial number, the name of the product, quantity and price) for the month of April, 06.
   - Font specifications for Title (Grocery List): 14-point Arial font in bold and italics.
   - The headings of the columns should be in 12-point and bold.
   - The rest of the document should be in 10-point Times New Roman.
   - Leave a gap of 12-points after the title.
2. Create a **telephone directory**.
   - The heading should be 16-point Arial Font in bold.
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   - Other headings should use 10-point Courier New Font.
   - The footer should show the page number as well as the date last updated.
3. Design a **time-table form** for your college.
   - The first line should mention the name of the college in 16-point Arial Font and should be bold.
   - The second line should give the course name/teacher's name and the department in 14-point Arial.
   - Leave a gap of 12-points.
   - The rest of the document should use 10-point Times New Roman font.
   - The footer should contain your specifications as the designer and date of creation.
4. XYZ Publications plans to release a new book designed as per your syllabus. Design the **First page of the book** as per the given specifications.
   - The title of the book should appear in bold using 20-point Arial font.
   - The name of the author and his qualifications should be in the center of the page in 16-point Arial font.
   - At the bottom of the document should be the name of the publisher and address in 16-point Times New Roman.
   - The details of the offices of the publisher (location) should appear in the footer.
5. Create the following one page documents.
   - Compose a note inviting friends to a get-together at your house, including a list of things to bring with them.
   - Design a certificate in landscape orientation with a border around the document.
   - Design a Garage Sale sign.
   - Make a sign outlining your rules for your bedroom at home, using a numbered list.

6. Create the following documents:
   - A newsletter with a headline and 2 columns in portrait orientation, including at least one image surrounded by text.
   - Use a newsletter format to promote upcoming projects or events in your classroom or college.

7. Convert following text to a table, using comma as delimiter
   Type the following as shown (do not bold).

Color, Style, Item
Blue, A980, Van
Red, X023, Car
Green, YL724, Truck
Name, Age, Sex
Bob, 23, M
Linda, 46, F
Tom, 29, M

8. Enter the following data into a table given on the next page.

Salesperson	Dolls	Trucks	Puzzles
Kennedy, Sally	1327	1423	1193
White, Pete	1421	3863	2934
Pillar, James	5214	3247	5467
York, George	2190	1278	1928
Banks, Jennifer	1201	2528	1203
Atwater, Kelly	4098	3079	2067
Pillar, James	5214	3247	5467
York, George	2190	1278	1928
Banks, Jennifer	1201	2528	1203
Atwater, Kelly	4098	3079	2067

Add a column Region (values: S, N, N,S,S,S) between the Salesperson and Dolls columns to the given table Sort your table data by Region and within Region by Salesperson in ascending order:
In this exercise, you will add a new row to your table, place the word "Total" at the bottom of the Salesperson column, and sum the Dolls, Trucks, and Puzzles columns.

9. Wrapping of text around the image.

MS Excel

1. Enter the Following data in Excel Sheet

REGIONAL SALES PROJECTION

State	Qtr1	Qtr2	Qtr3	QTR4	Qtr Total	Rate	Amount
Delhi	2020	2400	2100	3000	15		
Punjab	1100	1300	1500	1400	20		
U.P.	3000	3200	2600	2800	17		
Haryana	1800	2000	2200	2700	15		
Rajasthan	2100	2000	1800	2200	20		

TOTAL
AVERAGE

(a) Apply Formatting as follow:

i. Title in TIMES NEW ROMAN
viii. Font Size - 14
ix. Remaining text - ARIAL, Font Size -10
x. State names and Qtr. Heading Bold, Italic with Gray Fill Color.
xi. Numbers in two decimal places.
xii. Qtr. Heading in center Alignment.
xiii. Apply Border to whole data.

(b) Calculate State and Qtr. Total
(c) Calculate Average for each quarter
(d) Calculate Amount = Rate * Total.

3. Given the following worksheet

	A	B	C	D
1	Roll No.	Name	Marks	Grade
2	1001	Sachin	99	
3	1002	Sehwag	65	
4	1003	Rahul	41	
5	1004	Sourav	89	
6	1005	HarBhajan	56	

Calculate the grade of these students on the basis of following guidelines:

If Marks	Then Grade
>=80	A+
>= 60 < 80	A
>= 50 < 60	B
< 50	F

3. Given the following worksheet

	A	B	C	D	E	F	G
1	**Salesman**		**Sales in (Rs.)**				
2	No.	Qtr1	Qtr2	Qtr3	Qtr4	Total	Commission
3	S001	5000	8500	12000	9000		
4	S002	7000	4000	7500	11000		
5	S003	4000	9000	6500	8200		
6	S004	5500	6900	4500	10500		
7	S005	7400	8500	9200	8300		
8	S006	5300	7600	9800	6100		

4. Calculate the commission earned by the salesmen on the basis of following Candidates:

If Total Sales	**Commission**
< 20000	0% of sales
> 20000 and < 25000	4% of sales
> 25000 and < 30000	5.5% of sales
> 30000 and < 35000	8% of sales
>= 35000	11% of sales

The total sales is sum of sales of all the four quarters.

5. A company XYZ Ltd. pays a monthly salary to its employees which consists of basic salary, allowances & deductions. The details of allowances and deductions are as follows:

- HRA Dependent on Basic
  30% of Basic if Basic <=1000
  25% of Basic if Basic>1000 & Basic<=3000
  20% of Basic if Basic >3000

- DA Fixed for all employees, 30% of Basic

- Conveyance Allowance Rs. 50/- if Basic is <=1000
  Rs. 75/- if Basic >1000 & Basic<=2000
  Rs. 100 if Basic >2000

- Entertainment Allowance NIL if Basic is
  <=1000 Rs. 100/- if Basic > 1000

Deductions

- Provident Fund 6% of Basic

- Group Insurance Premium Rs. 40/- if Basic is <=1500

  Rs. 60/- if Basic > 1500 & Basic<=3000
  Rs. 80/- if Basic >3000

Calculate the following:

Gross Salary = Basic + HRA + DA + Conveyance + Entertainment

Total deduction = Provident Fund + Group Insurance Premium

Net Salary= Gross Salary – Total Deduction

6. Create Payment Table for a fixed Principal amount, variable rate of interests and time in the format below:

No. of Instalments	5%	6%	7%	8%	9%
3	XX	XX	XX	XX	XX
4	XX	XX	XX	XX	XX
5	XX	XX	XX	XX	XX
6	XX	XX	XX	XX	XX

7. Use an array formula to calculate Simple Interest for given principal amounts given the rate of Interest and time

Rate of Interest	8%
Time	5 Years

Principal	Simple Interest
1000	?
18000	?
5200	?

8. The following table gives year wise sale figure of five salesmen in Rs.

Salesman	2000	2001	2002	2003
S1	10000	12000	20000	50000
S2	15000	18000	50000	60000
S3	20000	22000	70000	70000
S4	30000	30000	100000	80000
S5	40000	45000	125000	90000

(a) Calculate total sale year wise.
(b) Calculate the net sale made by each salesman
(c) Calculate the maximum sale made by the salesman
(e) Calculate the commission for each salesman under the condition.
(i) If total sales >4,00,000 give 5% commission on total sale made by the salesman.
(ii) Otherwise give 2% commission.

(e) Draw a bar graph representing the sale made by each salesman.
(f) Draw a pie graph representing the sale made by salesman in 2000.

9. Enter the following data in Excel Sheet

PERSONAL BUDGET FOR FIRST QUARTER

Monthly Income (Net): 1,475

EXPENSES	JAN	FEB	MARCH	QUARTER TOTAL	QUARTER AVERAGE
Rent	600.00	600.00	600.00		
Telephone	48.25	43.50	60.00		
Utilities	67.27	110.00	70.00		
Credit Card	200.00	110.00	70.00		
Oil	100.00	150.00	90.00		
AV to Insurance	150.00				
Cable TV	40.75	40.75	40.75		
Monthly Total					

Calculate Quarter total and Quarter average.

(g) Calculate Monthly total.
(h) Surplus = Monthly income - Monthly total.
(i) What would be total surplus if monthly income is 1500.
(j) How much does telephone expense for March differ from quarter average.
(k) Create a 3D column graph for telephone and utilities.
(l) Create a pie chart for monthly expenses.

10. Enter the following data in Excel Sheet

TOTAL REVENUE EARNED FOR SAM'S BOOKSTALL

Publisher name	1997	1998	1999	2000	total
A	Rs. 1,000.00	Rs. 1100.00	Rs. 1,300.00	Rs. 800.00	
B	Rs. 1,500.00	Rs. 700.00	Rs. 1,000.00	Rs. 2,000.00	
C	Rs.700.00	Rs. 900.00	Rs. 1,500.00	Rs. 600.00	
D	Rs. 1,200.00	Rs. 500.00	Rs. 200.00	Rs. 1,100.00	

(c) Compute the total revenue earned.
(d) Plot the line chart to compare the revenue of all publisher for 4 years.
(d) Chart Title should be _Total Revenue of Sam's Bookstall (1997-2000)'
(e) Give appropriate categories and value axis title.

11. Generate 25 random numbers between 0 & 100 and find their sum, average and count. How many no. are in range 50-60.

Note: List of experiments may be changed by the concern teacher.

BCS-201 PROGRAMMING FUNDAMENTALS USING C/C++

Marks: 100

Core Course: 03
Total Credit: 04

Course Outcome: At the end of course, Students will be able to

- Understand the fundamental programming concepts and methodologies which are essential to create good C/C++ programs.
- Code, test, and implement a well-structured, robust computer program using the C/C++ programming language.
- Write reusable modules (collections of functions).
- Understand design/implementation issues involved with variable allocation and binding, control flow, types, subroutines, parameter passing.
- Develop an in-depth understanding of functional, logic, and object-oriented programming paradigms.

UNIT-I
Introduction to C and C++
Overview of Procedural Programming and Object-Orientation Programming, Character set, Identifiers and Keywords, Data types, Casting of DataTypes, Constants, Variables, Expressions, Statements, Symbolic constants. Operators (Arithmetic, Relational, Logical, Conditional, Bitwise, COMMA operator etc.), Character I/O (getc, getchar, putc, putchar etc), Formatted and Console I/O (printf(), scanf(), cin, cout), Compiling and Executing Simple Programs in C/C++.
Control Statements:if, if-else, Nested if- else, goto statements, switch, break, continue, while, do-while, for, nested loops.

UNIT-II
Arrays: Definition & their types, array declaration and assignments, processing an array, multi-dimensional arrays.
Functions: Declaration and Definition of Functions, Function prototypes, Call by Value, Call by Reference, Void functions, inline functions, function overloading, friend functions, constructors and their types, destructors, friend class, Command Line Arguments, Recursion, Automatic variables, external variables, static variables.

UNIT-III
String: Introduction, Operation function: strlen(), strcmp(), stricmp(), strncmp(), strincmp(), strcpy(), strcat(), strrev() and their implementation.
Structures and unions: Defining & Accessing a structure, union and enumeration elements, Array of Structures,Understanding the Preprocessor Directives (#include, #define), Macros.

UNIT-IV
Pointersand Referencesin C/ C++:
Understanding a Pointer Variable, Simple use of Pointers (Declaring and Dereferencing Pointers to simple variables), Pointers to Pointers, Pointers to structures, Passing pointers as function arguments, Returning a pointer from a function, using arrays as pointers, Passing arrays to functions. Pointers vs. References, Declaring and initializing references, Using references as function arguments and function return values.

UNIT-V
Memory Allocationin C++:
Differentiating between static and dynamic memory allocation, use of malloc, calloc and free functions, use of new and delete operators.

Object Oriented Programming: Defining & Using Classes, Access Specifier, Object, Instantiation, Encapsulation, Polymorphism, Abstract class, Inheritance & its types, Class Constructors, Constructor Overloading.

TEXT/REFERENCE BOOKS:

1. Let us C - Y.Kanetkar, BPB Publications
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
3. E. Balagurusamy, Programming in ANSI C, Tata McGraw-Hill.
4. Object oriented Programming with C++, E. Balagurusamy, Tata McGraw-Hill.
5. C++ Complete reference, Herbert Schildt, Tata McGraw-Hill.

