ROYAL GLOBAL UNIVERSITY
GUWAHATI

Royal School of Information Technology (RSIT)

Learning Outcomes based Curriculum Framework (LOCF)

2021-2022

SYLLABUS
&
COURSE STRUCTURE

B. SC. IT + M. SC. IT (INTEGRATED)

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1. Introduction

UGC has come up with the Learning Outcomes- based Curriculum Framework (LOCF) for undergraduate students to provide an outcome-based syllabus at the undergraduate level with the primary goal to structure the teaching-learning experiences in a more student-centric manner. The LOCF approach has been adopted to strengthen students' experiences as they engage themselves in the programme of their choice.Information Technology is fundamental in every aspect of our daily lives. Computers and IT has been catalyst in revolutionizing the way people live, work and communicate. The perceived difference between Computer Hardware and software is becoming indistinct day by day leading to fusion of technologies. The Integrated MSc (IT) Programme will foster the knowledge and skills required to be a part of this change that is happening constantly. The programme caters to address the latest developments by preparing students in managing and developing the software related to upcoming technological changes as well as exploring and implementing hardware resources in different realms.

B. Sc. IT + M. Sc. IT (Integrated) is a four year integrated course concentrated around the Information Technology domain. It provides an opportunity to develop key specialist skills for a career in Information Technology. The course has been specifically designed to suit the requirements of the IT industry, where individuals will be able to take up technical or management positions and design a career as Data Scientist, Data Modeler, IT Consultant, Cloud Architect, Computer Forensic Investigator, Mobile Application Developer, Software Engineer, Network Administrator, Data Administrator, Techwriters, Business Analyst, Research associates and many more.

B. Sc. IT + M. Sc. IT (Integrated)is a course customized for aspirants aiming to make a bright and outstanding career in the field of Information Technology. The syllabus follows Choice Based Credit System (CBCS) that has blend of contemporary and foundation subjects like Artificial Intelligence, Python Programming, Machine Learning, Robotics, Data Science, Microprocessors & Assembly Language, Digital Logic & Circuits, Multimedia Systems, Digital Image Processing, Software Engineering, Web Designing, Java, Data Communications and many more.

2. Learning Outcomes based approach to Curriculum Planning

The Course Curriculum for B. Sc. IT + M. Sc. IT (Integrated) for the undergraduate students to attain skills and knowledge require for employment. Framing and implementation of curricula and syllabi is envisaged to provide an understanding of the basic connection between theory and experiment and its importance in understanding the foundation of computing. This is very critical in developing a scientific temperament and to venture a career which a wide spectrum of applications as well as theoretical investigations. The curriculum provides students with theoretical foundations and practical experience in both hardware and software aspects of Information Technology The course learning outcomes are aimed at facilitating the learners to acquire knowledge, skills understanding, values, attributes and academic standards. A student is awarded with M.Sc IT on the basis of the attainment of these outcomes at the end of the programme.

2.1 Nature and extent of B. Sc. IT + M. Sc. IT (Integrated)

B. Sc. IT + M. Sc. IT (Integrated) is a four year degree program which develops advanced theoretical and research skills in computer science and information technology. This programme helps in building an advanced professional or academic career. M.Sc. IT follows CBCS structure as mandated by UGC. In accordance with CBCS guidelines the courses are categorized into compulsory courses, elective courses, ability enhancement courses. These categories of courses are discussed later on.

2.2 Aims of B. Sc. IT + M. Sc. IT (Integrated) Programme

The main aim of this programme is to deliver a modern curriculum that will equip graduates with strong theoretical and practical backgrounds to enable them to excel in the workplace and to be lifelong learners. The purpose of this program in computer science is twofold:

(1) to prepare the student for a position involving the design, development , implementation and skillful use of computer software, or hardware

(2) to prepare the student for entry to research and innovation in Computer Science and Information Technology

3. Learner's Attributes

Learner's Attributes (LA) are the qualities, skills and understandings that students should develop during their time with the HEI. These are qualities that also prepare graduates as agents of social good in future. Graduate Attributes can be viewed as qualities in following subcategories.

- Knowledge of the discipline
- Creativity
- Intellectual Rigour
- Problem Solving and Design
- Ethical Practices
- Lifelong Learning
- Communication and Social Skills

Among these attributes, categories attributes under Knowledge of the Discipline are specific to a programme of study.

- **Knowledge of Discipline of IT:** Knowledge of a discipline is defined as "command of a discipline to enable a smooth transition and contribution to professional and community settings. This Learner's Attribute describes the capability of demonstrating comprehensive and considered knowledge of Information Technology. It enables students to evaluate and utilize information and apply their knowledge and their professional skills in the workplace.
- **Creativity:** Creativity is a skill that underpins most activities, although this may be less obvious in some disciplines but it is prominent in IT sector. Students are required to apply imaginative and reflective thinking to design various software architecture and its underlying layout. Students are encouraged to look at the design issue or programming bugs through differing and novel perspectives. Creativity allows the possibility of a powerful shift in outlook and enables students to be open to thinking about different concepts and ideas.
- **Intellectual Consistency:** Intellectual consistency is the commitment to excellence in all scholarly and intellectual activities, including critical judgment. The students are expected in having clarity in thinking. This capability involves engaging constructively and methodically when exploring ideas, theories and philosophies. It also relates to the ability to analyses and construct knowledge with depth, insight and intellectual maturity.
- **Problem Solving and Design:** Problem solving skills empower students not only within the context of their programmers, but also in their personal and professional lives. Many employers cite good problem solving skills as a desired attribute that they would like graduates to bring to the workplace. With an ability to seek out and identify problems, effective problem solvers are able to actively engage with a situation, think creatively, to consider different perspectives to address identified challenge, to try out possible solutions and subsequently evaluate results as a way to make decisions. Through this process they can consolidate new and emergent knowledge and develop a deeper understanding of their subject discipline.
- **Ethical Practices:** Ethical practice is a key component of professionalism and needs to be instilled in curricula across courses. When operating ethically, graduates are aware that we live in a diverse society with many competing points of view. Ethical behavior involves tolerance and responsibility. It includes being open-minded about cultural diversity, linguistic difference, and the complex nature of our world. It also means behaving appropriately towards colleagues and the community and being sensitive to local and global social justice issues.
- **Life-Long Learning:** The skill of being a lifelong learner means a graduate is open, curious, willing to investigate, and consider new knowledge and ways of thinking. This flexibility of mind means they are always amenable to new ideas and actively seek out new ways of learning or understanding the world.
- **Communication and Social Skills:** The ability to communicate clearly and to work well in a team setting is critical to sustained and successful employment. Good communication skill is necessary to convey different

technical aspects of projects clearly and precisely. And social skills involve the ability to listen to, as well as clearly express, information back to others in a variety of ways - oral, written, and visual - using a range of technologies.

4. Qualification Descriptor

Qualification descriptors are generic statements of the outcomes of study. Qualification descriptors are a statement of outcomes, achievement of which a student should be able to demonstrate for the award of the MSc IT Degree. It also stated different capabilities a student could be expected to have developed which will be of assistance to employers and others with an interest in the general capabilities of holders of the qualification.

- A systematic, extensive and coherent knowledge and understanding of the field of computer science and IT as a whole and its applications, and links to related disciplinary areas; including a critical understanding of the established theories, principles and concepts, and of a number of advanced and emerging issues in the field of Computer Science
- Procedural knowledge that creates different types of professionals related to Computer Science and IT, including research and development, teaching industry and government and public service;
- Skills in areas related to computer science and usage of tools and current developments, including a critical understanding of the latest developments in the area, and an ability to use established techniques of analysis and enquiry within the area of Computer Science.
- Demonstrate comprehensive knowledge, including current research, scholarly, and/or professional literature, relating to essential and advanced learning areas pertaining to the chosen disciplinary areas (s) and field of study, and techniques and skills required for identifying problems and issues relating to th e disciplinary area and field of study.
- Demonstrate skills in identifying information needs, collection of relevant quantitative and/or qualitative data drawing on a wide range of sources, effective analysis and interpretation of data
- Use knowledge, understanding and skills for critical assessment of a wide range of ideas and complex problems and issues relating to the chosen field of study.
- Communicate the results of studies accurately in a range of different contexts using the main concepts, constructs and techniques of the subject(s) of study;
- Address one's own learning needs relating to current and emerging areas of study, making use of research, development and professional materials as appropriate
- Apply IT related knowledge and skills to identify and analyses problems and issues and seek solutions to real-life problems. Related to local area of community
- Demonstrate IT related skills like handling of tools or extensive knowledge of programming knowledge that are relevant to industry and employment opportunities.

5. Program Highlights

- To equip students with an integrated High-skill set that will allow them to develop their professional careers in Information Technology.
- To prepare students with the theoretical and practical knowledge that is necessary to enable them to understand the design of complex computer applications.
- To acquire the latest skills and build their future capabilities using world-class technology.
- To import skills to work with higher-end applications on complex network technologies, ability to analyse, design and develop software.
- To develop confidence in providing better Information Technology solutions for current issues and challenges faced by industry.
- To develop qualities and develop expertise to become proficient Information Technology entrepreneurs.

6. Programme Objectives

The programme aims at inculcating essential skills as demanded by the industry through an interactive learning process. This includes audio/video presentations, team building skills and personality development programmes. The broad objectives of the programme are:

- To inculcate aptitude and interest for innovations & research.
- To provide a sound academic base of Information Technology education so that students can develop an advanced career in IT.
- To encourage professional development in the chosen area of IT through in-depth conceptual knowledge and impeccable hands on training.
- To promote academic excellence by providing IT education in an intellectually stimulating environment.
- To equip the students with a sound knowledge and skill set, so that they are able to negotiate the complex, diverse and uncertain demands of a constantly changing IT market.

7. Program Structure of B. Sc. IT + M. Sc. IT (Integrated)

The B. Sc. IT + M. Sc. IT (Integrated) programme is a four-year, eight-semesters course. A student is required to complete 148 credits for completion of the course.

- **Credit Distribution**

	SEMESTER	**CREDITS**
FIRST YEAR	I	24
	II	24
SECOND YEAR	III	27
	IV	25
THIRD YEAR	V	32
	VI	24
FOURTH YEAR	VII	32
	VIII	34

Total Credits=232

- **Semester wise Details of B. Sc. IT + M. Sc. IT (Integrated) Course & Credit Scheme**

B. Sc. IT + M. Sc. IT (Integrated)
COURSE STRUCTURE

1st SEMESTER							
S.N.	**Subject Code**	**Names of subjects**	**L**	**T**	**P**	**C**	**TCP**
Core Courses (CC)							
1	INT052C101	Fundamentals of Computer Science	3	1	0	4	4
2	INT052C102	Introduction to C Programming	3	1	0	4	4
3	INT052C103	Digital Logic and Computer Design	3	1	0	4	4
4	INT052C112	Introduction to C Programming Lab	0	0	4	2	4
5	INT052C114	Office Automation Lab	0	0	4	2	4
Generic Elective (GE)							
6	INT052G10X	GE-I	3	0	0	3	3
7	INT052G10X	GE-II	3	0	0	3	3
Ability Enhancement Compulsory Courses (AECC)							
8	BHS982A104	Concepts of Behavioural Science	1	0	0	1	1
9	CEN982A101	Developing Oral Communication and Listening Skills	1	0	0	1	1
		TOTAL	**17**	**3**	**8**	**24**	**28**
2nd SEMESTER							
S.N.	**Subject Code**	**Names of subjects**	**L**	**T**	**P**	**C**	**TCP**
Core Courses (CC)							
1	INT052C201	Computer Organization and Architecture	3	1	0	4	4
2	INT052C202	Introduction to Data Structures	3	1	0	4	4
3	INT052C203	Object Oriented Programming using C++	3	1	0	4	4
4	INT052C212	Introduction to Data Structures Lab	0	0	4	2	4
5	INT052C213	Object Oriented Programming using C++ Lab	0	0	4	2	4
Generic Elective (GE)							
6	INT052G20X	GE-III	3	0	0	3	3
7	INT052G20X	GE-IV	3	0	0	3	3
Ability Enhancement Compulsory Courses (AECC)							
8	BHS982A204	Understanding Self and Others	1	0	0	1	1
9	CEN982A201	Conversation and Public Speaking	1	0	0	1	1
		TOTAL	**17**	**3**	**8**	**24**	**28**
3rd SEMESTER							
S.No.	**Subject Code**	**Names of subjects**	**L**	**T**	**P**	**C**	**TCP**
Core Courses							
1	INT052C301	JAVA Programming	3	1	0	4	4
2	INT052C302	Introduction to Database Management Systems	3	1	0	4	4
3	INT052C303	Graph Theory	3	1	0	4	4
4	INT052C311	JAVA Programming Lab	0	0	4	2	4
5	INT052C312	Introduction to Database Management Systems Lab	0	0	4	2	4
Generic Elective (GE)							
6	INT052G30X	GE-V	3	0	0	3	3
7	INT052G30X	GE-VI	3	0	0	3	3
Ability Enhancement Elective Courses (AEEC)							

7	INT052S30X	AECC-I	2	0	0	2	2
Ability Enhancement Compulsory Courses (AECC)							
8	EVS982A303	Environmental Sciences	2	0	0	2	2
9	CEN102A301	Career Oriented Communication	1	0	0	1	1
		TOTAL	**20**	**3**	**8**	**27**	**31**
4th SEMESTER							
S.No.	**Subject Code**	**Names of subjects**	**L**	**T**	**P**	**C**	**TCP**
Core Courses							
1	INT052C401	Operating Systems	3	1	0	4	4
2	INT052C402	Data Communication and Networks	3	1	0	4	4
3	INT052C403	Design and Analysis of Algorithms	3	1	0	4	4
4	INT052C411	Operating Systems Lab	0	0	4	2	4
5	INT052C412	Data Communication and Networks Lab	0	0	4	2	4
Generic Elective (GE)							
6	INT052G40X	GE-VII	3	0	0	3	3
7	INT052G40X	GE-VIII	3	0	0	3	3
Ability Enhancement Elective Courses (AEEC)							
8	INT052S40X	AECC-II	2	0	0	2	2
Ability Enhancement Compulsory Courses (AECC)							
9	CEN102A401	Communication and Presentation Skills	1	0	0	1	1
		TOTAL	**18**	**3**	**8**	**25**	**29**
5th SEMESTER							
Sno	**Subject Code**	**Names of subjects**	**L**	**T**	**P**	**C**	**TCP**
Core Courses (CC)							
1	INT052C501	Introduction to Probability and Statistics	4	0	0	4	4
2	INT052C502	Web Technology	4	0	0	4	4
3	INT054C503	Advanced Database Management Systems	4	0	0	4	4
4	INT054C504	Advanced Computer Organization and Architecture	4	0	0	4	4
6	INT052C512	Web Technology Lab	0	0	4	2	4
5	INT054C513	Advanced Database Management Systems Lab	0	0	2	1	2
Discipline Specific Elective (DSE)							
4	INT052D50X	DSE- I	4	0	0	4	4
5	INT052D50X	DSE-II	4	0	0	4	4
Ability Enhancement Compulsory Courses (AECC)							
6	CEN982A501	Ethics and Business Communication	1	0	0	1	1
Project Dissertation							
7	INT052C526	Mini Project	0	0	8	4	8
		TOTAL	**25**	**0**	**14**	**32**	**39**
6th SEMESTER							
S No.	**Subject Code**	**Names of subjects**	**L**	**T**	**P**	**C**	**TCP**
Core Courses (CC)							
1	INT052C601	Artificial Intelligence	4	0	0	4	4
2	INT052C602	System Analysis and Design	4	0	0	4	4
3	INT054C603	Advanced Computer Networks	4	0	0	4	4

4	INT054C604	Multimedia Theory and Applications	4	0	0	4	4
5	INT052C612	System Analysis and Design Lab	0	0	4	2	4
6	INT054C613	Advanced Computer Networks Lab	0	0	2	1	2
Discipline Specific Elective (DSE)							
7	INT052D60X	DSE-III	4	0	0	4	4
8	INT052D60X	DSE-IV	4	0	0	4	4
Ability Enhancement Compulsory Courses (AECC)							
9	CEN982A601	Effective Workplace Communication	1	0	0	1	1
Project Dissertation							
10	INT052C624	Major Project	0	0	12	6	12
		TOTAL	**25**	**0**	**18**	**34**	**43**
7th SEMESTER							
S No.	**Subject Code**	**Names of subjects**	**L**	**T**	**P**	**C**	**TCP**
Core Courses (CC)							
1	INT054C701	Introduction to Machine Learning	4	0	0	4	4
2	INT054C702	Compiler Design	4	0	0	4	4
3	INT054C703	Object Oriented Programming and Design	4	0	0	4	4
4	INT054C711	Introduction to Machine Learning Lab	0	0	2	1	2
5	INT054C712	Compiler Design Lab	0	0	2	1	2
6	INT054C713	Object Oriented Programming and Design Lab	0	0	2	1	2
Discipline Specific Elective (DSE)							
7	INT054D70X	DSE-V	4	0	0	4	4
8	INT054D70X	DSE-VI	4	0	0	4	4
Ability Enhancement Compulsory Courses (AECC)							
9	CEN984A701	Kinesics and Effective Communication	1	0	0	1	1
Ability Enhancement Elective Courses (AEEC)							
10	INT054S70X	AEEC-III	2	0	0	2	2
Project Dissertation							
11	INT054C726	Project Dissertation-I	0	0	12	6	12
		TOTAL	**23**	**0**	**18**	**32**	**41**
8th Semester							
S.N.	**Subject Code**	**Names of subjects**	**L**	**T**	**P**	**C**	**TCP**
Core Courses (CC)							
1	INT054C801	Soft Computing	4	0	0	4	4
2	INT054C802	Cryptography and Network Security	4	0	0	4	4
3	INT054C803	Modern Operating Systems	4	0	0	4	4
4	INT054C813	Modern Operating Systems Lab	0	0	2	1	2
Department Specific Elective (DSE)							
5	INT054D80X	DSE-VII	4	0	0	4	4
6	INT054D80X	DSE-VIII	4	0	0	4	4
7	INT054D80X	DSE-IX	4	0	0	4	4
Ability Enhancement Compulsory Courses (AECC)							
8	CEN984A801	Advance Corporate Communication	1	0	0	1	1
Project Dissertation							
9	INT054C827	Project Dissertation-II	0	0	16	8	16
		TOTAL	**25**	**0**	**18**	**34**	**43**

LIST OF DEPARTMENT SPECIFIC ELECTIVES			
Elective No	**Sl. No**	**Subject Code**	**Name of the Elective**
I	1	INT052D501	Introduction to Data Mining
	2	INT052D502	System Administration
II	1	INT052D503	Introduction to Cloud Computing
	2	INT052D504	Social Networking
III	1	INT052D601	Introduction to Big Data Analytics
	2	INT052D602	Mobile Application Development
IV	1	INT052D603	E-Commerce
	2	INT052D604	Introduction to Embedded Systems
V	1	INT054D701	Digital Image Processing
	2	INT054D702	Data Warehousing
VI	1	INT054D703	Distributed Operating System
	2	INT054D704	Wireless Computing
VII	1	INT054D801	Cyber Forensics
	2	INT054D802	Pattern Recognition
VIII	1	INT054D803	Bioinformatics
	2	INT054D804	Optimization Techniques
IX	1	INT054D805	Python Programming
	2	INT054D806	Robotics
	3	INT054D807	Neural Networks and Fuzzy Logic

LIST OF SUBJECTS OFFERED UNDER GENERIC ELECTIVES			
Elective No	**Semester**	**Subject Code**	**Name of the Elective**
GE-I	1	INT052G101	Computer Fundamentals
GE-II		INT052G102	Introduction to Computing
GE-III	2	INT052G202	Fundamentals of Web Design
GE-IV		INT052G203	Python Programming
GE-V	3	INT052G301	Windows Programming using C#
GE-VI		INT052G306	Introduction to Computing
GE-VII	4	INT052G401	Intellectual Property Rights and Cyber Law
GE-VIII		INT052G402	Python Programming

LIST OF SUBJECTS OFFERED UNDER AEEC			
AEEC No	**Sl. No**	**Subject Code**	**Name of the Subject**
I	1	INT052S301	Office Automation
II	2	INT052S401	Problem Solving using C++
III	3	INT054S701	General Aptitude and Quantitative Reasoning

8. Scheme of Evaluation

Theory Papers (T):

- **Continuous Evaluation: 15%** (Assignment, Class Test, Viva, Seminar, Quiz: Any Three)
- **Mid-term examination:** 10%
- **Attendance: 5%**
- **End Term Examination: 70%**

End term examination: 70 %

Practical Papers (P):

- **Continuous Evaluation: 25%** (Skill Test, lab copy, viva, lab involvement: Any Three)
- **Attendance: 5**%
- **End term examination**: 70 %

Combined Theory & Practical Papers (TP):

- **Continuous Evaluation: 15%** (Assignment. Class Test, Lab Experiment, Lab Copy, Viva: Any Three)
- **Mid-term examination:** 10%
- **Attendance: 5%**
- **End term examination:** 70 %

9. Detailed Syllabus of Core Courses

SYLLABUS (1ST SEMESTER)		
Paper I/Subject Name: Fundamentals of Computer Science		**Subject Code: INT052C101**
L-T-P-C – 4-0-0-4	**Credit Units: 04**	**Scheme of Evaluation: T**

Course Objective:

The objectives of the course are:

- To explain the basic idea about Computer Systems.
- To teach about the various components of a computer system.
- To give the students idea about issues related to data processing with computers.
- To explain about computer software and computer programming.

Prerequisites: None

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Introduction to Computer Systems**	Computer system characterization & capabilities; Speed, Accuracy, Reliability, Memory Capability, Repeatability. Block Diagram of a Computer. Types of Computers- Analog Digital & Hybrid; General and Special Purpose Computers. Characteristics of Computer Generations, Computer Systems Micros, Minis & Mainframes. Personal Computing- The IBM Personal Computer, Type of PC systems, Pentium PCS, Limitations of Microcomputer.	**12**
II	**Components of a Computer**	Input Devices, Categorizing Input Hardware, Keyboard, Direct Entry-card Reader, Scanners, Output Devices-O.M.R. Character Scanner, Character Readers, MICR, Smart Cards, Voice Input Devices, Pointing Devices-Mouse, Light Pen, impact printers, non-impact printer's plotters, computer output microfilm/microfiche system, softcopy output devices, CRT and flat screen technologies. Computer Storage Fundamentals, Central Proceeding Unit, ALU, register, Primary and Secondary Storage, Data Storage and Retrieval Methods-Sequential, Direct & Indexed & Sequential, Tape Storage and Retrieval Methods Tape Storage Devices, Direct Access Storage for Microcomputers- Hard Disks, Disk Cartridge, Direct Access Storage Devices for Large Computer Systems, Retrieval Methods-Sequential, Direct & Indexed & Sequential, Tape Storage and Retrieval Methods Tape Storage Devices,	**12**
III	**Data Processing with Computers and Network Fundamentals**	Interconnecting the units of a computer: buses, Data, data processing, data processing methods, data transmission modes, data transmission media: twisted pair, coaxial cable, optical fiber, radio transmission, microwave transmission, satellite transmission, Network topology: bus, star, ring, mesh, hybrid, types of network: LAN, WAN, MAN, PAN, Networking devices: hub, repeater, switch, bridge, router, gateway.	**12**
IV	**Computer Software and Programming**	Computer software: system software and application software, Types of System Software, Types of Operating System, Computer Programming Languages, Types of Programming Languages, Generations of programming Languages Development, Low Level Versus High Level Language, Machine Language, Assembly Language.	**12**

		Advantages of High Level Languages, problem Oriented Languages. Procedure Oriented Languages, Object Oriented Programming languages. Fourth Generation Languages, Device driver, BIOS, Utility Programs, File Maintenance, Language processors: Assembler, Compiler & Interpreter, Applications Software, Types of Application Software, Difference Between program and packages. System Software Versus Application Software,	
Total			**48**

Text Books:

1. *Information Technology: The Breaking Wave*, Dennis P Curtain, 1st Edition, 2017, McGraw Hill.
2. *Introduction to Computers*, Peter Norton, 7th Edition, 2017, McGraw Hill.