BCS-202 Programming Fundamentals using C/C++ Lab

Core Course: 03(P) **Marks: 100**
Total Credit: 02

Course Outcome: At the end of course, Students will be able to

- Understand the fundamental programming concepts and methodologies which are essential to create good C/C++ programs.
- Code, test, and implement a well-structured, robust computer program using the C/C++ programming language.
- Write reusable modules (collections of functions).
- Understand design/implementation issues involved with variable allocation and binding, control flow, types, subroutines, parameter passing.
- Develop an in-depth understanding of functional, logic, and object-oriented programming paradigms.

List of Experiments:

1. WAP to print the sum and product of digits of an integer.
2. WAP to reverse a number.
3. WAP to compute the sum of the first n terms of the following series
   S = 1+1/2+1/3+1/4+.....
4. WAP to compute the sum of the first n terms of the following series
   S =1-2+3-4+5.....
5. Write a function that checks whether a given string is Palindrome or not. Use this function to find whether the string entered by user is Palindrome or not.
6. Write a function to find whether a given no. is prime or not. Use the same to generate the prime numbers less than 100.
7. WAP to compute the factors of a given number.
8. Write a macro that swaps two numbers. WAP to use it.
9. WAP to print a triangle of stars as follows (take number of lines from user):

```
*
***
*****
*******
*********
```

10. WAP to perform following actions on an array entered by the user:
    i) Print the even-valued elements
    ii) Print the odd-valued elements
    iii) Calculate and print the sum and average of the elements of array
    iv) Print the maximum and minimum element of array
    v) Remove the duplicates from the array
    vi) Print the array in reverse order
    The program should present a menu to the user and ask for one of the options.
    The menu should also include options to re-enter array and to quit the program.

11. WAP that prints a table indicating the number of occurrences of each alphabet in the text entered as command line arguments.
12. Write a program that swaps two numbers using pointers.

13. Write a program in which a function is passed address of two variables and then alter its contents.

14. Write a program which takes the radius of a circle as input from the user, passes it to another function that computes the area and the circumference of the circle and displays the value of area and circumference from the main() function.
15. Write a program to find sum of n elements entered by the user. To write this program, allocate memory dynamically using malloc() / calloc() functions or new operator.
16. Write a menu driven program to perform following operations on strings:
    a) Show address of each character in string
    b) Concatenate two strings without using strcat function.
    c) Concatenate two strings using strcat function.
    d) Compare two strings
    e) Calculate length of the string (use pointers)
    f) Convert all lowercase characters to uppercase
    g) Convert all uppercase characters to lowercase
    h) Calculate number of vowels
    i) Reverse the string
17. Given two ordered arrays of integers, write a program to merge the two-arrays to get an ordered array.
18. WAP to display Fibonacci series (i)using recursion, (ii) using iteration
19. WAP to calculate Factorial of a number (i)using recursion, (ii) using iteration
20. WAP to calculate GCD of two numbers (i) with recursion (ii) without recursion.
21. Create Matrix class using templates. Write a menu-driven program to perform following Matrix Operations (2-D array implementation):
    a) Sum b) Difference c) Product d) Transpose
22. Create the Person class. Create some objects of this class (by taking information from the user). Inherit the class Person to create two classes Teacher and Student class. Maintain the respective information in the classes and create, display and delete objects of these two classes (Use Runtime Polymorphism).
23. Create a class Triangle. Include overloaded functions for calculating area. Overload assignment operator and equality operator.
24. Create a class Box containing length, breath and height. Include following methods in it:
    a) Calculate surface Area
    b) Calculate Volume
    c) Increment, Overload ++ operator (both prefix & postfix)
    d) Decrement, Overload -- operator (both prefix & postfix)
    e) Overload operator == (to check equality of two boxes), as a friend function
    f) Overload Assignment operator
    g) Check if it is a Cube or cuboid

    Write a program which takes input from the user for length, breath and height to test the above class.
25. Create a structure Student containing fields for Roll No., Name, Class, Year and Total Marks. Create 10 students and store them in a file.
26. Write a program to retrieve the student information from file created in previous question and print it in following format:

    Roll No. Name Marks
27. Copy the contents of one text file to another file, after removing all whitespaces.
28. Write a function that reverses the elements of an array in place. The function must accept only one pointer value and return void.

Note: List of programs may be changed by the concern teacher.

BCS-203 DISCRETE STRUCTURES

Core Course: 04 **Marks: 100**
Total Credit: 06

Course Outcome: At the end of course, Students will be able to

- Develop the understanding of Logic Sets and Functions.
- Use mathematical reasoning techniques including induction and recursion.
- Understand and apply counting techniques to the representation and characterization of relational concepts.

UNIT-I

Mathematical Logic:

Propositional and Predicate Logic, Predicates and Quantifiers, Law of duality, Rules of inference, Logical Connectives, Basic Logical Operations: Conjunction, Disjunction, Negation, Conditional and Bi-conditional statements, Tautology, Contradiction, Logical Equivalence.

UNIT-II

Set Theory:

Introduction, Universal and Empty set, cardinality of set, Power set, Cartesian Product, Subset, Venn diagram, Set operation, Inclusion and exclusion principle.

UNIT-III

Relation: Introduction, Properties of Binary Relation, Equivalence Relation, Relation Matrix, Relation Graph, Composition of Relation, Partition, Partial Order Relation, Hasse diagram.

Function: Introduction, Onto function, Into function, One to One function, Bijective Function, Composition of Function, Inverse of Function.

UNIT-IV

Graph Theory:

Definition, Finite and Infinite Graph, Incidence and Degree, Matrix Representation, Digraph. Isomorphic Graph, Homomorphism Graph, Connected , Disconnected and strongly connected graph, Sub Graph, Walk, Path , Circuit, Complement of Graph, Regular Graph, Complete Graph, Weighted Graph, Bipartite Graph, Operations on Graph, Cut set, cut Vertex, Eccentricity, Centre , Radius and diameter of a Graph.

UNIT-V

Searching Techniques:

Depth First Search, Breadth First Search, Dijkstra's Algorithm, Euler and Hamiltonian Paths and Circuits, PlanarGraphs, Graph Coloring, Trees,BasicTerminologyand properties ofTrees,Introduction to Spanning Trees.

TEXT BOOK:

1. "Discrete Mathematical structures with Applications to Computer Science", JP Trembly and R. Manohar, TMH International Edition (Latest Edition)
2. "Graph theory and its application to Engineering and Computer Science", NarsingDeo, PHI
3. "Advanced Discrete Mathematics" H.K. Pathak, J.P.Chauhan, ShikshaSahityaPrakashan

REFERENCE BOOK:

1. "Discrete Mathematics", Seymour Lipshutz& Marc Lipson, TMH
2. "Discrete Mathematics and Its Applications", Kenneth. H. Rosen, TMH
3. "Discrete Mathematics with Graph Theory" Goodaire and Parmenter, EEE.

BCS-204 ENVIRONMENTAL SCIENCE

Ability Enhancement Compulsory course (AECC): 02 **Marks:100**
Total credit: 04

Course Outcome: At the end of course, Students will be able to

- Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale.
- Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment.
- Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues.
- Learn to cope with balancing human requirements and environmental conservation.
- Learn causes and prevention of the different environmental Pollution.
- Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.

UNIT-I
Introduction to environmental studies: Multidisciplinary nature of environmental studies; Scope and importance; Concept of sustainability and sustainable development.

UNIT-II
Ecosystems: What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems :
Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

UNIT-III
Natural Resources : Renewable and Non-renewable Resources: Land resources and land use change; Land degradation, soil erosion and desertification, Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. Water : Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state). Energy resources : Renewable and non renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

UNIT-IV
Biodiversity and Conservation: Levels of biological diversity : genetic, species and ecosystem diversity; Biogeography zones of India; Biodiversity patterns and global biodiversity hot spots, India as a mega-biodiversity nation; Endangered and endemic species of India, Threats to biodiversity : Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity, Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

UNIT-V
Environmental Pollution: Environmental pollution : types, causes, effects and controls; Air, water, soil and noise pollution, Nuclear hazards and human health risks, Solid waste management : Control measures of urban and industrial waste. Pollution case studies.

UNIT-VI
Environmental Policies & Practices: Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture, Environment Laws: Environment Protection Act; Air

(Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD). Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.

UNIT-VII

Human Communities and the Environment: Human population growth: Impacts on environment, human health and welfare. Resettlement and rehabilitation of project affected persons; case studies. Disaster management : floods, earthquake, cyclones and landslides. Environmental movements : Chipko, Silent valley, Bishnois of Rajasthan. Environmental ethics: Role of Indian and other religions and cultures in environmental conservation. Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

UNIT-VIII

Field work: Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc. Visit to a local polluted site-Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds and basic principles of identification. Study of simple ecosystems-pond, river, Delhi Ridge, etc.

TEXTBOOKS:

1. Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt.
2. Gadgil, M., & Guha, R. 1993. This Fissured Land: An Ecological History of India. Univ. of California Press.
3. Gleeson, B. and Low, N. (eds.) 1999. Global Ethics and Environment, London, Routledge.
4. Gleick, P. H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. Principles of Conservation Biology. Sunderland: Sinauer Associates, 2006.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36-37.
7. McCully, P. 1996. Rivers no more: the environmental effects of dams (pp. 29-64). Zed Books.
8. McNeill, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.
9. Odum, E.P., Odum, H.T. & Andrews, J. 1971. Fundamentals of Ecology. Philadelphia: Saunders.
10. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press.
11. Rao, M.N. & Datta, A.K. 1987. Waste Water Treatment. Oxford and IBH Publishing Co. Pvt. Ltd.
12. Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012. Environment. 8th edition. John Wiley & Sons.
13. Rosencranz, A., Divan, S., & Noble, M. L. 2001. Environmental law and policy in India. Tripathi 1992.
14. Sengupta, R. 2003. Ecology and economics: An approach to sustainable development. OUP.
15. Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi.
16. Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. Conservation Biology: Voices from the Tropics. John Wiley & Sons.
17. Thapar, V. 1998. Land of the Tiger: A Natural History of the Indian Subcontinent.
18. Warren, C. E. 1971. Biology and Water Pollution Control. WB Saunders.
19. Wilson, E. O. 2006. The Creation: An appeal to save life on earth. New York: Norton.

World Commission on Environment and Development. 1987. Our Common Future. Oxford University press.

BCS-205 DIGITAL ELECTRONICS

Generic Elective (GE): 02 **Marks: 100**
Total credit: 04

Course Outcome: At the end of course, Students will be able to

- Understand the fundamental concepts and techniques used indigital electronics.
- Understand and examine the structure of various number systems and itsapplication in digital design.
- Understand, analyse and design various combinational and sequential circuits.
- Classify different semiconductor memories.
- Minimize the Boolean expression using Boolean algebra and design it using logic gates.

UNIT-I
Number System:
Digital Computers, Number Systems &Conversion: Decimal, Binary, Octal, Hexadecimal, Gray code, Excess-3 code, BCD code. Number system arithmetic, Complements (n-1's and n's), Signed and Unsigned numbers, Representation of negative numbers.

UNIT-II
Logic Gates:
OR, AND, NOT, XOR,XNOR,Universal (NOR and NAND) Gates.Boolean algebra, Minimization of Switching Functions: Standard representation of logic function (SOP and POS), Minimization technique- K Map method, Prime implicants, don't care combinations.

UNIT-III
Combinational Circuits:
Adder, Subtractor, Encoder, Decoder, Multiplexer (MUX), De-Multiplexer.MUX Realization of switching functions, Code-converters (BCD-EXCESS-3), Hazards and Hazard free realizations.

UNIT-IV:
Sequential circuits:
Definition, Basic flip-flops- SR, JK, T and D, Master Slave Flip Flop, race around condition, Steps in synchronous sequential circuit design: Register, modulo-N counter, Ring counter & Shift counters.

UNIT-V
Memory:
Main memory, Semiconductor memory, Flash memory, Cache memory, Secondary memory.

TEXTBOOKS:
1. "Computer Fundamentals Architecture and Organization", Bram, New Age Techno Press.
2. "Digital Design", Morris Mano, PHI, 3rd Edition, 2006.

REFERENCE BOOKS:
1. An Engineering Approach To Digital Design – Fletcher, PHI.
2. Digital Logic – Application and Design – John M. Yarbrough, Thomson
3. Fundamentals of Logic Design – Charles H. Roth, Thomson Publications, 5th Edition, 2004.
4. Digital Logic Applications and Design – John M. Yarbrough, Thomson Publications, 2006.
5. Malvino A.P, Digital Principles and Applications, Tata McGraw Hill.
6. Computer Fundamentals: Architecture and Organization.