Reference Books:

1. E. Balaguruswamy, *Fundamentals of Computers*, 1st Edition, 2009, McGraw Hill.
2. P. K. Sinha, *Computer Fundamentals*, 6th Edition, 2004, BPB.

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Understand the basic idea about Computer Systems and the various components of a computer system.	(i) Each topic to be expounded with examples. (ii) Students to be motivated to take part in discussions and ask questions. (iii) Students to be given homework/assignments. (iv) Discuss and solve the theoretical problems in the class. (v) Students to be encouraged to give short presentations	(a)Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on • Assignments • Class tests. • viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations.-70 marks.
II	Learn data processing with computers, computer software and computer programming.		
III	Learn about Data Processing. Understand the concepts of Computers Network Fundamentals		
IV	Learn the concepts of Object oriented programming and also know about application software and system software.		

Paper II/Subject Name: Introduction to C Programming		**Subject Code: INT052C102**
L-T-P-C – 4-0-0-4	**Credit Units: 04**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are:

- To provide an introduction to the Computers and Computing environments.
- To give the students exposure to computer programming.
- To teach C programming language and basic and advanced concepts of C programming.
- To make the students capable of using C programming to solve basic as well as advanced computing problems.

Prerequisites: None

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**C Programming Fundamentals**	History and importance of C language, Basic structure of programs, programming style, execution of C programs. Character set, Tokens, Keywords and Identifiers, Constants, variables, data types, statements, comments, declaration of storage class, assigning values to variables. Basic idea of Computer Algorithms and Flow Charts. Managing I/O, reading and writing characters, formatted Input/output. Arithmetic operators, relational operators, logical operators, assignment operators, increment & decrement operators, conditional operators, bitwise operators, special operators. Arithmetic expressions, operator precedence & associativity.	**12**
II	**Decision Making, Branching & Lopping**	Importance of decision making, decision making with *if* statement, *if-else* statement, nested *if-else* statements, *switch-case* statement, *goto* statement, the *?:* operator, examples. Importance of loping, the *while* statement, *do-while* statement, *for* statement, nested looping, examples.	**12**
III	**Arrays, Strings & User-Defined Functions**	Significance of Arrays, creation and use of one & two dimensional arrays, Dynamic arrays. Declaration and use of string variables, reading and writing strings, operations on strings. Benefits of user-defined functions, creation and use of user-defined functions, parameter passing, return types.	**12**
IV	**Advanced Programming Concepts**	Creation and use of Structures and Unions in programs. Introduction to Pointers, declaration & initialization of pointer variables, accessing a variable through its pointer. Defining, opening & closing files in C, Input/output operations on files.	**12**
Total			**48**

Text Book:

1. *Computer Fundamentals and Programming in C,* Reema Thareja, 2nd Edition, 2016, Oxford University Press, Delhi.

Reference Books:

1. E Balaguruswamy, *Computing Fundamentals and C Programming*, 1st Edition, 2017, McGraw Hill.
2. Venugopal and Prasad, *Mastering C*, 2nd Edition, 2017, Tata McGraw Hill.
3. Yashawant Kanetkar, *Let us C,* 15th Edition, 2017, BPB Publication.

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Understand basic idea of Computer Algorithms and Flow Charts and know the problem solving approach through programming. .Also learn the operators used in C.	(i) Each topic to be expounded with examples. (ii) Students to be motivated to take part in discussions and ask questions. (iii) Students to be given homework/assignments. (iv) Discuss and solve the theoretical problems in the class. (v) Students to be encouraged to give short presentations	(a)Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on • Assignments • Class tests. • viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations.-70 marks.
II	Understand about the various constructs of programming.		
III	Learn how to solve problems using C programming. Learn to write C programs		
IV	Learn the concepts of functions and pointers used in C programming.		

Paper III/Subject Name: Digital Logic and Computer Design		**Subject Code: INT052C103**
L-T-P-C – 4-0-0-4	**Credit Units: 04**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are:

- To give the students the basic idea about Fundamental concepts of Digital Logic used in Computer Systems.
- To provide an understanding of Simplification of Boolean expression and how to implement with various gates.

- To explain the concepts on Combinational Circuits design.
- To give the students the concepts of Sequential Circuit design.

Prerequisites: None

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Fundamentals of Digital Electronics**	Review of number system, Position number system- decimal, binary, octal and hexadecimal, number base conversion. Representation of negative binary numbers. Codes – BCD Gray, Excess -3. Digital signal, logic gates: AND, OR, NOT, NOR, EX-OR, EX-NOR,Universal Gates	**12**
II	**Boolean Algebra and Logic Implementation**	Axioms and basic theorem of Boolean algebra. Truth table, logic function and their realization, standard representation (canonical forms) of logic gates- SOP and POS forms, MIN terms and MAX terms. Simplification of logic function using K-map of 2, 3, 4 and 5 variables. Don't care condition. Quine Mcluskey methods of simplification. Synthesis using AND, OR and INVERT and then to convert to NAND or NOR implementation.	**12**
III	**Combinational Logic Circuit Design**	Combinational logic circuit and buildings blocks. Binary adders and subs tractors. Carry Lookahead Adder, Encoders, Decoders, Multiplexers, Demultiplexers, Comparators, parity generators, etc. Realization of logic gates functions through decoders and multiplexers.ROM fundamentals ,types of ROM	**12**
IV	**Sequential Circuits**	Flip flops: truth table and state table SR, JK, TD, race around condition, master slave conversion of flip-flops. Sequential shift register, sequence generator. Counters- asynchronous and Synchronous generators. Ring counters and Johnson counter, Up-Down counter, modulo-N counter. Design of Synchronous sequential circuit.Design with State Equations.	**12**
Total			**48**

Text Book:

1. *Digital Logic & Computer Design*, M. Morris Mano, 1st Edition, 2016, Prentice Hall of India.

Reference Books:

1. P. Malvino and D. K. Leach, *Digital Principles and Applications*, 8th Edition, 2014, Tata McGraw Hill.
2. S. Salivahanan and S. Pravin Kumar, *Digital Logic Circuits*, 1st Edition, 2010, Vikas Publishing House.
3. Stephen Brown and Zvonko Vranesic, *Fundamentals of Digital Logic with VHDL Design*, 3rd Edition, 2017, McGraw Hill.
4. Sanjay Sharma, *Digital Electronics: Digital Logic Design*, 1st Edition, 2013, S K Kataria & Sons.
5. Pratima Manhas and Shaveta Thakral, *Digital Logic & Design*, 1st Edition, 2013, S K Kataria & Sons.
6. A Potton, *An Introduction to Digital Logic*, Imort Edition, 2013, Palgrave.

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks

I	Understand basic idea of number system and logic gates.	(i) Each topic to be expounded with examples. (ii) Students to be motivated to take part in discussions and ask questions. (iii) Students to be given homework/assignments. (iv) Discuss and solve the theoretical problems in the class. (v) Students to be encouraged to give short presentations	(a)Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on • Assignments • Class tests. • viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations.-70 marks.
II	Understand the truth table, logic function and their realization, simplification of logic function using K-map		
III	Learn about Encoders, Decoders, Multiplexers, Demultiplexers		
IV	Learn the concepts Flip flops: truth table and state table SR, JK etc		

Paper IV/Subject Name: Introduction to C Programming Lab **Subject Code: INT052C112**

L-T-P-C – 0-0-4-2 **Credit Units: 02** **Scheme of Evaluation: P**

Objective:

The objectives of the course are:

- To make the student learn about problem solving techniques through C programming language.
- To teach the student to write good programs in C.
- To enhance the analyzing and problem solving skills.

Prerequisites: None

Detailed Syllabus:

Minimum 20 Laboratory experiments based on the following-

1. Character set, Tokens, Keywords and Identifiers, Constants, variables, data types, statements, comments, declaration of storage class, assigning values to variables.

2. Managing I/O, reading and writing characters, formatted Input/output.
3. Arithmetic operators, relational operators, logical operators, assignment operators, increment & decrement operators, conditional operators, bitwise operators, special operators. Arithmetic expressions, operator precedence & associativity.
4. Importance of decision making, decision making with if statement, if-else statement, nested if-else statements, switch-case statement, goto statement, the ?: operator.
5. Importance of loping, the while statement, do-while statement, for statement, nested looping.
6. Significance of Arrays, creation and use of one & two dimensional arrays, Dynamic arrays.
7. Declaration and use of string variables, reading and writing strings, operations on strings.
8. Benefits of user-defined functions, creation and use of user-defined functions, parameter passing, return types.
9. Creation and use of Structures and Unions in programs.
10. Use of Pointers, declaration & initialization of pointer variables, accessing a variable through its pointer.
11. Defining, opening & closing files in C, Input/output operations on files.

Text Book:

1. *Computer Fundamentals and Programming in C,* Reema Thareja, 2nd Edition, 2016, Oxford University Press, Delhi.

Reference Books:

1. E Balaguruswamy, *Computing Fundamentals and C Programming*, 1st Edition, 2017, McGraw Hill.
2. Venugopal and Prasad, *Mastering C*, 2nd Edition, 2017, Tata McGraw Hill.
3. Yashawant Kanetkar, *Let us C,* 15th Edition, 2017, BPB Publication.

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Understand examples programs based on character set, Tokens, Keywords and Identifiers		(a)Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on • Assignments • Class tests. • viva-voce or presentation (ii) Mid-term examinations :10 marks
II	Learn to write C programs based on decision making, loop control statements etc.		
III	Learn about creation and use of one & two dimensional arrays, Dynamic arrays etc.		

IV	Learn the concepts of functions and pointers using C program examples.	(i) Each topic to be expounded with examples. (ii) Students to be motivated to take part in discussions and ask questions. (iii) Students to be given homework/assignments. (iv) Discuss and solve the theoretical problems in the class. (v) Students to be encouraged to give short presentations	(iii) Class attendance -5 marks (c) End-term examinations.-70 marks.

Paper V/Subject Name: Office Automation Lab **Subject Code: INT052C114**

L-T-P-C – 0-0-4-2 **Credit Units: 02Scheme of Evaluation: T**

Objective:

The objectives of the course are:

- To give the students fundamentals of Office Automation using Computers.
- To provide concepts of Document creation and management using software available under Office Suites.

- To explain concepts of Spreadsheet management using software available under Office Suites.
- To teach concepts of Presentation management using software available under Office Suites.

Prerequisites: None

Detailed Syllabus:

Minimum 20 Laboratory experiments based on the following-

- To create a Memo in MS-Word.
- To create a resume in MS-Word including some tables, formatting styles, etc.
- To create a greeting card in MS-Word including some formatting styles, etc.
- To create a cover page for a project report in MS-Word.
- To create a mail merger letter in MS-Word.
- To create a Macro for inserting a picture formatting the text in MS-Word.
- To create a simple presentation using MS-PowerPoint.
- To create some worksheets using MS-Excel.
- To create a report containing pay details of employees using MS-Excel.
- To create a student result sheet using MS-Excel.
- To create some charts/diagrams using MS-Excel.
- To create some worksheets that import data from databases.
- To create query table for the result processing table.
- To create a form to update/modify the result processing table.
- To design a report to print the result sheet and marks card for the result.

Text Books:

1. *PC Software: Made Simple,*S. C. Jain, 1st Edition, 2004, BPB.
2. *PC Software Made Easy (Sixteen-In-One),* Ramesh Bangia, 2009 Edition, 2014, Arihant.

Reference Books:

1. Raja Raman, *Fundamentals* of *Computers,* 5th Edition, 2010, Prentice Hall of India.
2. Gautam Roy, *PC Software and IT Tools*, 1st Edition, 2008, S. Chand.

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Understand documentation using examples of MS Word.		(a)Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on • Assignments • Class tests. • viva-voce or presentation
II	Learn to make presentations using MS Powerpoint.		
III	Learn about creation of MS Excel		

IV	Learn the concepts of database operations through MS Access.	(i) Each topic to be expounded with examples. (ii) Students to be motivated to take part in discussions and ask questions. (iii) Students to be given homework/assignments. (iv) Discuss and solve the theoretical problems in the class. (v) Students to be encouraged to give short presentations	(ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations.-70 marks.

Paper VIII/Subject Name: Concepts of Behavioural Science		**Subject Code: BHS982A104**
L-T-P-C – 1-0-0-1	**Credit Units: 01**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are:

- To build understanding of the various elements of behavioral science, the way it is conducted and applied in different research.

Prerequisites: None

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Western Philosophy to present Behavioral Science**	Brief history Sources of knowledge The problem of reliable knowledge Dynamics of development in the Behavioural and Social Sciences	**3**
II	**Behavioral and Social Science Disciplines**	Understanding various behavioural and social science disciplines like Psychology, Sociology, Anthropology, Economics, Political Science, Geography, History and Statistics	**3**
III	**Modes and Methods**	Experimentation Statistical control Statistically uncontrolled observation	**3**
IV	**Applications**	Three fundamental features of basic research in Behavioural Sciences Exploring examples of behavioural science research	**3**
Total			**12**

Text Books:

1. Adams, R. M., Smelser, N. J. & Treiman, D. J., *Behavioral and social science research: A national resource (Part I),* Washington: National Academy Press.

Reference Books:

1. O'Grady, M. *An introduction to behavioural science,* 2001, Gill & Macmillan, London

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Understand the dynamics of development in the Behavioural and Social Sciences		(a)Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on • Assignments
II	Learn social science disciplines like Psychology, Sociology, Anthropology,		

III	Learn about Statistical control	(i) Each topic to be expounded with examples. (ii) Students to be motivated to take part in discussions and ask questions. (iii) Students to be given homework/assignments. (iv) Discuss and solve the theoretical problems in the class. (v) Students to be encouraged to give short presentations	• Class tests. • viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations.-70 marks.
IV	Learn the concepts of behavioural science research		

Paper IX/Subject Name: Developing Oral Communication and Listening Skills		**Subject Code: CEN982A101**
L-T-P-C – 1-0-0-1	**Credit Units: 01**	**Scheme of Evaluation: TP**

Objective:

The objectives of the course are:

- To develop and enhance the students' oral communication skills in English by engaging them to meaningful discussion and interactive activities.

Prerequisites: None

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Basics of Communication-Introduction**	Communication-Definition, Meaning, Elements. Basics of Communication- Communication Process, Importance of Communication, Components of Communication, Types/ Forms of Communication (Oral-Written, Formal-Informal (Grapevine), Interpersonal-Intrapersonal, Mass-Group, Verbal-Non Verbal External Communication, Organisational, Upward, Downward, Horizontal, Diagonal). Non-Verbal Communication-Introduction, Body Language, Personal Appearance, Postures, Gestures, Eye-contact, Facial Expressions, Paralinguistic Features-Rate, Pause, Volume, Pitch/ Intonation/Voice/modulation, Proxemics, Haptics, Artifacts, Chronemics	**3**
II	**Listening Process**	Types of Listening-Superficial, Appreciative, Focused, Evaluative, Attentive, Emphatic, Listening with a Purpose, Barriers to Communication, Barriers to Listening	**3**
III	**Focussing on Oral Group Communication**	Nature of Group Communication, Characteristics of successful Group Communication Selection of Group Discussion,-Subject, Knowledge, Leadership Skills, Team Management, Group Discussion Strategies	**3**
IV	**Language Styles-Oral and Written Communication**	Technical Style, ABC of Technical Communication- Accuracy, using Exact Words and Phrases, Brevity, Clarity. Objectivity of Technical Writing, Impersonal Language, Objectivity in Professional Speaking, Formal Language, Practice	**3**
Total			**12**

Text Books:

1. *Effective Technical Communication,* Rizvi, M.A., 11 reprint. 2008, Tata McGraw Hill. New Delhi
2. *Communicative Functional English 1,* Kumar, Varinder, 2012, Kalyani Publishers. New Delhi.

Reference Books:

1. Koneru, Aruna. *Professional Communication,* 1st Edition 2014, Tata McGraw Hill, India
2. Dan Ohair, *Pocket guide to public speaking,* 5th Edition, 2003, Mac Higher.

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Understand the Non-Verbal Communication-Introduction, Body Language, Personal Appearance etc.		(a)Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on • Assignments • Class tests.
II	Learn the types of Listening-Superficial, Appreciative, Focused etc.		

III	Learn about Group Communication	(i) Each topic to be expounded with examples. (ii) Students to be motivated to take part in discussions and ask questions. (iii) Students to be given homework/assignments. (iv) Discuss and solve the theoretical problems in the class. (v) Students to be encouraged to give short presentations	• viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations.-70 marks.
IV	Learn the concepts of Technical Writing		

SYLLABUS (2nd SEMESTER)

Paper I/Subject Name: Computer Organization and Architecture		**Subject Code: INT052C201**
L-T-P-C – 4-0-0-4	**Credit Units: 04**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are:

- To make the students understand the machine instructions and basic computer organization
- To give an idea of representation of information in computers
- T explain about memory hierarchy and various memory mapping techniques
- To teach I/O subsystems and pipelining processing.

Prerequisites: Basics of Digital Logic and Computer Design

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Introduction to Computer Hardware and Digital Logic**	Introduction to computer hardware- what is computer hardware, History of computing, the digital computer, PC versus workstation. Gates, circuits, and combinational logic- Analog and digital systems, Fundamental gates, applications of gates, Introduction to Digital Works, introduction to Boolean algebra, Special-purpose logic elements, Programmable logic, Sequential logic, Combinational Circuits..	**12**
II	**Machine Instruction**	Instruction Set Architecture, Assembly language Programming, Addressing modes, Instruction cycle, Registers and storage, RISC versus CISC architecture, Inside CPU.	**12**
III	**Computer Arithmetic & Information Representation**	Bits, bytes, words, and characters, Number bases, Number base conversion, Special-purpose codes, Error-detecting codes, Data-compressing codes, Binary arithmetic- half-adder, full-adder, addition of words, Signed numbers- Sign and magnitude representation, Complementary arithmetic, Two's complement representation, One's complement representation, Floating point numbers- Representation, Normalization, Floating point arithmetic, Multiplication and division.	**12**
IV	**CPU, Buses, Peripherals and Memory**	Input-Output device such as Disk, CD-ROM, Printer etc., Interfacing with IO device, Keyboard & Display Interface. Buses and input/output mechanisms- The bus, I/O fundamentals, Direct Memory Access, Parallel and serial interfaces. Computer memory- Static and Dynamic memory, Random and Serial Access Memories, Memory hierarchy, Memory technology, Cache memory	**12**
Total			**48**

Text Book:

1. *Computer System and Architecture*, Moris Mano, 3rd Edition, 2007, PHI.
2. *Structured Computer Organization,* A. S. Tanenbaum, 5th Edition, 2009, Prentice Hall of India

Reference Books:

1. V. C. Hamacher, Z. G. Vranesic and S. G. Zaky, *Computer Organization,* 5th Edition, 2002 McGraw Hill.
2. J. L. Hennessy and D. A. Patterson, *Computer Architecture: A Quantitative Approach,* 4/e, 2006, Morgan Kaufmann.
3. D. V. Hall, *Microprocessors and Interfacing,* 2nd Edition, 2006, McGraw Hall.

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Understand the various components in a computer, like CPU, Buses, Peripherals and Memory.		(a)Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on

II	Learn the Assembly language Programming	(i) Each topic to be expounded with examples. (ii) Students to be motivated to take part in discussions and ask questions. (iii) Students to be given homework/assignments. (iv) Discuss and solve the theoretical problems in the class. (v) Students to be encouraged to give short presentations	• Assignments • Class tests. • viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance - 5 marks (c) End-term examinations.-70 marks.
III	Learn about Binary arithmetic etc.		
IV	Learn the concepts of Buses, Peripherals and Memory		

Paper II/Subject Name:Introduction to Data Structures		**Subject Code: INT052C202**
L-T-P-C – 4-0-0-4	**Credit Units: 04**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are:

- To give students an introduction to the basic concepts of Data Structures and Algorithms.
- To give an exposure to the concepts of Linked Lists and their applications.
- To impart detailed concepts on various kinds of Trees, Graphs, Searching and Sorting.

Prerequisites: Basics of C Programming

Detailed Syllabus:

Modules	Topics	Course content	Periods

I	**Data Structure Basics**	Introduction, Terminologies, Data Structures Classification, Operations on Data Structures, Abstract Data Types. Algorithms Efficiency, Time and Space Complexity, Time and Space Tradeoff, Asymptotic Notations	**05**
II	**Linear Data Structures**	Arrays- Introduction, Memory Representation of One Dimensional and Two Dimensional Arrays, Various operations on array, Sparse Matrices. Linked Lists- Introduction, Memory Representation, Various Types of Linked Lists, Operations and Applications of Linked Lists. Stacks- Introduction, Array and Linked Representation of Stacks, Operations on Stacks, Applications of Stacks. Queues- Introduction, Array and Linked Representation of Queues, Operations on various types of Queues, Types of Queues, Applications of Queues.	**20**
III	**Non-Linear Data Structures**	Trees- Introduction, Basic Definitions, Types of Trees, Memory Representations, Binary Tree Traversal, Binary Search Trees, Operations on Binary Search Trees, AVL Trees, applications of Trees. Graphs- Introduction, Basic Definitions, Memory Representations, Graphs Vs Trees, Minimum Spanning Trees, Applications of Graphs	**15**
IV	**Searching and Sorting**	Searching- Introduction, Linear Search, Binary Search, Complexity Analysis Sorting- Introduction, Bubble Sort, Insertion Sort, Selection Sort, Merge Sort, Quick Sort, Radix Sort, Heap Sort, Complexity Analysis	**08**
Total			**48**

Text Book:

1. *Data Structures Using C*, Reema Thareja, 2nd Edition, 2014, Oxford University Press.

Reference Books:

1. Seymour Lipschutz, *Data Structures*, 1st Edition (reprint) 2017, McGraw Hill Education.
2. Yashavant P. Kanetkar, *Data Structure through C*, 2nd Edition, 2003, BPB Publications.
3. E. Balagurusamy, *Data Structures Using C*, 1st Edition, 2017, McGraw Hill Education.

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Understand the various components in a computer, like CPU, Buses, Peripherals and Memory.		(a)Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on • Assignments • Class tests. • viva-voce or presentation (ii) Mid-term
II	Learn the Assembly language Programming		
III	Learn about Binary arithmetic etc.		

IV	Learn the concepts of Buses, Peripherals and Memory	(i) Each topic to be expounded with examples. (ii) Students to be motivated to take part in discussions and ask questions. (iii) Students to be given homework/assignments. (iv) Discuss and solve the theoretical problems in the class. (v) Students to be encouraged to give short presentations	examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations.-70 marks.

Paper III/Subject Name: Object Oriented Programming using C++		**Subject Code: INT052C203**
L-T-P-C – 4-0-0-4	**Credit Units: 04**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are:

- To explain the basic object-oriented concepts and the issues involved in effective class design.
- To teach how to write C++ programs that use: object-oriented concepts such as information hiding, constructors, destructors, inheritance.

Prerequisites: Basics of C programming

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Introduction**	Introduction, Need, Characteristics, Difference between POP and OOP, Basic concepts of OOP, Features, Applications of OOP Revision of topics like data types, keywords, identifiers, tokens, reference variables, different operators, conditional and loop control structures.	**12**
II	**Classes and Objects**	Definition of class, object, Difference between class and structure, class definitions, member functions, access specifiers. Objects Dynamic Creation and initialization, Passing and Returning objects, Object assignment and array of objects Constructors Types, Destructors, Nesting member function, Private member function , Inline functions Static class members, Function prototyping, Call by reference, Return by reference, Default Argument, Friend functions, this pointer.	**12**
III	**Inheritance and Polymorphism**	Types of Inheritance; Base and Derived classes, Syntax of derived classes, access to the base class; Types of Inheritance, Multiple inheritance, Virtual Base classes, Constructors and Destructors in Inheritance, Container classes, Abstract Classes. Polymorphism: Compile time(Early/Static binding), Overloading functions and operators, Overloading new and delete operators, Run time polymorphism(Late/Dynamic Binding), Virtual functions, Pure Virtual functions, Virtual Destructors, Review of Virtual base classes,	**12**
IV	**Templates, Exception and File Handling**	Templates–Uses, Generic classes, Class templates, Function templates, Advance templates. Examples. Exception handling-Advantages, Try catch and throw clauses, Examples, Manipulators, different examples of manipulators. Pointer types-uses; Dynamic memory allocation techniques, garbage collection, Linked list, generic pointers; Files Open, Close, Read and Write; File attributes, File management	**12**
Total			**48**

Text Books:

1. *Object Oriented Programming With C++,* E. Balaguruswamy, 4th Edition, 2011,Tata McGraw Hill.
2. C++, *The Complete Reference,* Herbert Schildt, 4th Edition, 2017, McGraw Hill Education.