BCS-206 DIGITAL ELECTRONICS LAB

Generic Elective (GE): 02(P) **Marks: 100**
Total credit: 02

Course Outcome: At the end of course, Students will be able to

- Represent numerical values in various number systems and perform number conversions between different number systems.
- Analyze and design digital combinational circuits like decoders, encoders, multiplexers, and de- multiplexers including arithmetic circuits (half adder, full adder, and multiplier).
- Design and implement binary Adder and Subtractor.
- Design and implement 3-bit synchronous counters.

List of Experiments:

1. Study of Logic Gates–AND, OR, NOT, NAND, NOR XOR (Using respective ICs)
2. Realization of AND, OR and NOT gates using Universal Gates.
3. Design and Realization of Half Adder/Subtracted using NAND Gates.
4. Design and Realization of Full Adder using Logic Gates.
5. Design and Realization of 4 bit Adder/Subtractor using IC 7483.
6. Design and Realization of BCD Adder using IC 7483.
7. Realization of J-K flip flop using IC 7400 and 7410.
8. Realization of T and D flip flop using IC 7476.
9. Implementation of PIPO Shift Registers using flip flops. (IC 7476).
10. Design and implementation of odd and even parity checker Generator using IC 74180.

Note: List of experiments may be changed by the concern teacher.

BCS-207 INTRODUCTION TO PROGRAMMING

Generic Elective (GE): 02 **Marks: 100**
Total Credit: 04

Course Outcome: At the end of course, Students will be able to

- Understand the basic terminology used in computer programming.
- Use different data types in a computer program.
- Practice the fundamental programming methodologies in the C/C++ programming language.
- Code, test, and implement a well-structured, robust computer program using the C/C++ programming language.
- Write reusable modules (collections of functions).
- Develop logics which will help them to create programs.

UNIT-I
Introduction to C and C++:
Overview of Procedural Programming and Object-Orientation Programming, Character set, Identifiers and Keywords, Data types, Casting of Data Types, Constants, Variables, Expressions, Statements, Symbolic constants. Operators (Arithmetic, Relational, Logical, Conditional, Bitwise, COMMA operator etc.), Character I/O (getc, getchar, putc, putchar etc), Formatted and Console I/O (printf(), scanf(), cin, cout), Compiling and Executing Simple Programs in C/C++.
Control Statements:if, if-else, Nested if- else, goto statements, switch, break, continue, while, do-while, for, nested loops.

UNIT-II
Arrays: Definition & their types, array declaration and assignments, processing an array, multi-dimensional arrays.
Functions: Declaration and Definition of Functions, Function prototypes, Call by Value, Call by Reference, Void functions, inline functions, function overloading, friend functions, constructors and their types, destructors, friend class, Command Line Arguments, Recursion, Automatic variables, external variables, static variables.

UNIT-III
String: Introduction, Operation function: strlen(), strcmp(), stricmp(), strncmp(), strincmp(), strcpy(), strcat(), strrev() and their implementation.
Structures and Unions: Defining & Accessing a structure, union and enumeration elements, Array of Structures,Understanding the Preprocessor Directives (#include, #define), Macros.

UNIT-IV
Pointers and References in C/ C++:
Understanding a Pointer Variable, Simple use of Pointers (Declaring and Dereferencing Pointers to simple variables), Pointers to Pointers, Pointers to structures, Passing pointers as function arguments, Returning a pointer from a function, using arrays as pointers, Passing arrays to functions. Pointers vs. References, Declaring and initializing references, Using references as function arguments and function return values.

UNIT-V

Memory Allocation in C++:

Differentiating between static and dynamic memory allocation, use of malloc, calloc and free functions, use of new and delete operators.

Object Oriented Programming: Defining & Using Classes, Access Specifier, Object, Instantiation, Encapsulation, Polymorphism, Abstract class, Inheritance & its types, Class Constructors, Constructor Overloading.

TEXT/REFERENCE BOOKS:

1. Let us C - Y.Kanetkar, BPB Publications.

2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.

3. E. Balagurusamy, Programming in ANSI C, Tata McGraw-Hill.

4. Object oriented Programming with C++, E. Blagurusamy, Tata McGraw-Hill.

5. C++ Complete reference, Herbert Schildt, Tata McGraw-Hill.

BCS-208 INTRODUCTION TO PROGRAMMING LAB

Generic Elective (GE: 02) -P **Marks: 100**
Total Credit: 02

Course Outcome: At the end of course, Students will be able to

- Understand the fundamental programming concepts and methodologies which are essential to create good C/C++ programs.
- Code, test, and implement a well-structured, robust computer program using the C/C++ programming language.
- Write reusable modules (collections of functions).
- Understand design/implementation issues involved with variable allocation and binding, control flow, types, subroutines, parameter passing.
- Develop an in-depth understanding of functional, logic, and object-oriented programming paradigms.

List of Experiments:

1. WAP to print the sum and product of digits of an integer.
2. WAP to reverse a number.
3. WAP to compute the sum of the first n terms of the following series
   S = 1+1/2+1/3+1/4+.....
4. WAP to compute the sum of the first n terms of the following series
   S =1-2+3-4+5.....
5. Write a function that checks whether a given string is Palindrome or not. Use this function to find whether the string entered by user is Palindrome or not.
6. Write a function to find whether a given no. is prime or not. Use the same to generate the prime numbers less than 100.
7. WAP to compute the factors of a given number.
8. Write a macro that swaps two numbers. WAP to use it.
9. WAP to print a triangle of stars as follows (take number of lines from user):

```
*
***
*****
*******
*********
```

10. WAP to perform following actions on an array entered by the user:
    vii) Print the even-valued elements
    viii) Print the odd-valued elements
    ix) Calculate and print the sum and average of the elements of array
    x) Print the maximum and minimum element of array
    xi)Remove the duplicates from the array
    xii) Print the array in reverse order
    The program should present a menu to the user and ask for one of the options.
    The menu should also include options to re-enter array and to quit the program.

11. WAP that prints a table indicating the number of occurrences of each alphabet in the text entered as command line arguments.
12. Write a program that swaps two numbers using pointers.

13. Write a program in which a function is passed address of two variables and then alter its contents.

14. Write a program which takes the radius of a circle as input from the user, passes it to another function that computes the area and the circumference of the circle and displays the value of area and circumference from the main() function.
15. Write a program to find sum of n elements entered by the user. To write this program, allocate memory dynamically using malloc() / calloc() functions or new operator.
16. Write a menu driven program to perform following operations on strings:
    j) Show address of each character in string
    k) Concatenate two strings without using strcat function.
    l) Concatenate two strings using strcat function.
    m) Compare two strings
    n) Calculate length of the string (use pointers)
    o) Convert all lowercase characters to uppercase
    p) Convert all uppercase characters to lowercase
    q) Calculate number of vowels
    r) Reverse the string
17. Given two ordered arrays of integers, write a program to merge the two-arrays to get an ordered array.
18. WAP to display Fibonacci series (i)using recursion, (ii) using iteration
19. WAP to calculate Factorial of a number (i)using recursion, (ii) using iteration
20. WAP to calculate GCD of two numbers (i) with recursion (ii) without recursion.
21. Create Matrix class using templates. Write a menu-driven program to perform following Matrix Operations (2-D array implementation):
    a) Sum b) Difference c) Product d) Transpose
22. Create the Person class. Create some objects of this class (by taking information from the user). Inherit the class Person to create two classes Teacher and Student class. Maintain the respective information in the classes and create, display and delete objects of these two classes (Use Runtime Polymorphism).
23. Create a class Triangle. Include overloaded functions for calculating area. Overload assignment operator and equality operator.
24. Create a class Box containing length, breath and height. Include following methods in it:
    a) Calculate surface Area
    b) Calculate Volume
    c) Increment, Overload ++ operator (both prefix & postfix)
    d) Decrement, Overload -- operator (both prefix & postfix)
    e) Overload operator == (to check equality of two boxes), as a friend function
    f) Overload Assignment operator
    g) Check if it is a Cube or cuboid

    Write a program which takes input from the user for length, breath and height to test the above class.
25. Create a structure Student containing fields for Roll No., Name, Class, Year and Total Marks. Create 10 students and store them in a file.
26. Write a program to retrieve the student information from file created in previous question and print it in following format:

    Roll No. Name Marks
27. Copy the contents of one text file to another file, after removing all whitespaces.
28. Write a function that reverses the elements of an array in place. The function must accept only one pointer value and return void.

Note: List of programs may be changed by the concern teacher.

BCS-301 INTERNET TECHNOLOGIES

Core Course: 05 **Marks: 100**
Total Credit: 06

Course Outcome: At the end of course, Students will be able to

- Understand the basic concepts of Internet programming and protocols used.
- Create applications using HTML, CSS and Java Script.
- Learn different type of Internet applications.
- Understand fundamental tools and technologies for web design.
- Specify design rules in constructing web pages and sites.
- Understand how Web pages are designed and created.

UNIT-I
Internet Basics:
What is web, Web page, website, Internet browsers, WWW, HTTP, search engine, URL, Hypertext, ISP, Web server, Tools for web site creation.

UNIT-II
Introduction to Web Design:
Introduction to hypertext markup language (html),Document type definition, creating web pages, Headings, Paragraphs, lists, hyperlinks, tables, web forms, Input Types, Input Attributes, inserting images, frames, hosting options and domain name registration.

UNIT-III
CSS:
Introduction, Syntax, measurement units, colors, Backgrounds, Font, Text, position, Align, Images, Link, Table, List, Padding, Cursor, Rounded corner, Borders, Multi Background

UNIT-IV
Java Script:
Overview, syntax, Enabling Java script, Variables, Operators, Decision control statement: If-else, Switch Case; Looping statement: while loop, for loop, forin Loop
JavaScript functions, events, Cookies, Page Redirect, Dialog Boxes, Page printing, Error handling, Validation, Debugging, Image Map,

UNIT-V
Internet Applications:
WWW, Telnet, FTP, e-mail, Social networks, search engines,Video Conferencing, e-Commerce, m-Commerce,VOIP, blogs.

TEXT/REFERENCE BOOKS:
1. "Internet and Internet Engineering", Daniel Minoli, TMH (Latest Edition)
2. "Java Script", Gosslin, Vikas (Latest Edition)
3. "HTML The Definite Guide", Chuck musiano& Bill Kenndy, O Reilly (Latest Edition)
4. "Dynamic HTML", Joseph Schmuller, BPB, 2000.

BCS-302 COMPUTER NETWORK

Core Course: 06 **Marks: 100**
Total Credit: 06

Course Outcome: At the end of course, Students will be able to

- Understand the basic computer network technology.
- Understand and explain Data Communications System and its components.
- Identify the different types of network topologies and protocols.
- Understand the layers of the OSI model and TCP/IP.
- Expose wireless and wired LANs.

UNIT-I
Overview of Data Communication and Networking:
Data Communications:components, data representation, 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), Protocols and standards;
Reference Models: OSI & TCP/IP reference model comparative study.

UNIT-II
Physical Layer:
Analog & Digital Transmission: Transmission Impairments, Data Rates Limits, Digital to Digital Conversion, Line coding Scheme,
Analog to Digital Conversion: PCM, PAM, Delta Modulation, Transmission Modes, Parallel, Serials Asynchronous and Synchronous Communication
Digital to Analog Conversion: ASK, FSK, PSK, QPSK Constellation Diagram, QAM
Analog to Analog Conversion: AM, FM, PM, Bandwidth Utilization, Multiplexing: FDM, WDM and TDM, Switching Circuits.
Transmission Media: Guided Media: Twisted Pair, Coaxial and Fiber Optic, Unguided Media: Wireless, Radio Waves, Microwaves and Infrared.

UNIT-III
Data Link Layer:
Flow Control: Protocols: Stop & wait ARQ, Go-Back- N ARQ, Selective repeat ARQ, HDLC;
Medium Access Sub Layer: Point to point protocol, LCP, NCP, FDDI, token bus, token ring;
Multiple Access Protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, FDMA, TDMA, CDMA; Traditional Ethernet, Fast Ethernet.