Reference Books:

1. Deital And Deital, *C++ How To Program,* 9th Edition, 2016, Pearson Education India.
2. R. Lafore, *Object Oriented Programming In Turbo C++*, 4th Edition, 2013, Galgotia, New Delhi

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Understand the various Features and applications of OOP		(a)Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on • Assignments
II	Learn the concept of classes and objects with examples		

III	Learn about Inheritance , Polymorphism , overloading etc	(i) Each topic to be expounded with examples. (ii) Students to be motivated to take part in discussions and ask questions. (iii) Students to be given homework/assignments. (iv) Discuss and solve the theoretical problems in the class. (v) Students to be encouraged to give short presentations	• Class tests. • viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations.-70 marks.
IV	Learn the concepts of Templates, Exception and File Handling		

Paper IV/Subject Name:Introduction to Data Structures Lab		**Subject Code: INT052C212**
L-T-P-C – 0-0-4-2	**Credit Units: 02**	**Scheme of Evaluation: P**

Objective:

The objectives of the course are:

- To develop skills to design and analyze simple linear and non-linear data structures.
- To strengthen the ability to identify and apply appropriate data structure for real world problem.
- To give practical knowledge on the practical applications of data structures.

Prerequisites: Basics of C Programming

Detailed Syllabus:

Minimum 20 Laboratory experiments based on the following-

1. Some common programs of C as revision.
2. Programs on Arrays- Traversal, Insertion, Deletion, Polynomial Representation, etc.
3. Programs on Linked List- Creation Insertion, Deletion, Polynomial Representation, etc.
4. Programs on Stacks-Creation, Push Pop, Infix to Postfix Conversion, Evaluation.
5. Programs on Queues-Creation, Insertion, Deletion, etc.
6. Programs on Trees- Binary Tree Creation, Tree Traversal, BST
7. Programs on Searching- Linear Search, Binary Search
8. Programs on Sorting- Bubble Sort, Insertion Sort, Selection Sort, Quick Sort, Merge Sort, Heap Sort.

Text Book:

1. *Data Structures Using C*, Reema Thareja, 2nd Edition, 2014, Oxford University Press.

Reference Books:

1. Seymour Lipschutz, *Data Structures*, 1st Edition (reprint) 2017, McGraw Hill Education.
2. Yashavant P. Kanetkar, *Data Structure through C*, 2nd Edition, 2003, BPB Publications.
3. E. Balagurusamy, *Data Structures Using C*, 1st Edition, 2017, McGraw Hill Education.

Facilitating the Achievement of Course Learning Outcomes

Module	**Course Learning Outcomes**	**Teaching and Learning Activity**	**Assessment Tasks**
I	Understand the variouslinear and non-linear data structures using examples	(i) Each topic to be expounded with examples. (ii) Students to be motivated to take part in discussions and ask questions. (iii) Students to be given homework/assignments. (iv) Discuss and solve the theoretical problems in the class. (v) Students to be encouraged to give short presentations	(a)Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on • Assignments • Class tests. • viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations.-70 marks.
II	Learn about Time and Space Complexity, Asymptotic Notations		
III	Array and Linked Representation of Stacks examples		
IV	Learn the concepts of Trees , Graphs , searching , sorting etc		

Paper V/Subject Name: Object Oriented Programming using C++ Lab		**Subject Code: INT052C213**
L-T-P-C – 0-0-4-2	**Credit Units: 02**	**Scheme of Evaluation: P**

Objective:

The objectives of the course are:

- To make the student learn C++ programming language.
- To teach the student the implementation of object oriented programming features.
- To teach the student to write programs in C++ to solve the problems

Prerequisites: Basics of C Programming

Detailed Syllabus:

Minimum 20 Laboratory experiments based on the following-

- Write a C++ program to display "HELLO WORLD".
- Write a C++ program that will ask the temperature in Fahrenheit and display in Celsius
- Write a C++ program to print the following output using for loop.

  1
  2 2
  3 3 3
  4 4 4 4
- Write a C++ program to reverse a number using do-while loop
- Write a C++ program to find out the factorial of a number using while loop
- Write a C++ program to read an integer array and display it.
- Write a C++ program to read a character array and display it.
- Write a C++ program to find out the maximum of three number using if-else statement
- Write a C++ program to implement the concept of static data member in class.
- Write a C++ program to implement the concept of static function in class.
- Write a C++ program using function with default argument.
- Write a C++ program to illustrate the use of objects as function arguments (which performs the addition of time in the hour and minutes format)
- Write a C++ program to illustrate the use of friend function.
- Write a C++ program to illustrate how an object can be created (within a function) and returned to another function
- Write a C++ program to illustrate the use of constructors and destructors.
- Write a C++ program to illustrate the use of copy constructor.
- Write a C++ program to implement single inheritance (private/public)
- Write a C++ program to implement multilevel inheritance
- Write a C++ program to implement multiple inheritances.
- Write a C++ program to illustrate the use of virtual base class.
- Write a C++ program to overload unary minus operator
- Write a C++ program to overload binary „+" operator
- Write a C++ program to illustrate how an operator can be overloaded using friend function.
- Write a C++ program to illustrate the use of run time polymorphism.
- Write a C++ program to swap two variable using function template
- Write a C++ program to implement try(), catch(), throw() function.
- Write a C++ program to implement this pointer
- Write a C++ program to illustrate the use of pointers to derived objects
- Write a C++ program to illustrate the use of virtual function
- Write a C++ program to open and close a file using open(), close() function
- Write a C++ program to illustrate the use of read(), write() function

Text Books:

1. *Object Oriented Programming With C++,* E. Balaguruswamy, 4th Edition, 2011,Tata McGraw Hill.
2. C++, *The Complete Reference,* Herbert Schildt, 4th Edition, 2017, McGraw Hill Education.

Reference Books:

1. Deital and Deital, *C++ How To Program,* 9th Edition, 2016, Pearson Education India.
2. R. Lafore, *Object Oriented Programming In Turbo C++*, 4th Edition, 2013, Galgotia, New Delhi

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Understand the OOP with C++ programs		(a)Participation in class discussions

II	Learn the concept of classes and objects with example programs	(i) Each topic to be expounded with examples. (ii) Students to be motivated to take part in discussions and ask questions. (iii) Students to be given homework/assignments. (iv) Discuss and solve the theoretical problems in the class. (v) Students to be encouraged to give short presentations	(b)Continuous Evaluation(30Marks) (i)15 marks on • Assignments • Class tests. • viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations.-70 marks.
III	Learn about Inheritance , Polymorphism , overloading etc		
IV	Learn the concepts of Templates, Exception and File Handling using C++ example programs.		

Paper VIII/Subject Name: Understanding Self and Others		**Subject Code: BH982A204**
L-T-P-C – 1-0-0-1	**Credit Units: 01**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are:

- To provide students insight into the various aspects of self and how one perceives and comprehends other's behavior in the light of their present appearance.

Prerequisites: None

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Self and Identity**	Separated and Connected perspective Immersed and Distal perspective Self-concept, self-esteem and self-efficacy Personal and social identity	**3**

II	**Structure and Functions of Identity**	Continuity and differentiation Identity crisis: Erikson and Marcia Quarter life crisis- a new concept of understanding young people's difficulties in transitioning to adulthood	**3**
III	**Social Perception**	Making sense and categorizing information from environment Person schemas and group stereotypes	**3**
IV	**Attribution**	Attribution theory Dispositional versus situational attributions Inferring dispositions from acts Co-variation model of attribution Attributions for success and failure Bias and error in attribution Over-attribution to dispositions Focus of attention bias Actor observer difference Motivational biases Cultural basis of attributions	**3**
Total			**12**

Text Books:

1. Baron, R. A. & Branscombe, N. R., *Social Psychology*, 13th Edition, 2012, US Pearson.
2. Baumeister, R. F., *Self-concept, self-esteem and identity*., In Varerian, J. D., Barbara, W. A. & Warren, J. H. (Eds*), Personality: Contemporary Theory and Ethnicity,* (pp. 339-375). US: Nelson-Hall Publishers

Reference Books:

1. Leary, M.R. & Tangney, J. P., Handbook of Self and Identity, 2012, New York: The Guilford Press.

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Understand self-efficacy Personal and social identity		(a)Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on • Assignments • Class tests. • viva-voce or presentation
II	Learn the Continuity and differentiation Identity crisis		
III	Learn about Social Perception		

IV	Learn the concepts of Attribution theory	(i) Each topic to be expounded with examples. (ii) Students to be motivated to take part in discussions and ask questions. (iii) Students to be given homework/assignments. (iv) Discuss and solve the theoretical problems in the class. (v) Students to be encouraged to give short presentations	(ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations.-70 marks.

Paper IX/Subject Name: Conversation and Public Speaking		**Subject Code: CEN982A201**
L-T-P-C – 1-0-0-1	**Credit Units: 01**	**Scheme of Evaluation: TP**

Objective:

The objectives of the course are:

- To give students a platform to enhance their speaking and conversational skills in English by engaging them in meaningful discussions and interactive activities.

Prerequisites: Basic understanding of conversation and speaking in public.

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Speaking Skills**	Speaking-The Art of Speaking, Goals, Speaking Styles, Speaking Process, Importance of Oral Communication, Choosing the form of Communication, Principles and Guidelines of Successful Oral Communication, Barriers to Effective Oral Communication, Three aspects of Oral Communication- Conversing, Listening and Body Language, Intercultural Oral Communication	**3**
II	**Conversational Skills: Listening and Persuasive Speaking**	Introduction, Conversation- Types of Communication, Strategies for Effectiveness, Conversation Practice, Persuasive Functions in Conversation, Telephonic Conversation and Etiquette, Dialogue Writing, Conversation Control	**3**
III	**Transactional Analysis**	The Role of Intonation, Strokes, Psychological Characteristics of Ego States (The Parent, The Adult, The Child), Structure and Aspects of Human Personality, Analysis Transactions- Complementary Transactions, Crossed Transactions, Duplex or Ulterior Transactions, How to Identify the Ego States of the Interacting Individuals, How to Manage Conversations, Structural Analysis, Certain Habits of Ineffective Conversationalists	**3**
IV	**Business Presentation and Public Speaking**	Business Presentation and Speeches–Difference, Elements of a Good Speech-Planning, Occasion, Audience, Purpose, Thesis, Material, Organising and Outlining a Speech Outline, Types of Delivery, Guidelines for Delivery–Verbal Elements, Non-Verbal Elements, Vocal Elements, Visual Elements, Controlling Nervousness and Stage Fright	**3**
		TOTAL	**12**

Text Books:

1. *Business Communication,* Raman Meenakshi and Prakash Singh. Oxford University Press. Page 123–165
2. *Technical Communication,* Raman Meenakshi and Sangeeta Sharma. Oxford University Press. Page 137-148

Reference Books:

1. Sengupta Sailesh, *Business and Managerial Communication.* PHILearning Pvt. Ltd. Page 136-153
2. Mehra Payal, *Business Communication for Managers,* Pearson, Page 75–83

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Understand the Speaking Styles, Speaking Process, Importance of Oral Communication etc.		(a)Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on • Assignments • Class tests. • viva-voce or presentation (ii) Mid-term examinations :10 marks
II	Learn the Conversation- Types of Communication		
III	Learn about Human Personality, Analysis Transactions- Complementary Transactions,		

IV	Learn about the Speech Outline, Types of Delivery, Public speaking etc.	(i) Each topic to be expounded with examples. (ii) Students to be motivated to take part in discussions and ask questions. (iii) Students to be given homework/assignments. (iv) Discuss and solve the theoretical problems in the class. (v) Students to be encouraged to give short presentations	(iii) Class attendance -5 marks (c) End-term examinations.-70 marks.

SYLLABUS (3rd SEMESTER)

Paper I/Subject Name: JAVA Programming		**Subject Code: INT052C301**
L-T-P-C – 4-0-0-4	**Credit Units: 04**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are:

- To learn the basic concept and techniques which form the object oriented programming paradigm which is a new way of thinking about problem using models organizes around real world concept.
- To implement the concepts of object oriented programming using JAVA.

Prerequisites: Basics of Procedural or Object Oriented Programming

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Introduction**	A look at procedure-oriented programming, Object-oriented paradigm, Basic concepts of object-oriented programming (OOP) (encapsulation, inheritance, polymorphism), How Java differs from C and C++, Applications of OOP. Overview of JAVA, Use of math functions, comments, Constructing a java program, Introduction of JVM, Command line argument, Data types, Variables: declaration, scope, Type Conversion and Type Casting, Constants, Operators, Evaluation of Expression, Precedence of Operators, Control statements: selection, iteration and jump.	**12**
II	**Classes and Objects**	Class: definition and example, Declaring objects, Method overloading and overriding, Binding : concept of binding, static vs. dynamic binding, Using this and super keywords, Access Control, Inheritance: Extending a class, Final, Abstract classes, Constructors Arrays: one-dimensional and multi-dimensional, Strings : string processing functions	**12**
III	**Packages, Interfaces, Exception Handling**	Defining a package, accessing a package and using a package, Interfaces: multiple inheritance, Defining interfaces, implementing interfaces and extending interfaces. Exception handling fundamentals, Exception type: using try…catch, Multiple catch clauses, Throw and Throws Creating threads, Extending the thread class, Stopping and blocking a thread, Life cycle of thread, Threads methods, Thread exceptions	**12**
IV	**Applets and Files**	Introduction: local and remote applets, How to write applets, Building applet code, Applet life cycle, Creating an executable applet I/O basics, concept of streams, Stream classes: byte stream classes, character stream classes, I/O exceptions, Creation of files, Random access files	**12**
Total			**48**

Text Books:

1. *Programming with Java: A Primer*; Balagurusamy E.; 3rd Edition; 2005; Tata McGraw-Hill, New Delhi
2. *Thinking in Java*; Eckel B.; 4th Edition;2006;PHI.

Reference Books:

1. *Java Generics and Collections*; Maurice N. et al; 1st Edition; 2006; O'REILLY Publication.
2. *The Unified Modeling Language User Guide*; Booch G., Rumbaugh J.,Jacobson I.;2nd Edition;2005;Pearson Education.
3. *The Complete Reference Java*; Schildt H.; 7th Edition; 2007;Tata McGraw-Hill, New Delhi

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching And Learning Activity	Assessment Task
I	To study the comparison between procedure-oriented programming, Object-oriented paradigm, the Basic concepts of object-oriented programming (OOP)., introduction to JAVA, constructing java programs, Introduction of JVM and an introduction to the control statements and looping constructs in Java.	Written tests, assignments, quizzes, program execution tests, presentations as announced by the instructor in the class.	(a) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 markson • Assignments • classtests. • viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations.-70 marks.
II	Study and implement the concepts of Class and Object and learn the programming concepts of Method overloading and overriding, Static vs. Dynamic binding, Inheritance, Final, Abstract classes, Constructors. This module also spans the concepts of One-dimensional and multi-dimensional arrays and Strings.		
III	Learn about defining, accessing and using Java Packages and Interfaces. This module also covers the concepts of Exception handling fundamentals along with a detail study of the exception type: using try…catch, Multiple catch clauses, Throw and Throws.		
IV	To Introduce the concepts of local and remote applets along with its implementation. It also outlines the I/O basics, concept of streams, Stream classes: byte stream classes, character stream classes, I/O exceptions, Creation of files and Random access files.		

Paper II/Subject Name: Introduction to Database Management Systems		**Subject Code: INT052C302**
L-T-P-C – 4-0-0-4	**Credit Units: 04**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are:

- To provide fundamental knowledge on database concepts.
- To study the concepts of relational data model.
- To gain practical to experience designing and constructing data models and using SQL to interface to both multi-user DBMS packages and to desktop DBMS packages.

Prerequisites: C/C++, Concepts of Data Structures.

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Introduction**	Introduction to Data System, Drawbacks of Conventional File System, Purpose of database systems, DBMS Components, Architecture, Data Independence, Data modeling, Entity Relationship Model, Relational, Network, Hierarchical and object oriented models, Data Modeling using the Entity Relationship Model.	**12**
II	**Relational Databases**	Relational databases, relational algebra, relational calculus. Data definition with SQL, insert, delete and update statements in SQL, views, data manipulation with SQL, triggers and assertions, cursors	**12**
III	**Normalization**	Relational Database Design guidelines, Integrity Constraints, Domain Constraints, Referential integrity, Functional Dependency, Normalization using Functional Dependencies, Normal forms (1NF, 2NF, 3NF, BCNF), Multi-valued Dependencies and Forth Normal Form, Join Dependencies and Fifth Normal Form, Pitfalls in Relational Database Design, Lossless Non-additive Join Property of Decomposition, Dependency Preserving Decomposition	**12**
IV	**Transaction Processing, Concurrency and Recovery**	Introduction. ACID Properties, Schedules and Recoverability - Serializability of Schedules- Concurrency Control, Database Recovery Concepts- Caching, Checkpoints, Transaction Rollback, Case Study-Recovery Techniques in DBMS	**12**
Total			**48**

Text Book:

1. *Fundamentals of Database System;* Elmasri, Navathe; 7th Edition; 2016; Pearson Education Asia
2. *Database System Concepts*; Korth H.F., Silberschatz A.; 6th edition; 2013; Mc Graw Hill.
3. *Introduction to Database Management System*; Kahate A.; 1st Edition; 2004; Pearson Educations
4. *DataBase Management System*; Paneerselvam; 2nd Edition; 2011; PHI Learning

Reference Books:

1. *An Introduction to Database Systems;* Date C.J.*;* 8th Edition; 2003; Pearson Education Asia
2. *An Introduction to Database Systems*; Desai B.C.;Revised Edition; 2012; Galgotia Publications

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching And Learning Activity	Assessment Task
I	Studies about data modelling, the Entity Relationship Model, Relational, Network, Hierarchical and object oriented models, Data Modelling using the Entity Relationship Model.	Written tests, assignments, quizzes, program execution tests, presentations as announced by the instructor in the class.	(b) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 markson • Assignments • classtests. • viva-voce or presentation (iv) Mid-term examinations
II	Studies about the Relational databases with a detailed implementation of the concepts of SQL by constructing queries using it.		

III	Learns to design databases efficiently by implementing the concepts of functional dependencies and normalization.		:10 marks (v) Class attendance -5 marks (c) End-term examinations.-70 marks.
IV	Learns in details about database transactions.		

Paper III/Subject Name:Graph Theory		**Subject Code: INT052C303**
L-T-P-C – 4-0-0-4	**Credit Units: 04**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are:

- To explain the fundamental concepts in graph theory
- To define how graph theory can be used as tools in solving practical problems
- To improve the proof writing skills and know its applications

Prerequisites: Concepts of Data Structures

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Introduction**	Definition of Graph, Application of Graphs Finite and Infinite graphs, Incidence and degree of a graph, Isolated Vertex, Pendent Vertex, Null Graph. Isomorphism; Sub graphs and Union of Graphs, walks, Paths and Circuits, Connected Graphs, disconnected graphs and components, Eulerian graph, Chinese postman problem, Konigsberg Bridge Problem, Operations on Graphs, Arbitrarily traceable graphs, Fleury's algorithms, Hamilton graph-necessary and sufficient	**6**

		conditions, Complete Graph, Traveling salesman, bipartite graph	
II	**Trees**	Definition of tree, Properties of tree, Pedant vertices in a tree; Center of a tree, Rooted binary trees, On counting trees, Fundamental circuits; Spanning trees, Spanning algorithms Spanning trees of a weighted graph, algorithms for shortest Spanning tree.	**13**
III	**Cut Sets and Vertices, Plannar Graph and Matrix Representation of Graph**	Cut-sets and cut-vertices; Some properties of Cut-Set, Fundamental Circuits and cut-sets, Connectivity and separativity and different theorems; Network flow, max-flow min-cut theorem, 1-isomorphism and 2-isomorphism. Combinatorial and geometric graphs, planar graphs, Geometric and Combinatorial dual; Kuratowski graph; detection of planarity; Thickness and crossings. Incidence; Adjacency; Circuit, Cut-Set, Path matrices and their properties	**14**
IV	**Graph Coloring, Directed Graphs and Enumeration of Graphs**	Chromatic number; Chromatic Partitioning, Chromatic polynomial, Coverings, minimization of Switching Functions. Four Color theorem, five color theorems Digraphs, different types of digraphs, Binary relations, Directed graphs and connectedness, Euler Digraph, Tree with directed graph, Arborescence an Polish method. Types of Enumerations, Counting labeled an Unlabelled trees, Counting Methods, Polay Counting Theory.	**15**
Total			**48**

Text Book:

1. *Graph Theory with applications to Engineering and Computer Science*, Narasingh Deo, New Edition, PHI Publications.
2. *Graph Theory*, Franck Harary, 2001, Narosa Publising House

Reference Books:

1. Bondy,J. A. and Murty,U.S.R., *Graph Theory with Applications*, 2008, Springer
2. C.L. Liu, *Elements of Discrete Mathematics*, 2nd Edition, 2000, Tata McGraw Hill
3. Harikishan, Shivraj Pundir and Sandeep Kumar, *Discrete Mathematics*, 7th Edition, 2010, Pragati Publication

Facilitating The Achievement Of Course Learning Outcomes

Module	**Course Learning Outcomes**	**Teaching And Learning Activity**	**Assessment Task**
I	Learn about the concept of graph. Study about the different types of graph.	Written tests, assignments, quizzes, program execution tests,	(a) Participation in class discussions (b)Continuous Evaluation(30Marks)

II	Understand the concept of trees. fundamental circuits , Spanning trees etc.	presentations as announced by the instructor in the class.	(i)15 marks on ● Assignments ● class tests. ● viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations.-70 marks.
III	Learns about Cut Sets and Vertices, Plannar Graph and different concepts of graph.		
IV	Learn in details about Graph Coloring, Directed Graphs different types of digraphs etc.		

Paper IV/Subject Name: JAVA Programming Lab		**Subject Code: INT052C311**
L-T-P-C – 0-0-4-2	**Credit Units: 02**	**Scheme of Evaluation: P**

Objective:

The objectives of the course are:

- To learn the basic concept and techniques which form the object oriented programming paradigm which is a new way of thinking about problem using models organizes around real world concept.
- To implement the concepts of object oriented programming using JAVA.

Prerequisites: Basics of Procedural or Object Oriented Programming

Detailed Syllabus:

- Write a program in java that outputs your name in giant letters.
- Write a program in Java to find the day of the week of a given date.
- Write a program in Java called GradesStatistics, which reads in n grades (of int between 0 and 100, inclusive) and displays the average, minimum, maximum, and standard deviation.
- Write a program in Java to compute execution time by generating random numbers.
- Write a program in Java to implement the following:
    a. Tokenize the paragraph into single word.
    b. Find the number of word in a paragraph?
    c. Find the number of similar words from the input word.
    d. Find the number of occurrence of each word.
- Write a program in Java to implement some inheritance hierarchy.
- Design and implement an address book object that contains a person's name, home address and phone number, business address and phone number, and numbers for their fax machine, cellular phone, and pager. Write a program in Java to this test plan for the object and implement a driver [finally prepare a package].