UNIT-IV
Network Layer:
Internetworking Devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway;
Addressing: Internet address, classful address, subnetting, classless address
Routing: Techniques, static vs. dynamic routing, and routing table for classful address
Routing Algorithms: shortest path algorithm, flooding, distance vector routing, linkstate routing.
Protocols:ARP, RARP, IP, ICMP, IPV6; Unicast and multicast routing protocols.

UNIT-V
Transport Layer and Application Layer:
Process To Process Delivery:UDP, TCP; Congestion control algorithm: Leaky bucket algorithm, Token bucket algorithm, choke packets; Quality of service: techniques to improve QoS; DNS, SMTP, SNMP, FTP, HTTP, Firewalls.

Modern Topics: Wireless LAN: IEEE 802.11; Introduction to blue-tooth, VLAN's, Cellular telephony & Satellite network.

TEXTBOOKS:

1. "Data Communications and Networking", B. A. Forouzan, TMH, (Latest Edition)
2. "Computer Networks", A. S. Tanenbaum, 4th Edition, Pearson Education/PHI
3. "Data and Computer Communications", W. Stallings, 5th Edition, PHI/ Pearson Education

REFERENCE BOOKS:

1. "Computer Networking -A top down approach featuring the internet", Kurose and Rose, Pearson Education
2. "Communication Networks", Walrand, TMH (Latest Edition)
3. "Internetworking with TCP/IP, vol. 1, 2, 3", Daglous E. Comer, 4th Edition Pearson Education/PHI

BCS-303 DATA STRUCTURE

Core Course: 07 **Marks: 100**
Total Credit: 04

Course Outcome: At the end of course, Students will be able to

- Use different types of data structures, operations and algorithms.
- Implement appropriate sorting/searching technique for any given problem.
- Use stack, Queue, Lists, Trees and Graphs in problem solving.
- Find suitable data structure during application development/Problem Solving.

UNIT-I

Data Types: primitive, non-primitive data types, ADT, Data structure, Linear and nonlinear data structure.

Arrays: Definition and their types, Allocation methods, Address calculations.

Linked List: Definitions, Types with operations (INSERT, DELETE, TRAVERSE).(Insertion/Delete operation includes – insertion before a given element, insertion after a given element, insertion at given position, insertion in sorted linked list).

UNIT-II

Stacks: Definition, Operations PUSH, POP, Implementations using array and linked list, Applications of stack: Infix, Prefix, Postfix representation and conversion using stack, Postfix expression evaluation using stack.

Queues: Introduction, Types of Queues: Priority Queue, Circular queue, Double Ended Queue, operations (INSERT, DELETE), implementation using array and linked list, Applications

UNIT-III

Trees: Definition of trees and their types, Binary trees, Properties of Binary trees and Implementation operation (Insertion, deletion, searching and traversal algorithm: preorder, post order, in-order traversal), Binary Search Trees, AVL Trees, B tree, B+ tree.

UNIT-IV

Sorting: Types of sorting, Sequential Sort, Insertion Sort, Bubble Sort, Quick Sort, Merge Sort, Heap Sort, Radix sort.

Searching: Linear search, Binary search, Hashing.

UNIT-V

Graph: Definition of Graph and their types, Graph Traversal – Breadth first Traversal, Depth first Traversal, Shortest path Algorithm, spanning tree, Minimum Spanning tree, Kruskal and prims algorithms.

TEXT/REFERENCE BOOKS:

1. "Data structures using C", Tanenbaum, PHI, 1996.
2. "Fundamentals of Data Structures", Horowitz and Sahani, Computer Science Press, 1978
3. "Data structures and Algorithms", Aefred V. Aho, John E. Joperoft and J.E. Ullman.
4. "An Introduction to Data Structures with Applications", Jean Paul Trembley and Paul Sorenson, TMH,International Student Edition, 1985.
5. "Data Structures and Program Design in C", R. Kurse, Leung &Tondo, 2nd Edition, PHI publication.

BCS-304 Data Structure Lab

Core Course: 07 (P) **Marks: 100**
Total Credit: 02

Course Outcome: At the end of course, Students will be able to

- Design, develop, implement, analyze and evaluation/testing of Asymptotic performance of algorithms.
- Select appropriate data structures needed to be applied on a specified problem definition.
- Implement operations like searching, insertion, and deletion, traversing mechanism etc. on various data structures.
- Describe stack, queue and linked list operation.
- Implement appropriate sorting/searching technique for given problem.

List of Experiments:

1. Write a program to search an element from a list. Give user the option to perform Linear or Binary search. Use Template functions.
2. WAP using templates to sort a list of elements. Give user the option to perform sorting using Insertion sort, Bubble sort or Selection sort.
3. Implement Linked List and Include functions for insertion, deletion and search of a number, reverse the list and concatenate two linked lists.
4. Implement Doubly Linked List. Include functions for insertion, deletion and search of a number, reverse the list.
5. Implement Circular Linked List. Include functions for insertion, deletion and search of a number, reverse the list.
6. Perform Stack operations using Linked List implementation.
7. Perform Stack operations using Array implementation.
8. Perform Queues operations using Circular Array implementation.
11. WAP to calculate factorial and to compute the factorial of a given no. (i)using recursion, (ii) using iteration
12. (ii) WAP to display Fibonacci series (i)using recursion, (ii) using iteration
13. WAP to calculate GCD of 2 number (i) with recursion (ii) without recursion
14. WAP to create a Binary Search Tree and include following operations in tree:
    (a) Insertion (Recursive and Iterative Implementation)
    (b) Deletion by copying
    (c) Deletion by Merging
    (d) Search a no. in BST
    (e) Display its preorder, postorder and inorder traversals Recursively
    (f) Display its preorder, postorder and inorder traversals Iteratively.

Note: List of programs may be changed by the concern teacher.

BCS-305 HTML PROGRAMMING

Skill Enhancement Course SEC: 01 **Marks: 100**
Total Credit: 02

Course Outcome: At the end of course, Students will be able to

- Adapt HTML syntax and semantics to build web pages.
- Construct and visually format tables and forms using HTML and CSS.
- Illustrate the Semantic Structure of HTML and CSS.
- Learn how to combine basic HTML elements to create Web pages.
- Understand how to use HTML tags and tag attributes to control a Web page's appearance.
- Learn how to use tables and frames as navigational aids on a Web site.

UNIT-I
HTML Basics:
HTML Introduction, HTML History, HTML Versions, HTML Elements, Attributes, HTML Headings, Paragraphs, HTML Formatting, Fonts, Styles, HTML Links, Images, Tables.

UNIT-II
HTML Elements:
HTML Lists, Forms, Frames, HTML Colors, Color names, Color values, HTML Quick List. Introduction to HTML5, HTML5 - New standard for HTML, XHTML, The HTML DOM, How Did HTML5 Get Started, Rules for HTML5, New Features, Some of the most interesting new features in HTML5, Browser Support, New Elements in HTML5, New Markup Elements, New Media Elements, The Canvas Element, New Form Elements, New Input Type Attribute Values, Video on the Web, Video Formats, How It Works, All <video> Attributes.

UNIT-III
HTML5 - Audio and Canvas:
Audio on the Web, Audio Formats, How It Works, All <audio> Attributes, HTML5 Canvas, Create a Canvas Element, Draw With JavaScript, Understanding Coordinates, More Canvas Examples, HTML5 Web Storage, Storing Data on the Client, The localStorage Object, The sessionStorage Object.

UNIT-IV
HTML5 - Input Types:
HTML5 New Input Types, Browser Support, Input Type – email, Input Type – url, Input Type – number, Input Type – range, Input Type - Date Pickers, Input Type – search, Input Type – color.

UNIT-V
HTML5 Form Elements and Attribute:
HTML5 New Form Elements, Browser Support, data list Element, keygen Element, output Element, HTML5 Form Attributes, HTML5 New Form Attributes, Browser Support, autocomplete Attribute, autofocus Attribute, form Attribute, Form Override Attributes, height and width Attributes, st Attribute, min, max and step Attributes, multiple Attribute, novalidate Attribute, pattern Attribute, placeholder Attribute, required Attribute: HTML5 Tag Reference, HTML5 Global Attributes, HTML5 Event Attributes, Global Event Attributes, Window Event Attributes, Form Events, Keyboard Events, Mouse Events, Media Events.

TEXT/REFERENCE BOOKS:
1. VirginiaDeBolt,Integrated HTML and CSSA Smarter, Faster Way to LearnWiley/ Sybex, 2006
2. Cassidy Williams, Camryn Williams Introduction to HTMLand CSS, O'Reilly, 2015

BCS-306 OPERATION RESEARCH

General Elective GE: 03 **Marks: 100**
Total Credit: 06

Course Outcome: At the end of course, Students will be able to

- Formulate and solve mathematical model (linear programming problem) for a physical situations like production, distribution of goods and economics.
- Solve the problem of transporting the products from origins to destinations with least transportation cost.
- Convert and solve the practical situations into non-linear programming problem.
- Identify the resources required for a project and generate a plan and work schedule
- Understand the theoretical workings of the simple method for linear programming and perform iterations of it by hand.

UNIT-I
Introduction to Operation Research:
Introduction and History, Definition and concept, Characteristics or significant features of Operations research, General methods for solving Operations Research Models, Phases of Operations Research methods, Scope, Shortcomings, Applications, Techniques.

UNIT-II
Linear Programming:
Introduction, Salient features of linear programming (Terminology), Advantages, Limitations, Applications, Formulation of linear programming model, Simplex method.

UNIT-III
Transportation Problems:
Introduction, North West Corner Method, Vogel's Approximation Method,
Optimality test: Stepping stone method and MODI method.

UNIT-IV
Assignment Models:
Introduction, mathematical formulation of the problem, Hungarian method, Sample Problems, Special cases in assignment.

UNIT-V
Sequencing Problems:
Introduction, general sequencing formula, Processing n jobs through two machines, Processing n jobs through three machines, Processing n jobs through m machines.

TEXT BOOKS:
1. Manohar Mahajan, "Operations Research", Dhanpat Rai &Co., 2013. 2. P. SankaraIyer, "Operations Research", Tata McGraw-Hill, 2008.
3. A.M. Natarajan, P. Balasubramani, A. Tamilarasi, "Operations Research", Pearson Education, 2005.

REFERENCE BOOKS:
1. J K Sharma., "Operations Research Theory & Applications , 3e", Macmillan India Ltd, 2007.
2. P. K. Gupta and D. S. Hira, "Operations Research", S. Chand & co., 2007.
3. J K Sharma., "Operations Research, Problems and Solutions, 3e", Macmillan India Ltd.
4. N.V.S. Raju, "Operations Research", HI-TECH, 2002.

BCS-307 E-COMMERCE

General Elective GE: 03 **Marks: 100**
Total Credit: 06

Course Outcome: At the end of course, Students will be able to

- Analyze the impact of E-commerce on business models and strategy
- Describe Internet trading relationships including Business to Consumer, Business-to-Business, Intra-organizational.
- Describe the infrastructure for E-commerce.
- Discuss legal issues and privacy in E-Commerce.
- Define and analyze the principles of E-commerce and basics of World Wide Web.
- Define and analyze the concept of E-banking, electronic payment system.

UNIT-I

Introduction to Electronic commerce:

WhatisE-Commerce(IntroductionAnd Definition),MainactivitiesE-Commerce,GoalsofE-commerce,TechnicalComponentsofE-Commerce,FunctionsofE-commerce,Advantagesanddisadvantages ofE-Commerce,Scopeof E-Commerce, Electronic CommerceApplications,ElectronicCommerceand Electronic Business(C2C)(C2G,G2G, B2G,B2P, B2A, P2P,B2A, C2A,B2B,B2C)

UNIT-II

Internet and WWW:

Evolution of Internet, Domain Names and Internet, Organization (.edu,.com,.mil,.gov,.netetc.),TypesofNetwork,InternetService. Provider,WorldWideWeb,Internet&Extranet,RoleofInternetinB2BApplication,buildingownwebsite,Cost, Time, Reach, Registering aDomain Name, Web promotion, Target email,Banner, Exchange, Shopping Bots.

UNIT-III

Electronic Data Exchange:

Introduction, Concepts of EDI and Limitation, Applications of EDI, Disadvantages of EDI, EDImodel,Electronic Payment System: Introduction, Types of ElectronicPayment System, Payment Types, ValueExchangeSystem, Credit Card System, ElectronicFund Transfer, Paperless bill, ModernPayment Cash, ElectronicCash.