- Write a program in Java to demonstrate the use of try, catch, finally throw and throws keywords and demonstrate the following points in the program.
    a. Multiple catch blocks.
    b. try-catch-finally combination.
    c. try-finally combination.
    d. Exception propagation among many methods.
    e. Use of getMessage(), printStackTrace() function of Throwable class.
    f. Nested try blocks
- Write a program that does the following.
    a. Prompts the user for an input file name through a dialog box.
    b. Prompts the user for an output file name through a dialog box.
    c. Copies the input file into the output file, subject to the removal of the space characters listed below from each line.
        i. The leading space characters
        ii. The trailing space characters
        iii. The space characters that are preceded by space characters
- Write a program in Java to design forms.
- Write a program in Java to design a student information form to enter data into the database.
- Write a program in Java to connect some form designed with the back-end database and test them by inserting some records.

Text Books:

1. *Programming with Java: A Primer*; Balagurusamy E.; 3rd Edition; 2005; Tata McGraw-Hill, New Delhi
2. *Thinking in Java*; Eckel B.; 4th Edition;2006;PHI.

Reference Books:

1. *Java Generics and Collections*; Maurice N. et al; 1st Edition; 2006; O'REILLY Publication.
2. *The Unified Modeling Language User Guide*; Booch G., Rumbaugh J.,Jacobson I.;2nd Edition;2005;Pearson Education.
3. *The Complete Reference Java*; Schildt H.; 7th Edition; 2007;Tata McGraw-Hill, New Delhi

Facilitating The Achievement Of Course Learning Outcomes

COURSE LEARNING OUTCOMES	**TEACHING AND LEARNING ACTIVITY**	**ASSESSMENT TASK**
Show competence in the use of JAVA language in the development different programs. Understand the basic principles of the object-oriented programming. Demonstrate an introductory understanding of graphical user interfaces, multithreaded programming, and event-driven programming.	Written tests, assignments, quizzes, presentations as announced by the instructor in the class.	(a)Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 markson • Assignments • classtests. • viva-voce or presentation (vi) Mid-term examinations :10 marks (vii) Class attendance -5 marks (c) End-term examinations.-70 marks.

Paper V/Subject Name: Introduction to Database Management Systems Lab		Subject Code: INT052C312
L-T-P-C – 0-0-4-2	Credit Units: 02	Scheme of Evaluation: P

Objective:

The objectives of the course are:

- To provide fundamental knowledge on database concepts.
- To study the concepts of relational data model.
- To teach the student database design and query and PL/SQL.

Prerequisites: C/C++, Concepts of Data Structures

Detailed Syllabus:

- Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
- Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET,
- Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
- Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)
- Creation of simple PL/SQL program which includes declaration section, executable section and exception – Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
- Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
- Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
- Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE- APPLICATION ERROR.
- Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
- Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
- Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
- Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers

Text Book:

1. *Fundamentals of Database System;* Elmasri, Navathe; 7th Edition; 2016; Pearson Education Asia
2. *Database System Concepts*; Korth H.F., Silberschatz A.; 6th edition; 2013; Mc Graw Hill.
1. *Introduction to Database Management System*; Kahate A.; 1st Edition; 2004; Pearson Educations
2. *DataBase Management System*; Paneerselvam; 2nd Edition; 2011; PHI Learning

Reference Books:

1.An Introduction to Database Systems; Date C.J.*;* 8th Edition; 2003; Pearson Education Asia
2. An Introduction to Database Systems; Desai B.C.; Revised Edition; 2012; Galgotia Publications

Facilitating The Achievement Of Course Learning Outcomes

Course Learning Outcomes	**Teaching And Learning Activity**	**Assessment Task**
Learn the basic concepts and applications of database systems. Learn the basic constructs of SQL and construct queries using it. Understand the basic concepts of transaction processing and concurrency control.	Written tests, assignments, quizzes, presentations as announced by the instructor in the class.	(a)Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 markson • Assignments • classtests. • viva-voce or presentation (viii) Mid-term examinations :10 marks (ix) Class attendance -5 marks (c) End-term examinations.-70 marks.

Paper IX/Subject Name: Environmental Sciences		Subject Code: EVS982A303
L-T-P-C – 2-0-0-2	Credit Units: 02	Scheme of Evaluation: T

Objective:

The objectives of the course are:

- To create awareness about the importance of environment
- To learn the effect of technology on the environment and ecological balance

Prerequisites: None

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Concepts Of Environmental Science**	Environment, Levels of organizations in environment, Structure and functions in an ecosystem Biosphere its Origin and distribution on land, in water and in air, Broad nature of chemical composition of plants and animals	**6**
II	**Natural Resources and Biodiversity**	Renewable and Non-renewable Resources, Forests, water, minerals, Food and land (with example of one case study); Energy, Growing energy needs, energy sources (conventional and alternative) Biodiversity at global, national and local levels; India as a mega-diversity nation; Threats to biodiversity (biotic, abiotic stresses), and strategies for conservation	**6**
III	**Environmental Pollution**	Types of pollution- Air, water (including urban, rural, marine), soil, noise, thermal, nuclear; Pollution prevention; Management of pollution– Rural /Urban/Industrial waste management[with case study of any one type, e.g., power (thermal/nuclear), fertilizer, tannin, leather, chemical, sugar), Solid/Liquid waste management, disaster management	**6**
IV	**Social Issues and Environment**	Problems relating to urban environment- Population pressure, water scarcity, industrialization, remedial measures Climate Change – reasons, effects, (global warming, ozone layer depletion, acid rain) with one case study; Legal issues – Environmental legislation (Acts & issues involved), Environmental Ethics; Environmental monitoring, covering, Monitoring – Identification of Environment	**6**
Total			**24**

Text Book:

1. *Perspectives in Environmental Studies,* Kaushik, A., Kaushik, C.P.;4th Edition;2014; New Age International (P) Ltd. Publishers, New Delhi – 110 002.

Reference Books:

1. *Environmental Science*; Sinha, J.;1st Edition; 2011; Galgotia Publication Pvt Ltd, Darya Ganj, Delhi 110002.
2. *Environment & Ecology*; Agarwal, R.K.; 1st Edition; 2008; Krishna Prakashan Media (P) Ltd, Meerut, India.
3. *Environmental Science;* Miller T.G.; Spoolman, S.;15th Edition; 2014; Cengage Learning, 20 Channel Street, Boston, MA 02210, USA

Facilitating The Achievement Of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching And Learning Activity	Assessment Task
I	Learns about the environment, the levels of organizations in environment and about the ecosystem and biosphere.	Written tests, assignments, quizzes, presentations as announced by the instructor in the class.	(c) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 markson • Assignments • classtests. • viva-voce or presentation (x) Mid-term examinations :10 marks (xi) Class attendance -5 marks (c) End-term examinations.-70 marks.
II	Learns about theRenewable and Non-renewable Resources, about Biodiversity at global, national and local levels; India as a mega-diversity nation, about the threats to biodiversity and conservation strategies.		
III	Studies about environmental pollution, pollution prevention and management strategies.		
IV	Is made aware about the problems relating to urban environment, about the reasons and effects of Climate Change, about Environmental legislation and on the strategies to monitor the environment.		

Paper X/Subject Name: Career Oriented Communication		Subject Code: CEN982A301
L-T-P-C – 1-0-0-1	Credit Units: 01	Scheme of Evaluation: T

Objective:

The objectives of the course are:

- To adopt different communication strategies to meet different objectives of communication inside the organisation.
- To develop a robust communication strategy such that the student gets prepared for employment by considering relevant information relating to job requirements

Prerequisites: None

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Communication in Organization**	Types of organisation Different purposes of communication in organisations Modes of communication in organisation Levels of communication in organisation Direction of flow of communication in organisation Networks Channels of communication Crisis communication in organisation	**3**
II	**Communication Strategies for Managers**	Introduction Different communication strategies for managers Communicating different types of messages- positive, negative, persuasive Team communication Cross-cultural communication Communicating for negotiation Corporate communication Leadership communication Business Etiquettes and Professionalism, Applying Ethics	**3**
III	**Written Communication**	Principles of effective writing Different forms of written communication used in organisations Business Letters- parts of business letters, office order, circular, notice, agenda, minutes. Order, acceptance & cancellation, complaint & adjustment letters. Writing across cultures	**3**
IV	**Communication for Employment**	Preparing Resumes and Application Messages Planning Targeted Resume Preparing resume Supplementing a Resume Composing Application Messages	**3**
Total			**12**

Text Book:

1. *Business Communication: Essential Strategies for twenty-first century Managers,* Verma, S.; 2nd Edition;2015;Vikas Publishing House Pvt Ltd; pp 59-86, 119-165, 191-232, 243-259..

Reference Books:

1. *BCOM: An Innovative Approach to learning and teaching Business Communication,*Lehman, Dufrene, Sinha; 2011;Cengage Learning Pvt. Ltd.;;pp.399-405, 332-355

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching And Learning Activity	Assessment Task
I	Studies about the different purposes of communication in organisations and the variosus modes of communication in organisation	Written tests, assignments, quizzes, presentations as announced by the instructor in the class.	(d) Participation in class discussions (b) Continuous Evaluation(30Marks) (i) 15 markson • Assignments • classtests. • viva-voce or presentation (xii) Mid-term examinations :10 marks (xiii) Class attendance -5 marks (c) End-term examinations.-70 marks.
II	Introduces to different communication strategies for managers, team communication and Cross-cultural communication, Business Etiquettes and Professionalism and the Application of Ethics.		
III	Highlights the principles of effective writing, writing business letters and writing across cultures to develop a robust communication strategy helpful for employment.		
IV	This module eduacates on preparing targeted resumes, readying the student for effective communication for employment.		

Paper I/Subject Name: Operating Systems **Subject Code: INT052C401**

L-T-P-C – 4-0-0-4 **Credit Units: 04** **Scheme of Evaluation: T**

Objective:

The objectives of the course are:

- To learn the fundamentals of Operating System and the mechanisms of OS to handle processes and threads and their communication
- To learn the mechanisms involved in memory management in contemporary OS.
- To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols
- To know the components and management aspects of concurrency management.

Prerequisites: Concepts of Computer Organization and Architecture, Data Structures, Computer Programming

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Introduction to OS, Process and Threads**	Operating system functions, evaluation of O.S., Different types of O.S.: batch, multi-programmed, time-sharing, real-time, distributed, parallel. Operating system structure (simple, layered, virtual machine), O/S services, and system calls. Concept of processes, process scheduling, operations on processes, co-operating processes, inter-process communication. Overview of threads, benefits of threads, user and kernel threads. Scheduling criteria, preemptive & non-preemptive scheduling, scheduling algorithms (FCFS, SJF, RR, and priority), algorithm evaluation, multi-level queue scheduling and multilevel feedback queue scheduling	**12**
II	**Process Synchronization and Deadlocks**	Data Access and control synchronization, critical section problem, critical region, Race conditions in process synchronization , classical problems of synchronization, semaphores, Inter-process communication through message passing mechanism System model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.	**12**
III	**Memory and File Management**	Background, logical vs. physical address space, swapping, contiguous memory allocation, paging, segmentation, segmentation with paging Virtual Memory background, demand paging, performance, page replacement, page replacement algorithms (FCFS, LRU), allocation of frames, thrashing. File concept, access methods, directory structure, file system structure, allocation methods (contiguous, linked, indexed), free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency & performance	**12**
IV	**I/O, Disk Management, Protection and Security**	I/O hardware, polling, interrupts, DMA, application I/O interface (block and character devices, network devices, clocks and timers, blocking and non-blocking I/O), kernel I/O subsystem (scheduling, buffering, caching, spooling and device reservation, error handling), performance. Disk structure, disk scheduling (FCFS, SSTF, SCAN, C-SCAN), disk reliability,	**12**

		disk formatting, boot block, bad blocks. Goals of protection, domain of protection, security problem, authentication, one time password, program threats, system threats, threat monitoring, encryption.	
Total			**48**

Text Book:

1. *Operating System: Concept & Design*; Milenkovie M.; 2nd Edition; 2001; McGraw Hill.
2. *Operating System Design & Implementation*;Tanenbaum A.S.; 3rd Edition; 2006; Practice Hall NJ.
3. *Operating System Concepts*; Silbersehatz A. , Peterson J. L.; 8th Edition; 2008;Wiley.
4. *Operating System;*Dhamdhere; 3rd Edition; 2017;TMH.

Reference Books:

1. *Operating Systems* ;Stalling, W.;1992; Maxwell McMillan International Editions
2. *An Introduction to Operating Systems*; Dietel H. N.; 2nd Edition; 2002; Addison Wesley.
3. *The Design of the UNIX Operating System;*M. J. Bach;1994; Prentice Hall of India.