UNIT-IV

PlanningforElectronicCommerce

PlanningElectronicCommerceinitiates, Linking objectives to business strategies, Measuring cost objectives, Comparingbenefits to Costs, Strategies for developing electroniccommerceweb sites.

UNIT-V

Internet Marketing

ThePROSand CONSofonlineshopping, The cons ofonline shopping,JustifyingInternet business, Internet marketingtechniques, TheE-cycleof Internet marketing, Personalization e-commerce.

TEXT/REFERENCE BOOKS:

1. G.S.V.Murthy, E-Commerce Concepts,Models,Strategies-:-HimalayaPublishingHouse, 2011.
2. Kamlesh K Bajaj and Debjani Nag, E-Commerce, 2005.
3. GrayP. Schneider,Electronic commerce,International Student Edition, 2011.
4. Henrychan, Raymondlee, Tharamdillon, Elizabethchang.
5. E-Commerce, Fundamentals And Applications, Wiley Student Edition, 2011.

BCS-401 ARTIFICIAL INTELLIGENCE

Core Course: 08 **Marks: 100**
Total Credit: 06

Course Outcome: At the end of course, Students will be able to

- Understand the various searching techniques, constraint satisfaction problem and example problems- game playing techniques.
- Analyze and design a real world problem for implementation and understand the dynamic behaviour of AI system.
- Apply techniques to solve the AI problems.
- To provide a strong foundation of fundamental concepts in Artificial Intelligence.
- To provide a basic exposition to the goals and methods of Artificial Intelligence.

UNIT-I
Introduction:
Overview of Artificial Intelligence (AI), Foundations of A.I., History of AI, Background and Applications, TuringTest and RationalAgent approaches to AI, Introduction to Intelligent Agents, their structure, behavior and environment.

UNIT-II
AI Programming languages:
Introduction to LISP, Basic list manipulation functions, Input/output and local variables, Lists and Arrays, simple program in LISP, Introduction to PROLOG.

UNIT -III
Problems and Heuristic Search Techniques:
Problem Characteristics, Production Systems, Control Strategies, Search techniques: Breadth First, Depth-first search, Hill-climbing, Heuristics Search Techniques: Best First Search, A* algorithm.

UNIT -IV
Knowledge Representation:
Approaches and Issues, Frame, Conceptual dependency, Semantic Net, Scripts etc., Propositional Logic, First order, Propositional Logic (FOPL), Conversion to clausal form, Inference rules, Resolution principal.

UNIT -V
Expert System:
Introduction, Application, Existing Expert systems. Components of typical expert system, Rule based system architecture,

TEXT/REFERENCE BOOKS:
1. Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems, PHI Publication.
2. Elaine Rich and Kevin Knight, Artificial Intelligence,TMH publication.
3. V.S. Jankiraman,K. Sarukesi and P.Gopalakrishnan,Foundations of Artificial Intelligence and Expert Systems , Macmillan Series in Computer Science.

BCS-402 SOFTWARE ENGINEERING

Core Course:09 **Marks: 100**
Total Credit: 06

Course Outcome: At the end of course, Students will be able to

- Select and implement different software development process models.
- Extract and analyze software requirements specifications for different projects.
- Apply standard coding practices.
- Apply different testing and debugging techniques and analyzing their effectiveness.
- Define the concepts of software quality and reliability on the basis of International quality standards.

UNIT-I
Introduction to Software Engineering:
Definition, Evolution, Principles, Exploratory style of software development, Need of software engineering, Emergence of software engineering, Computer systems engineering.

UNIT-II
Software Life Cycle Models:
Definition, Classical Waterfall model, Iterative Waterfall model, V-model, Prototyping model, Incremental development model, Evolutionary model, Rapid Application Development(RAD), Agile model, Extreme programming model, Spiral model.

UNIT-III
Software Project Management (SPM):
SPM complexities, responsibilities of a software project manager, project planning, metrics for project size estimation, project estimation techniques, COCOMO model, Scheduling: Work breakdown structure, Activity networks, Critical Path Method (CPM), PERT, risk management, software configuration management.

UNIT-IV
Requirements Analysis and Specification:
Requirements gathering, requirements analysis, Software Requirements Specification (SRS): Users of SRS Document, Need of SRS, Characteristics of SRS Document, functional requirements, non-functional requirements, goals of implementation;
Software Design:
Characteristics, Outcome of the Design process, Cohesion and Coupling, Approaches to software design, Data Flow Diagram (DFD), Data dictionary.

UNIT-V
Coding and Testing:
Coding standards and guidelines, code review, software documentation, Testing: Basic concepts and terminologies, verification, validation, testing process, unit testing, black-box testing, white-box testing, Control flow graph, cyclomatic complexity, mutation testing, debugging, integration testing, system testing.

TEXT/ REFERENCE BOOKS:
1. "Fundamentals of Software Engineering", Rajib Mall, PHI
2. "Software Engineering, A Practitioner's Approach", Roger Pressman", 4th Edition, TMH.
3. "Software Engineering", P.S.Pressman, TMH
4. "An Integrated Approach of Software Engineering", PankajJalote, Galgotia
5. "Software Engineering", M.Shooman, TMH

BCS-403 DATABASE MANAGEMENT SYSTEMS

Core Course: 10 **Marks: 100**
Total Credit: 06

Course Outcome: At the end of course, Students will be able to

- Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS.
- Practice SQL programming through a variety of database problems.
- Demonstrate the use of concurrency and transactions in database
- Design and build database applications for real world problems.
- Is able to imply join concepts on tables.

UNIT-I
Introductory Concepts:
Introduction, Instance and schema, Data models, Three-Schema architecture, View of Database system, Database languages, Centralized and Client/Server architectures for DBMS, Database Administrator

UNIT-II
Database Design and ER- Model:
Introduction, Entity, Relationship, Attributes, Constraints, ER Diagram, Relational model: Constraints, Languages, Codd Rules, Design Reduction to Relational Schema, Specialization, Generalization, Aggregation.

UNIT-III
Relational Database Design:
Functional Dependency, 1NF, 2NF, 3NF, BCNF, 4NF, 5NF, Comparison of BCNF and 3NF, Closure of set of functional Dependency, Closure of Attribute Sets, Canonical Cover, Lossless Decomposition, Dependency Preservation

UNIT-IV
Relational Database:
Structure of Relational Database, Schema, Keys, Relational Operation- Selection, Projection, Join and types, Cartesian Production, Union, Intersection and Minus operation

UNIT-V
Transaction:
Introduction, Desirable properties of transaction(ACID), Concurrency control techniques, Serializability.

TEXT/REFERENCE BOOKS:

1. "Fundamentals of Database System", R. Elmasri& S. Navathe
2. "Data Base Management System", Henry F. Korth& Abraham Silberschats, TMH, 1991.
3. "An Introduction to Database Management System", Vol I &II, Date C.J., Addison Wesley, 1981, 1983.

BCS-404(SQL/PL-SQL)

Skill Enhancement CourseSEC: 02 **Marks: 100**
Total Credit: 02

Course Outcome: At the end of course, Students will be able to

- Enhance the knowledge and understanding of Database analysis and design.
- Enhance the knowledge of the processes of Database Development and Administration using SQL and PL/SQL.
- Enhance Programming and Software Engineering skills and techniques using SQL and PL/SQL.
- Use the Relational model and how it is supported by SQL and PL/SQL.
- Application of real time transaction logics.

UNIT-I
Introductionto Oracle:
Oracleas RDBMS, SQLCommands and Datatypes, Operators and Expressions,Introduction to SQL* Plus,SQLVs. SQL* Plus.

UNIT-II
Table Manipulation:
Creating and AlteringTables (Includingconstraints), DataManipulation Command (likeInsert, update,delete),
SELECTstatementwithWHERE,GROUPBYandHAVING,ORDERBY,DISTINCT,

UNIT-III
Operators:
Special operator (IN, ANY, ALL BETWEEN, EXISTS, LIKE), Join, Built in functions;

UNIT-IV
Database Objects:
Other Database Objects: View, Synonyms, Index; Transaction Control Statements: Commit, Rollback, Savepoint.

UNIT-V
Introductionto PL/SQL:
SQLv/s PL/SQL, PL/SQLBlock Structure, Language construct of PL/SQL (Variables, Basic and Composite Data type, Conditions loopingetc.), %TYPE and %ROWTYPE, UsingCursor(Implicit,Explicit).

TEXT/REFERENCE BOOKS:

1. IvanBayross,"SQL, PL/SQLtheProgrammingLanguageofOraclePaperback",BPBPublications, 2010.
2. Steven Feuerstein, BillPribyl , "OraclePL/SQL Programming", 6th Edition, O'ReillyMedia,2014.
3. RajeebC. Chatterjee,"LearningOracleSQL and PL/SQL: A simplifiedGuide", PHI, 2012.
4. Ron Hardman, Michael Mclaughlin, "Expert OraclePL/SQL", OraclePress, 2005.
5. Michael Mclaughlin,"OracleDatabase11gPL/SQLProgramming", OraclePress, 2008.
6. JohnWatson,RoopeshRamklass, "OCA OracleDatabase11gSQL FundamentalsExamGuide", OraclePress, 2008.

BCS-405 PROGRAMMING IN PYTHON

General Elective GE:4 (Group-A) **Marks: 100**
Total Credit: 04

Course Outcome: At the end of course, Students will be able to

- Define the structure and components of a Python program.
- Demonstrate proficiency in handling of loops and creation of functions. Identify the methods to create and manipulate lists, tuples and dictionaries.
- Discover the commonly used operations involving regular expressions and file system.
- Determine the need for scraping websites and working with CSV, JSON and other file formats.
- Interpret the concepts of Object-Oriented Programming as used in Python.

UNIT-I
Planning the Computer Program:
Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in programming, Documentation.

UNIT-II
Techniques of Problem Solving:
Flowcharting, decision table, algorithms, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming.

UNIT-III
OverviewofProgramming: StructureofaPython Program, Elements ofPython.

UNIT-IV
IntroductiontoPython: PythonInterpreter,UsingPythonas calculator, Python shell,Indentation.Atoms, Identifiers and keywords, Literals, Strings, Operators(Arithmetic operator, RelationalOperator,Logical orBoolean operator, Assignment, Operator, Ternaryoperator, Bit wiseoperator,Increment orDecrement operator).

UNIT-V
CreatingPythonPrograms: Input and Output Statements, Control statements(Branching, Looping, Conditional Statement, Exit function, Differencebetween break,continue and pass.), Defining Functions, default arguments.

TEXT/REFERENCE BOOKS

1. T. Budd, ExploringPython, TMH, 1st Ed, 2011
2. PythonTutorial/Documentation www.python.or 2015(4L)
3. AllenDowney,JeffreyElkner,ChrisMeyers,Howtothinklikeacomputerscientist: Learningwith Pyth,Freelyavailableonline.2012
4. Mark lutz and davidascber, Learning python by O'realy
5. Charles severance,Python for everybody: Exploring data with python, SPD publication

BCS-406 Programming in Python Lab

General Elective GE:4(P) (Group-A) **Marks: 100**
Total Credit: 02
Lab Practical: 60 lectures

Course Outcome: At the end of course, Students will be able to

- Learn the Numbers, Math functions, Strings, List in Python.
- Learn the tuples and dictionaries in Python .
- Demonstrate proficiency in handling of loops and creation of functions.
- Identify the methods to create and manipulate lists, tuples and dictionaries.
- Express different Decision Making statements and Functions

Interpret Object oriented programming in Python

1. Using for loop, print a table of Celsius/Fahrenheit equivalences. Let c be the Celsius temperatures ranging from 0 to 100, for each value of c, print the corresponding Fahrenheit temperature.

2. Using while loop, produce a table of sins, cosines and tangents. Make a variable x in range from 0 to 10 in steps of 0.2. For each value of x, print the value of sin(x), cos(x) and tan(x).

3. Write a program that reads an integer value and prints —leap year‖ or —not a leap year‖.

4. Write a program that takes a positive integer n and then produces n lines of output shown as follows.
   For example enter a size: 5
   *
   **
   ***
   ****
   *****

5. Write a function that takes an integer _n' as input and calculates the value
   of 1 + 1/1! + 1/2! + 1/3! + … + 1/n

6. Write a function that takes an integer input and calculates the factorial of that number.

7. Write a function that takes a string input and checks if it's a palindrome or not.

8. Write a list function to convert a string into a list, as in list (_abc') gives [a, b, c].

9. Write a program to generate Fibonacci series.

10. Write a program to check whether the input number is even or odd.

11. Write a program to compare three numbers and print the largest one.
12. Write a program to print factors of a given number.

13. Write a method to calculate GCD of two numbers.

14. Write a program to create Stack Class and implement all its methods. (Use Lists).
15. Write a program to create Queue Class and implement all its methods. (Use Lists)
16. Write a program to implement linear and binary search on lists.
17. Write a program to sort a list using insertion sort and bubble sort and selection sort.

Note: List of programs may be changed by the concern teacher.

BCS-407 INTRODUCTION TO DATABASE SYSTEM

General Elective GE:4 (Group B) **Marks: 100**
Total Credit: 04

Course Outcome: At the end of course, Students will be able to

- Learn and practice data modelling using the entity relationship and developing database designs.
- Apply normalization techniques to normalize the database.
- . Design data base and normalize data and Understand how query are being processed and executed.
- Understand the needs of database processing and learn techniques for controlling the consequences of concurrent data access
- Understand types of Data Base failures and Recovery.

UNIT-I
Database:
Introduction to database, relational datamodel, DBMS architecture, dataindependence, DBA, databaseusers, end users, front end tools.

UNIT-II
E-R Modeling:
Entity types, entity set, attribute and key, relationships, relation types, E-R diagrams, database design using ER diagrams.

UNIT -III
Relational Data Model:
Relational model concepts, relational constraints, primary and foreign key, Normalization.

UNIT- IV
Structured Query Language:
SQL queries, create database table, create relationships between database tables, modify and manage tables, queries, forms, reports, modify, filter and view data.

UNIT-V
Transaction:
Introduction, Desirable properties of transaction (ACID), Concurrency control techniques, Serializability.

TEXT/REFERENCEBOOKS :

1.P. Rob, C. Coronel, DatabaseSystem Concepts by, CengageLearning India, 2008
2.R.Elmsasri,S.NavatheFundamentalsofDatabaseSystems,PearsonEducation, Fifth Edition, 2007.
3.MySQL: ReferenceManual

BCS-408 Introduction to Database System Lab

General Elective GE:4 (Group B) **Marks: 100**
Total Credit: 02

Course Outcome: At the end of course, Students will be able to

- Gain knowledge about SQL Fundamentals.
- Perform Unary & Binary table operations.
- Write Embedded and Nested Queries.
- Create Table View, Log & Triggers.
- Create Database connectivity with front-end.
- Develop database applications using front-end tools and back-end DBMS.

Create and use the following database schema to answer the given queries.

EMPLOYEE SCHEMA

Field	Type	NULL	KEY	DEFAULT
Eno	Char(3)	NO	PRI	NIL
Ename	Varchar(50)	NO		NIL
Job_type	Varchar(50)	NO		NIL
Manager	Char(3)	Yes	FK	NIL
Hire_date	Date	NO		NIL
Dno	Integer	YES	FK	NIL
Commission	Decimal(10,2)	YES		NIL
Salary	Decimal(7,2)	NO		NIL

DEPARTMENT Schema

Field	Type	NULL KEY	DEFAULT
Dno	Integer	No PRI	NULL
Dname	Varchar(50)	Yes	NULL
Location	Varchar(50)	Yes	New Delhi

Query List

1. Query to display Employee Name, Job, Hire Date, Employee Number; for each employee with the Employee Number appearing first.
2. Query to display unique Jobs from the Employee Table.
3. Query to display the Employee Name concatenated by a Job separated by a comma.
4. Query to display all the data from the Employee Table. Separate each Column by a comma and name the said column as THE_OUTPUT.
5. Query to display the Employee Name and Salary of all the employees earning more than $2850.
6. Query to display Employee Name and Department Number for the Employee No= 7900.
7. Query to display Employee Name and Salary for all employees whose salary is not in the range of $1500 and $2850.

8. Query to display Employee Name and Department No. of all the employees in Dept 10 and Dept 30 in the alphabetical order by name.
9. Query to display Name and Hire Date of every Employee who was hired in 1981.
10. Query to display Name and Job of all employees who don't have a current Manager.
11. Query to display the Name, Salary and Commission for all the employees who earn commission.
12. Sort the data in descending order of Salary and Commission.
13. Query to display Name of all the employees where the third letter of their name is _A'.
14. Query to display Name of all employees either have two _R's or have two _A's in their name and are either in Dept No = 30 or their Manger's Employee No = 7788.
15. Query to display Name, Salary and Commission for all employees whose Commission Amount is 14 greater than their Salary increased by 5%.
16. Query to display the Current Date.
17. Query to display Name, Hire Date and Salary Review Date which is the 1st Monday after six months of employment.
18. Query to display Name and calculate the number of months between today and the date each employee was hired.
19. Query to display the following for each employee <E-Name> earns < Salary> monthly but wants < 3 * Current Salary >. Label the Column as Dream Salary.
20. Query to display Name with the 1st letter capitalized and all other letter lower case and length of their name of all the employees whose name starts with 'J', 'A 'and 'M'.
21. Query to display Name, Hire Date and Day of the week on which the employee started.
22. Query to display Name, Department Name and Department No for all the employees.
23. Query to display Unique Listing of all Jobs that are in Department # 30.
24. Query to display Name, Dept. Name of all employees who have an 'A'in their name.
25. Query to display Name, Job, Department No. and Department Name for all the employees working at the Dallas location.
26. Query to display Name and Employee no. Along with their Manger's Name and the Manager's employee no; along with the Employees'Name who do not have a Manager.
27. Query to display Name, Dept No. And Salary of any employee whose department No. and salary matches both the department no. And the salary of any employee who earns a commission.
28. Query to display Name and Salaries represented by asterisks, where each asterisk (*) signifies $100.
29. Query to display the Highest, Lowest, Sum and Average Salaries of all the employees.
30. Query to display the number of employees performing the same Job type functions.
31. Query to display the no. of managers without listing their names.
32. Query to display the Department Name, Location Name, No. of Employees and the average salary for all employees in that department.
33. Query to display Name and Hire Date for all employees in the same dept. as Blake.
34. Query to display the Employee No. And Name for all employees who earn more than the average salary.
35. Query to display Employee Number and Name for all employees who work in a department with any employee whose name contains a _T'.

Note: List of experiments may be changed by the concern teacher..

BCS-501 THEORY OF COMPUTATION

Core Course:11 **Marks: 100**
Total Credit: 06

Course Outcome: At the end of course, Students will be able to

- Discuss properties of different grammars and languages.
- Solveproblems related to string membership to an automata and respective Language.
- Create grammar for specific language.
- Identify language accepted by particular automata.
- Design optimum automata for particular language.

UNIT-I
Introduction:
Introduction of alphabets, Strings and Languages; Automata, Finite automata (FA), Deterministic Finite Automata (DFA) -Formal definition, simplified notations (state transition diagram, transition table), Non-deterministic Finite Automata (NFA -Formal Definition, Acceptability of a String by a DFA & NFA), Minimizing number of state of a DFA.

UNIT-II
Finite Automata with output:
Moore and Mealy Machine, Procedure for Transforming a Mealy Machine into a Moore Machine and vice versa.

Formal language:
Definition of a Grammar, Derivations and the Language Generated by a Grammar, Chomsky Classification of Languages, Languages and Their Relation, Recursive and Recursively Enumerable Sets, Operations on Languages, Languages and Automata.

UNIT-III
Regular expressions (RE):
Definition, FA and RE, Transition System Containing A-moves, NFAs with A-moves and Regular Expressions, NFA to DFA conversion, Algebraic Method Using Arden's Theorem, Construction of Finite Automata Equivalent to a Regular Expression and vice versa, Equivalence of two FA, Equivalence of two RE.

Regular Sets:
Pumping Lemma for Regular Sets, Application of Pumping Lemma, Closure Properties of Regular Sets, Regular Sets and Regular Grammars, Closure Properties of Regular languages, emptiness, finiteness, membership.

UNIT-IV
Context-free Grammars (CFGs): Formal definition, sentential forms, leftmost and rightmost derivations, The language of CFG, Derivation tree, Ambiguity in grammars and Languages, Ambiguity in CFG, Simplification of CFG, Normal Forms for CFG (Chomsky Normal Form, Greibach Normal Form), Pumping Lemma for Context-free Languages, Closure Properties of CFG's.

UNIT-V
Pushdown Automata (PDA): Formal definition, acceptance by PDA, PDAs and CFGs, CFG to PDA, PDA to CFG, DPDAs -Definition, DPDAs and Regular Languages, DPDAs, and CFLs, Languages of DPDAs, DPDAs.

Context Sensitive Grammar: Definition, Linear Bounded Automata, Turing Machines -Formal definition and behavior, Transition diagrams, acceptance by TM, Multi tape Turing Machine, Universal Turing Machine, Halting Problem of Turing Machine.

TEXT/REFERENCE BOOKS:

1. "Elements of The Theory of Computation", H.R.Lewis& C.H. Papadimitriou, P.H.I.
2. "Introduction To Automata Theory, Language and Computation" J.E.Hopcroft, R.MotwaniJ.D.Ullman, Pearson Education
3. "Theory of Computer Science(Automata, Languages And Computation)", K.L.P.Mishra, N.Chandrasekaran:,PHI
4. "Introduction to languages and Theory of Computation", John Martin, McGraw Hill
5. "Introduction To Computer Theory", D.A.Cohen (J.Wiley)

BCS-502 PROGRAMMING IN JAVA

Core Course: 12 **Marks: 100**
Total Credit: 06

Course Outcome: At the end of course, Students will be able to

- Explain the object-oriented concepts and JAVA.
- Implement, compile, test and run Java programs comprising more than one class, to address a particular software problem.
- Demonstrate the principles of object oriented programming.
- Create multi-threaded programs and event handling mechanisms
- Develop simple GUI interfaces for a computer program to interact with users.

UNIT-1
Overview of JAVA:
The genesis of java, An overview of java, Java virtual machine (JVM), Java development kit (JDK), Java Vs C++, Data types, Literals, Variables, and Arrays, Operators, Control statements.

UNIT-II
Introducing Class:
Class fundamentals, Closer look at Methods and class ,Nested and inner class ,Exploring Java lang, String handling ,Constructor ,this keyword, Garbage collection and finalize() method. Writing simple JAVA program.

UNIT-III
Inheritance:
Basics ,Types of inheritance ,Access specifier ,using super, method overriding ,Abstract class ,constructor in multilevel inheritance ,using final with inheritance ,Dynamic method dispatch .

UNIT-IV
Package and Interface:
Defining package, CLASSPATH, Access protection, Importing package, Defining and implementing interface, Variable in interface, Extending interface, Nested interface.

UNIT-V
Exception handling and Multithreading:
Using try and catch ,multiple catch classes, Nested try statements , throw ,throws and finally ,Built in exception ,Uncaught exception , Creating own exception class , Java Thread Model: Main thread ,Creating own Thread ,Life cycle of thread, Thread priorities ,Synchronization and messaging, Interthread communication ,Suspending ,Resuming and stopping thread.

TEXT/REFERENCE BOOK
1. Java: The complete reference By Naughton P and schildtH. ,Osborne Tata Mcgraw-Hill.
2. Java Programming By E.Balguruswami
3. Core JAVA for beginners By RashmiKantaDas ,Vikas Publication.
4. Core JAVA : A Comprehensive Study by Mahesh P. Matha , PHI publication.

BCS-504 NUMERICAL METHODS

Discipline Specific Elective DSE:1 **Marks: 100**
Total Credit: 06

Course Outcome: At the end of course, Students will be able to

- To provide suitable and effective methods called Numerical Methods, for obtaining approximate representative numerical results of the problems.
- To solve complex mathematical problems using only simple arithmetic operations. The approach involves formulation of mathematical models of physical situations that can be solved with arithmetic operations
- Make use of analytical methods to solve higher order differential equations.
- Apply elementary probability theory and solve related problems.
- Classify partial differential equations and solve them by exact methods.
- Apply the knowledge of numerical methods in modelling and solving engineering problems.

Note: Scientific calculators are allowed for this subject.

UNIT–I
Algebraic and Transcendental Equations:
Errors and precision, errors due to round off, Solution of Algebraic and Transcendental Equations, Bisection Method, Method of False Position, Newton-Raphson Method.

UNIT-II
Interpolation:
Introduction, Newton's Backward Interpolation formula, Newton's Forward Interpolation formula, Gausses forward Interpolation Formula, Gausses Backward Interpolation formula, Lagrange's Interpolation formula, Newton divided difference formula.

UNIT–III
Curve Fitting:
Graphical method, Laws reducible to the linear laws, Principal of least square, Method of least squares, fitting a curve of type $y= a+bx^2$, $y= ax+bx^2$, $y=ax+b/x$, $y= ax^2+bx$, $y=ax^b$, $y=ae^{bx}$ etc. Method of group averages.

UNIT-IV
Numerical Differentiation:
Forward Difference formula, Backward Difference formula, Numerical Integration : Quadrature formulae , Errors in Quadrature formulae, Rombergs Method, Euler –Maclaurin formula.

UNIT–V
Numerical solution of Ordinary Differential equations:
Picards method, Taylors series method, Eulers method, Modified Eulers method, Runges method, Runge-kutta method

TEXT /REFERENCE BOOKS:

1. "Numerical Analysis", S.S. Sastry, PHI
2. "Numerical Method in Engineering and Science", Dr. B.S. Grewal, Khanna Publishers,2010
3. "Computer Oriented Numerical Methods", Rajaraman, PHI
4. "Numerical Computations", Venkataraman
5. "Computer Oriented Numerical Methods", Stoer, Bullrich, Springer Verlag, 1980.

BCS-505 MICROPROCESSOR

Discipline Specific Elective DSE:1 **Marks: 100**
Total Credit: 06

Course Outcome: At the end of course, Students will be able to

- Understand and device techniques for faster execution of instructions, improve speed of operations and enhance performance of microprocessors.
- Assess and solve basic binary math operations using the microprocessor and explain the microprocessor's and Microcontroller's internal architecture and its operation within the area of manufacturing and performance
- Compare accepted standards and guidelines to select appropriate Microprocessor (8085 & 8086) and Microcontroller to meet specified performance requirements.
- Analyze assembly language programs; select appropriate assemble into machine a cross assembler utility of a microprocessor and microcontroller.
- Design electrical circuitry to the Microprocessor I/O ports in order to interface the processor to external devices.
- Evaluate assembly language programs and download the machine code that will provide solutions real-world control problems.

UNIT-I
Introduction to Microprocessor:
Fundamental definition of Microprocessor, evolution of Microprocessor, Microprocessor Instruction set and Computer Languages, From large scale to single chip microcontrollers, Von Neumann and Harvard architecture, RISC vs. CISC, Application: Microprocessor Controlled Temperature System.

UNIT-II
8086 Architecture:
Register organization of 8086, Architecture, signal description of 8086, Physical memory organization , General Bus operation, I/O addressing capability, Special processor activities, Minimum mode 8086 system and timings, Maximum Mode 8086 system and timings, The processor 8088.

UNIT-III
8086/8088 instruction set and assembler directives:
Machine language instruction format, Addressing mode of 8086, Instruction set of 8086/8088, Assembler directives and operators.

UNIT-IV
Special architectural features:
Stack structure of 8086/8088, interrupt and interrupt services routine, interrupt cycle of 8086/8088, Non maskable interrupt, Maskable interrupt.

UNIT-V
Intel I Processor:
Case study of Intel i series of processors.

TEXT BOOKS:

1. "Microprocessors Architecture, Programming and Applications", Ramesh S. Goanker, Wiley Eastern, 1994 or (Latest Edition)

REFERENCE BOOKS:

1. "Micro Processors & Interfacing", Douglas U. Hall, 2007."The 8088 and 8086 Micro Processors", 4th Edition, PHI, 2003.
2. "Micro Computer System 8086/8088 Family Architecture, Programming and Design", Liu and GA Gibson, 2nd Edition, PHI
3. "Introduction to Microprocessors", Aditya P. Mathur, TMH, 1995

BCS-506 MACHINELEARNING

Discipline Specific Elective DSE:2 (Group-A) **Marks: 100**
Total Credit: 04

Course Outcome: At the end of course, Students will be able to

- Learn, understand, and practice machine learning approaches, which include the study of modern computing technologies and scaling up machine learning techniques.
- Select and implement machine learning techniques and computing environment that are suitable for the applications under consideration.
- Apply various machine learning algorithms to solve real world problems.
- Write program to implement machine learning based models.
- Solve the problems related to liner regression, classification etc.

UNIT-I
Introduction:
Concept of Machine Learning, Applications of Machine Learning, Key elements of Machine Learning, Supervised vs. Unsupervised Learning, Traditional programming Vs. Machine learning Statistical Learning: Bayesian Method, The Naïve Bayes Classifier.

UNIT-II
Linear Regression:
Prediction using Linear Regression, Gradient Descent, Linear Regression with one variable, Linear Regression with multiple variables, Polynomial Regression, Feature Scaling/Selection.

UNIT-III
Logistic Regression:
Classification using Logistic Regression, Logistic Regression vs. Linear Regression, Logistic Regression with one variable and with multiple variables.

UNIT-IV
Regularization:
Regularization and its utility: The problem of Over fitting, Application of Regularization in Linear and Logistic Regression, Regularization and Bias/Variance.
Neural Networks: Introduction, Model Representation, Gradient Descentvs. Perceptron Training, Stochastic Gradient Descent, Multilayer Perceptrons, Multiclass Representation, Backpropagation Algorithms.

UNIT V
Machine learning tools: Introduction of MATLAB, WEKA as machine learning tools,Using GUI of MATLAB and WEKA to develop Machine learning based models. Write programs to Implementmachine learning models.

TEXT/REFRENCE BOOKS:

1. Ethem Alpaydin,"Introduction to MachineLearning"2nd Edition, TheMIT Press, 2009.
2. TomM.Mitchell,"MachineLearning",FirstEditionbyTataMcGraw-HillEducation,2013.
3. ChristopherM. Bishop, "Pattern Recognition andMachineLearning"bySpringer, 2007.
4. MevinP.Murphy,"MachineLearning:AProbabilisticPerspective"byTheMITPress,2012.
5. S.N. shivanandan and pai, willey publication.
6. Neural network and Learning Machines, Simon Haykin, Pearson Education, 2011.

BCS-507 MACHINE LEARNING LAB

Discipline Specific Elective DSE: 2 (Group-A) **Marks: 100**
Total Credit: 02

Course Outcome: At the end of course, Students will be able to

- Understand complexity of Machine Learning algorithms and their limitations;
- Applying common Machine Learning algorithms in practice and implementing their own.
- Perform experiments in Machine Learning using real-world data.
- Design and implement machine learning solutions to classification, regression, and clustering problems; and be able to evaluate and interpret the results of the algorithms.
- Understand modern notions in data analysis oriented computing.

1. Use command to compute the size of a matrix, size/length of a particular row/column, load data from a text file, store matrix data to a text file, finding out variables and their features in the current scope.
2. Perform basic operations on matrices (like addition, subtraction, multiplication) and
3. Display specific rows or columns of the matrix.
4. Perform other matrix operations like converting matrix data to absolute values, taking the negative of matrix values, additing/removing rows/columns from a matrix, finding the maximum or minimum values in a matrix or in a row/column, and finding the sum of some/all elements in a matrix.
5. Create various type of plots/charts like histograms, plot based on sine/cosine function based on data from a matrix. Further label different axes in a plot and data in a plot.
6. Generate different subplots from a given plot and color plot data.
7. Use conditional statements and different type of loops based on simple example/s.
8. Perform vectorized implementation of simple matrix operation like finding the transpose of a matrix, adding, subtracting or multiplying two matrices.
9. Implement Linear Regression problem. For example, based on a dataset comprising of existing set of prices and area/size of the houses, predict the estimated price of a given house.
10. Based on multiple features/variables perform Linear Regression. For example, based on a number of additional features like number of bedrooms, servant room, number of balconies, number of houses of years a house has been built – predict the price of a house.
11. Implement a classification/ logistic regression problem. For example based on different features of students data, classify, whether a student is suitable for a particular activity. Based on the available dataset, a student can also implement another classification problem like checking whether an email is spam or not.
12. Use somefunction for regularization of dataset based on problem 14.
13. Use some function for neural networks, like Stochastic Gradient Descent or backpropagation - algorithm to predict the value of a variable based on the dataset of problem

Note: List of experiments may be changed by the concern teacher.

BCS-508 INTRODUCTIONTO DATA SCIENCE

Discipline Specific Elective DSE:2 (Group-B) **Marks: 100**
Total Credit: 04

Course Outcome: At the end of course, Students will be able to

- Describe what Data Science is and the skill sets needed to be a data scientist.
- Explain in basic terms what Statistical Inference means. Identify probability distributions commonly used as foundations for statistical modelling. Fit a model to data.
- Use R to carry out basic statistical modelling and analysis.
- Explain the significance of exploratory data analysis (EDA) in data science. Apply basic tools(plots, graphs, summary statistics) to carry out EDA.
- Employ cutting edge tools and technologies to analyze Big Data.

UNIT-I
Data Scientist's Tool Box:
Turning data into actionable knowledge, introduction to the tools that will beused in buildingdata analysis software: version control, markdown, git, GitHub, R, and RStudio.

UNIT-II
R Programming Basics:
Overview of R, R data types and objects, reading and writing data, Control structures, functions, scoping rules, dates and times, Loop functions, debugging tools, Simulation, code profiling

UNIT-III
Getting andCleaning Data:
Obtaining data from the web, from APIs, from databases and from colleagues in various formats. Basicsofdata cleaning and makingdata—tidy.

UNIT-IV
Exploratory Data Analysis:
Essential exploratory techniques for summarizing data, applied before formal modeling commences, eliminating or sharpening potential hypotheses about the world that can be addressed by the data, common multivariate statistical techniques used to Visualize high-dimensional data.

UNIT-V
ReproducibleResearch:
Concepts and tools behind reporting modern data analyses in a reproducible manner, To write a document using R markdown, integrate live R code into a literate statistical program, compile R markdown documents using knitr and related tools, and organizeadata analysis so that it is reproducible and accessibleto others.

TEXT/REFERENCE BOOKS:

1. Rachel Schutt, Cathy O'Neil, "Doing Data Science: Straight Talk from theFrontiline"bySchroff/O'Reilly, 2013.
2. FosterProvost,TomFawcett,"DataScienceforBusiness"WhatYouNeedtoKnowAbout DataMining andData-AnalyticThinking" byO'Reilly, 2013.
3. JohnW.Foreman,"DataSmart:UsingdataSciencetoTransformInformationintoInsight"byJoh n Wiley&Sons, 2013.
4. IanAyres,"SuperCrunchers:WhyThinking-by-NumbersIstheNewWaytoBeSmart"Ist Editionby Bantam,2007.5.EricSeigel,"PredictiveAnalytics:ThePowertoPredictwhoWillClick,Buy,Li st e,orDie", 1 Edition, byWiley, 2013.

BCS-509 INTRODUCTIONTO DATA SCIENCE LAB

Discipline Specific Elective DSE:2 (Group-B) **Marks: 100**
Total Credit: 02

Course Outcome: At the end of course, Students will be able to

- Describe what Data Science is and the skill sets needed to be a data scientist.
- Explain in basic terms what Statistical Inference means.
- Identify probability distributionscommonly used as foundations for statistical modelling.
- Use R to carry out basic statistical modelling and analysis.
- Explain the significance of exploratory data analysis (EDA) in data science. Apply basic tools(plots, graphs, summary statistics) to carry out EDA.

1. Write a program that prints "Hello World' to the screen.
2. Write a program that asks the user for a number n and prints the sum of the numbers 1to n
3. Write a program that prints a multiplication table for numbers up to 12.
4. Write a function that returns the largest element in a list.
5. Write a function that computes the running total of a list.
6. Write a function that tests whether a string is a palindrome.
7. Implement linear search.
8. Implement binary search.
9. Implement matrices addition , subtraction and Multiplication
10. Fifteen students were enrolled in a course. There ages were:

    20 20 20 20 20 21 21 21 22 22 22 22 23 23 23

    i. Find the median age of all students under 22 years
    ii. Find the median age of all students
    iii. Find the mean age of all students
    iv. Find the modal age for all students
    v. Two more students enter the class. The age of both students is 23. What is now mean, mode and median ?

11. Following table gives a frequency distribution of systolic blood pressure. Compute all themeasures of dispersion.

Midpoint	95.5	105.5	115.5	125.5	135.5	145.5	155.5	165.5	175.5
Number	5	8	22	27	17	9	5	5	2

12.Obtain probability distribution of , where X is number of spots showing when a six-sidedsymmetric die (i.e. all six faces of the die are equally likely) is rolled. Simulate random samplesof sizes 40, 70 and 100 respectively and verify the frequency interpretation of probability.

13.Make visual representations of data using the base, lattice, and ggplot2 plotting systems in R,apply basic principles of data graphics to create rich analytic graphics from available datasets.

14. Use Git / Github software to create Github account. Also, create a repo using Github.

Note: List of experiments may be changed by the concern teacher..

BCS-601 DESIGN AND ANALYSIS OF ALGORITHMS

Core Course: 13 **Marks: 100**
Total Credit: 06

Course Outcome: At the end of course, Students will be able to

- Explain various computational problem solving techniques.
- Apply appropriate method to solve a given problem.
- Describe various methods of algorithm analysis.
- Write rigorous correctness proofs for algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations.

UNIT -I
Introduction of Algorithm:
Analysis of algorithms, Time and space complexities, asymptotic notations, Standard notations and common functions, Recurrence solution: Substitution method, iteration method and the master method.

UNIT -II
Divide and Conquer: Binary search, Min-Max Problem, merge sort, quick sort, and Matrix Multiplication.
Greedy Method: Knapsack problem, Huffman codes, job sequencing with deadlines, Minimum **Spanning Trees:** Prim's and Kruskal's algorithms, Single Source Shortest path: Dijkstra's algorithm and Bellman Ford algorithms.

UNIT –III
Dynamic Programming:
O/1 Knapsack problem, all Pair's shortest paths: Warshal's and Floyd's algorithms, Single source shortest paths, Backtracking, Branch and Bound: Travelling
Salesman Problem.

UNIT –IV
Graph Algorithms:
Undirected Graph, Directed Graph, Traversing Graphs, Representation of graphs, Breadth-first search, Depth-first search, strongly connected components, topological sort.
String Matching:
Introduction, The naïve string matching algorithm, Rabin-Karp algorithm.

UNIT –V
Introduction to NP-Completeness:
The class P and NP, Polynomial reduction, NP-Completeness Problem, NP-Hard Problems, Reducibility.

TEXT /REFERENCE BOOKS:
1. "Introduction to Algorithms ", Thomas H. Cormen et al., PHI
2. "Fundamentals of computer algorithms", Ellis Horowitz, SartrajSahni and Rajasekaran, Galgotia
3. "Design Methods and Analysis of Algorithms", Prof S.K.Basu, BHU, PHI
4. "Data Structures,Algorithms and Applications in C++", Sahni, TMH
5. "Design and analysis of computer algorithms", Aho A.V, Hopcroft, J.E. Ullman, Addision-wesley
6. "Fundamentals of Algorithmics", Brassard and Bratley, PHI

BCS 602 COMPUTER GRAPHICS

Core Course:14 **Marks: 100**
Total Credit: 06

Course Outcome: At the end of course, Students will be able to

- Design and implement algorithms for 2D graphics primitives and attributes.
- Apply concepts of clipping and visible surface detection in 2D and 3D viewing, and Illumination Models.
- Demonstrate Geometric transformations, viewing on both 2D and 3D objects.
- Infer the representation of curves, surfaces, Colour and Illumination models
- Design and implementation of algorithms for 2D graphics Primitives and attributes.
- Explain hardware, software and OpenGL Graphics Primitives.

UNIT-I
Introduction to Computer Graphics:
Application of Graphics, Display Devices: Refresh Cathode-Ray Tubes, Raster Scan Displays, Random Scan Displays, Color CRT Monitors and Flat Panel Displays. Video cards/display cards. Graphic Software, Graphics Software Standard and Software Packages

UNIT-II
Line Generation Algorithms: DDA algorithm, Bresenham's algorithm;
Circle Generation Algorithms: Midpoint Circle algorithm
Polygon filling Algorithms: Scan Line Polygon fill algorithm, Inside - Outside Tests, Boundary-Fill algorithm, Flood - Fill algorithm. Fundamentals of aliasing and Antialiasing Techniques.

UNIT-III
Two Dimensional Viewing: Window to Viewport coordinates transformation.
Clipping: Clipping operations, Point clipping, **Line clipping:** Cohen Sutherland Algorithm, Liang Barsky Algorithm, Nicholl-Lee-Nicholl Algorithm, **Polygon clipping:** Sutherland-Hodgeman Algorithm, Weiler Atherton Algorithm, **Text clipping, Exterior clipping.**
Two Dimensional Transformations: Translation, Scaling, Rotation, Reflection, Shear

UNIT-IV
Three Dimensional Viewing: 3D Geometry, 3D display techniques, transformations.
Projections: Parallel Projection, Perspective Projection. Orthogonal Projection

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UNIT-V
Color Models and Color Application: Color Model, Standard Primaries and the Chromaticity Diagram, XYZ Color Model, CIE Chromaticity Diagram. RGB Color Model, YIQ Color Model, CMY Color Model, HSV Color Model. Conversion between HSV and RGB Models.HLS Color Model, Color Selection and Application.
Case study of OpenGL

TEXT/REFERENCE BOOKS:
1. "Principles of Interactive Computer Graphics", Newman, W. Sproul, R.F., TMH,1980
2. "Fundamentals of Interactive Computer Graphics", Foley J.D., Van Dome, Addison Wesley,1982
3. "Computer Graphics", Hearn D., Baker, PHI, 1986
4. "Procedural Elements for Computer Graphics", Rogers D. F., TMH, 1986
5. "Computer Graphics using OpenGL", F. S. Hill Jr., Pearson Education, 2003.

BCS-605 BIG DATA ANALYTICS

Discipline Specific Elective DSE:4 (Group-A) **Marks: 100**
Total Credit: 04

Course Outcome: At the end of course, Students will be able to

- Understand fundamentals of Big Data analytics.Investigate Hadoop framework and Hadoop Distributed File system.
- Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data.
- Demonstrate the MapReduce programming model to process the big data along with Hadoop tools.
- Analyze web contents and Social Networks to provide analytics with relevant visualization tools
- Interpret business models and scientific computing paradigms, and apply software tools for big data analytics.

UNIT-I
Introduction To Big Data:
Big Data and its importance, Characteristics of Big Data, What Comes Under Big Data, Who's Generating Big Data, Challenges in Handling Big Data, How Big Data Impact on IT, Big Data Analytics, Big data applications, Future of Big Data, Risks of Big Data.

UNIT-II
Introduction To Hadoop:
Introduction to Hadoop, Hadoop Architecture, Design Principles of Hadoop, Advantages of Hadoop, Hadoop Storage: Hadoop Distributed File System (HDFS), Properties of HDFS, NameNode, Secondary NameNode, DataNode, Goals of HDFS, Hadoop vs. Other Systems.

UNIT-III
Hadoop MapReduce:
Hadoop MapReduce, MapReduce paradigm, Resource manager, Node manager, Partitioner, combiner.

UNIT-IV
Yarn:
Introduction to YARN, YARN Framework, Classic MapReduceVs YARN, Schedulers: FIFO, Fair, Capacity.

UNIT-V
HADOOP Ecosystem:
Spark, Hive, HBase, Pig, Sqoop, Oozie.

TEXT/ REFERENCE BOOKS
1. "Professional Hadoop Solutions", Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, Wiley, 2015.
2. "Understanding Big data", Chris Eaton, Dirk deroos et al., McGraw Hill, 2012.
3. "HADOOP: The definitive Guide" , Tom White, O Reilly 2012.
4. "Big Data Analytics with R and Haoop", VigneshPrajapati, Packet Publishing 2013.
5. "Oracle Big Data Handbook", Tom Plunkett, Brian Macdonald et al , Oracle Press, 2014.
6. http://www.bigdatauniversity.com/
7. "Big Data and Business analytics", JyLiebowitz, CRC press, 2013.

TEXT/REFERENCE BOOKS:

1. Principles of soft computing , S.N. Shivanandan and S.N Deepa , Wiley publication, Wiley India Edition.
2. Neural network and Learning Machines, Simon Haykin, Pearson Education, 2011.
3. Artificial Neural Networks, Robert J. Scholkoff, McGraw Hill Education(India) Pvt. Limited,1997.
3. Neural Networks and Fuzzy Systems, A dynamical Systems Approach to Machine Learning, Bart Kosko, PHI learning private limited.
4. Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications, S. Rakasekaran, G.A. VijayalakshmiPai, PHI learning private limited, 14th Edition. 2003.
5. Neural Networks and Fuzzy Logic, K. Vinoth Kumar, R. Saravana Kumar, S. K. Kataraia and Sons publication.
6. Artificial Neural Networks, B.Yegnanarayana Prentice Halll of India (P) Limited.
7. Introduction to Artificial Neural Systems, Jacek M. Zurada, Jaico Publication House.
8. Fuzzy Sets, Uncertainty and Information, G. J. Klir and T.A. Folger, PHI learning private limited. Publisher– Pearson 3Edition 1999

BCS-607 SOFT COMPUTING

Discipline Specific Elective DSE:4 (Group-B) **Marks: 100**
Total Credit: 04

Course Outcome: At the end of course, Students will be able to

- Analyze and appreciate the applications which can use fuzzy logic.
- Understand the difference between learning and programming and explore practical applications of Neural Networks (NN).
- Students would understand the efficiency of a hybrid system and how Neural Network and fuzzy logic can be hybridized to form a Neuro-fuzzy network and its various applications
- Ability to appreciate the importance of optimizations and its use in computer engineering fields and other domains.
- To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience.

UNIT–I
Introduction :
What is soft computing? Different tools of soft computing and its comparison, Area of application.

UNIT-II
Artificial Neural Network(ANN):
Architecture, Introduction, Evolution of Neural Network, Biological Neural Network Vs ANN, Basic Model of ANN, Different types of ANN, Single layer Perceptron, Solving XOR problem, Activation function, Linear severability, Supervised and unsupervised learning, perceptron learning, delta learning, Feed-forward and Feedback networks, Error Back Propagation Network (EBPN), Associative memories and its types, Hopefield Network, Kohenenself-organizing Map.

UNIT-III
Fuzzy Logic:
Introduction to Classical Sets and Fuzzy Sets, Membership Function, properties and operations of classical set and Fuzzy set, a-cuts, Properties of a-cuts, Linguistic Variables, Membership function, Classical relation and Fuzzy Relation and its properties and operations, Defuzzification and its methods, Fuzzy rule base.

UNIT–IV
Genetic Algorithm :
What is Optimization?, Introduction, Application, GA operators: selection, crossover and mutation ,different techniques of selection ,crossover and mutation, different types of chromosomes, Application of GA.

UNIT-V
Hybrid Soft Commuting:
Design of Neuro-Fuzzy model like ANFIS ,Neuro-Genetic, Fuzzy-Genetic Neuro-Fuzzy-Genetic model, MATLAB environment for soft computing.

TEXT/REFERENCE BOOKS:

1. Principles of soft computing , S.N. Shivanandan and S.N Deepa , Wiley publication, Wiley India Edition.

2. Neural network and Learning Machines, Simon Haykin, Pearson Education, 2011.

3. Artificial Neural Networks, Robert J. Scholkoff, McGraw Hill Education(India) Pvt. Limited,1997.

3. Neural Networks and Fuzzy Systems, A dynamical Systems Approach to Machine Learning, Bart Kosko, PHI learning private limited.

4. Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications, S. Rakasekaran, G.A. VijayalakshmiPai, PHI learning private limited, 14th Edition. 2003.

5. Neural Networks and Fuzzy Logic, K. Vinoth Kumar, R. Saravana Kumar, S. K. Kataraia and Sons publication.

6. Artificial Neural Networks, B.Yegnanarayana Prentice Halll of India (P) Limited.

7. Introduction to Artificial Neural Systems, Jacek M. Zurada, Jaico Publication House.

8. Fuzzy Sets, Uncertainty and Information, G. J. Klir and T.A. Folger, PHI learning private limited. Publisher– Pearson 3Edition 1999