Facilitating the Achievement of Course Learning Outcomes

Module	**Course Learning Outcomes**	**Teaching And Learning Activity**	**Assessment Task**
I	This module gives an introduction to operating systems, process concepts and the different scheduling techniques.	Written tests, assignments, quizzes, program execution tests, presentations as announced by the instructor in the class.	(e) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 markson • Assignments • classtests. • viva-voce or presentation (xiv) Mid-term examinations :10 marks (xv) Class attendance -5 marks (c) End-term examinations.-70 marks.
II	Learns about theoretical concept behind the different synchronization techniques of processes and about deadlocks, deadlock prevention and avoidance.		
III	Analyse the various device and resource management techniques for timesharing and distributed systems; learns about the various memory management techniques including paging and segmentation and the concepts of virtual memory.		
IV	Interpret the mechanisms adopted for file sharing in distributed Applications and highlight the I/O handling mechanisms of the OS including I/O hardware, polling, interrupts and different protection and security issues.		

Paper II/Subject Name:Data Communication and Networks		**Subject Code: INT052C402**
L-T-P-C – 4-0-0-4	**Credit Units: 04**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are:

- To educate concepts, vocabulary and techniques currently used in the area of computer networks.
- To master the terminology and concepts of the OSI model and the TCP/IP model.
- To be familiar with wireless networking concepts and contemporary issues in networking technologies.

Prerequisites: Concepts of Data Communication

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Introduction and Data Link Layer**	Goals and Applications of Networks, Network structure and architecture, The OSI reference and TCP/IP model services, Network Topology Design - Delay Analysis, Back Bone Design, Overview of Physical Layer, ISDN, Terminal Handling, FDDI, X.25, Frame Relay Flow Control and ARQ techniques, Data link Protocols, Sliding Window protocols, Error Handling, HDLC, DLL in Internet.	**12**
II	**Network Layer and Protocols**	Network Layer - Point to Point Networks, Routing, Congestion control, Internetworking -TCP / IP, IP packet, IP addressing: classless, class full addressing, IPv4, IPv6, IPv4 vs. IPv6. ICMP, RARP, BOOTP, Internet Multicasting – IGMP, Exterior Routing Protocols – BGP	**12**
III	**Transport, Session and Presentation Layer**	Transport Layer - Design issues, Connection management, Transport Layer – TCP & UDP., Session Layer-Design issues, Presentation Layer-Design issues, Data compression techniques, cryptography.	**12**
IV	**Application Layer**	Application layer –DNS, File Transfer, Access and Management, Electronic mail, MIME, SNMP, Virtual Terminals, Bluetooth,World wide Web	**12**
Total			**48**

Text Book:

1. *Data and Computer Communication*; Stallings W.; 10th Edition; 2013; PHI.
2. *Data Communications and Networking*; Forouzan B.A; 4th Edition; 2017; Tata McGraw Hill
3. *Computer Networks*; Tannenbaum; 3rd Edition; 1996; Pearson Education.

Reference Books:

1. *Computer Networks: A Systems Approach* ; Peterson L.L. , Davie B.S.; 5thEdition;2011; Morgan Kaufmann
2. *Computer Networks*; Misra A.;2006; Acme Learning, Morgan Kaufman Publication, New Delhi
3. *Computer Networks*, Trivedi B.;Reprint Edition; 2011; Oxford press

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching And Learning Activity	Assessment Task
I	To understand the underlying concepts behind the data link layer and apply knowledge of different techniques of error detection and correction to detect and solve error bit during data transmission.	Written tests, assignments, quizzes, program execution tests, presentations as announced by the instructor in the class.	(f) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 markson • Assignments • classtests. • viva-voce or presentation (xvi) Mid-term
II	To determine proper usage of the IP address, subnet masks and default gateway in a routed network.		

III	To learn about the various transport layer protocols and about the basic concepts of data compression and cryptography.		examinations :10 marks (xvii) Class attendance -5 marks (c) End-term examinations.-70 marks.
IV	To understand internals of main protocols such as HTTP, FTP, SMTP, TCP, UDP, IP of the application layer.		

Paper III/Subject Name:Design and Analysis of Algorithms		**Subject Code: INT052C403**
L-T-P-C – 4-0-0-4	**Credit Units: 04**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are:

- To teach the fundamental algorithms
- To explain how to analyse the performance of algorithms
- To provide the fundamental algorithmic design strategies

Prerequisites: Concepts of Data Structures and Basic Mathematics

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Introduction**	Fundamental characteristics of an algorithm. Basic algorithm analysis – Asymptotic analysis of complexity bounds – best, average and worst-case	**12**

		behaviour, standard notations for expressing algorithmic complexity. Empirical measurements of performance, time and space trade-offs in algorithms. Using recurrence relations to analyse recursive algorithms – illustrations using recursive algorithms.	
II	**Fundamental Algorithm Strategies**	Brute Force: String Matching, Closest-Pair and Convex-Hull Problems ,Exhaustive Search, Travelling Salesman Problem, Knapsack Problem, Job Assignment problem. Divide and Conquer Methodology :Binary Search, Merge sort , Quick sort ,Heap Sort, Multiplication of Large Integers ,Closest-Pair and Convex . Dynamic Programming: Computing a Binomial Coefficient, Wars hall's and Floyd' algorithm, Optimal Binary Search Trees, Knapsack Problem and Memory functions. Greedy Technique: Prim's algorithm- Kruskal's Algorithm - Dijkstra's Algorithm-Huffman Trees.	**12**
III	**Iterative Improvement**	The Simplex Method – The Maximum-Flow Problem – Maximum Matching in Bipartite Graphs, Stable marriage Problem	**12**
IV	**Tractable and Intractable Problems**	Limitation of algorithms,. The Halting problem. Computability classes – P, NP, NP-complete and NP-hard. Cook's theorem. Standard NP complete problems Reduction techniques. Approximation algorithms, Randomized algorithms, Class of problems beyond NP – PSPACE.	**12**
Total			**48**

Text Book:

1. *Introduction to Algorithms,* T. H. Cormen, C. E. Leiserson, R. L. Rivest, 3rd Edition, 2009, The MIT Press, Cambridge, Massachusetts.

Reference Books:

1. Aho, Hopcroft & Ullman, *The Design and Analysis of Algorithms*, Addison- Wesley
2. Horowitz & Sahani, *Fundamentals of Algorithms,* 2nd Edition, 2009, Galgotia Publications

Facilitating the Achievement of Course Learning Outcomes

Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks

On completion of this course the students will be expected to:
• Be able to analyze algorithms and improve the efficiency of algorithms.
• Apply different designing methods for development of algorithms to realistic problems, such as divide and conquer, greedy and etc.
• Understand and estimate the performance of algorithm.
	• Each topic to be explained with examples.
	• Students to be motivated to discover the relevant concepts to take part in discussions and ask questions.
	• Students to be given homework/assignments to make their concept clear.
	• Discuss and solve the theoretical problems in the class
		• Participation in class discussions
		• Continuous Evaluation: 30 Marks
		  • 15 marks on
		  ○ Assignments
		  ○ class tests
		  ○ viva-voce or presentation
		  • Mid-term examinations :10 marks
		  • Class attendance: 5 marks
		• End-term examinations: 70 marks

Paper IV/Subject Name: Operating Systems Lab		**Subject Code: INT052C411**
L-T-P-C – 0-0-4-4	**Credit Units: 02**	**Scheme of Evaluation: P**

Objective:

The objectives of the course are:

- To learn the fundamentals of Operating System
- To learn the UNIX commands.
- To learn the shell scripting
- To learn about process, CPU scheduling etc.

Prerequisites: Concepts of Computer Programming and Data Structures

Detailed Syllabus:

Minimum 20 Laboratory experiments based on the following-

1. Usage of following commands: ls, pwd, tty, cat, who, who am I, rm, mkdir, rmdir, touch, cd.
2. Usage of following commands: cal, cat(append), cat(concatenate), mv, cp, man, date.
3. Usage of following commands: chmod, grep, tput (clear, highlight), bc.
4. Write a shell script to check if the number entered at the command line is prime or not.
5. Write a shell script to modify “cal” command to display calendars of the specified months.
6. Write a shell script to modify “cal” command to display calendars of the specified range of months.

7. Write a shell script to accept a login name. If not a valid login name display message – "Entered login name is invalid".
8. Write a shell script to display date in the mm/dd/yy format.
9. Write a shell script to display on the screen sorted output of "who" command along with the total number of users.
10. Write a shell script to display the multiplication table any number,
11. Write a shell script to compare two files and if found equal asks the user to delete the duplicate file.
12. Write a shell script to find the sum of digits of a given number.
13. Write a shell script to merge the contents of three files, sort the contents and then display them page by page.
14. Write a shell script to find the LCD (least common divisor) of two numbers.
15. Write a shell script to perform the tasks of basic calculator.
16. Write a shell script to find the power of a given number.
17. Write a shell script to find the factorial of a given number.
18. Write a shell script to check whether the number is Armstrong or not.
19. Write a shell script to check whether the file have all the permissions or not.
20. Program to show the pyramid of special character "*".
21. Implementation of CPU scheduling. a) Round Robin b) SJF c) FCFS d) Priority
22. Implement all file allocation strategies
23. Implement Semaphores

Text Book:

1. *Operating System: Concept & Design*; Milenkovie M.; 2nd Edition; 2001; McGraw Hill.
2. *Operating System Design & Implementation*; Tanenbaum A.S.; 3rd Edition; 2006; Practice Hall NJ.
3. *Operating System Concepts*; Silbersehatz A. , Peterson J. L.; 8th Edition; 2008;Wiley.
4. *Operating System;* Dhamdhere; 3rd Edition; 2017;TMH.

Reference Books:

1. *Operating Systems* ;Stalling, W. ; 1992; Maxwell McMillan International Editions
2. *An Introduction to Operating Systems*; Dietel H. N.; 2nd Edition; 2002; Addison Wesley.
3. *The Design of the UNIX Operating System;*M. J. Bach; 1994; Prentice Hall of India.

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching And Learning Activity	Assessment Task
I	Analyse the structure, basic architectural components involved in OS design. Able to learn the shell scripting method. Able to learn the basics Unix commands	Written tests, assignments, quizzes, presentations as announced by the instructor in the class.	(g) Participation in class discussions (b) Continuous Evaluation(30Marks) (i) 15 markson • Assignments • classtests. • viva-voce or presentation (xviii) Mid-term examinations :10 marks (xix) Class attendance -5 marks (c) End-term examinations.-70 marks.
II			
III			
IV			

Paper V/Subject Name:Data Communication and NetworksLab Subject Code: INT052C412

L-T-P-C – 0-0-4-4 **Credit Units: 02** **Scheme of Evaluation: P**

The objectives of the course are:

- To educate concepts, vocabulary and techniques currently used in the area of computer networks.
- To master the terminology and concepts of the OSI model and the TCP/IP model.
- To make the students familiar with wireless networking concepts and contemporary issues in networking technologies.

Prerequisites: Concepts of Computer Programming

Detailed Syllabus:

Minimum 20 Laboratory experiments based on the following-

- Study of different network cables and devices.
- Study of college LAN with references to network IP and design a LAN for it.
- Study of basic network command and network configuration command.
- Study of LAN transmission media's, topologies, interconnection devices & LAN standards.
- Write a program in 'C' for PC to PC communication using RS-232 port.
- Implement Dijkstra's algorithm to compute the Shortest path in a graph.
- Study of Different network simulators for simulations.
- Token bus and token ring protocol tyo create scenario and study the performance of token bus and token ring protocols through simulation.
- Implement Transfer of files from PC to PC using Windows / Unix socket programming.
- Case study of client/server scenario. Observing the difference between UDP and TCP servers.
- To observe the working of TCP three-way-hand-shaking procedure. Locating different packets like, SYN, SYN-ACK and ACK. Comparing different fields of these packets.
- Write a program for Hamming Code generation for error detection and correction Using TCP/IP sockets.
- Write a client-server program to make client sending the file name and the server to send back the contents of the requested file if present.
- Study & Simulation of Routing Protocols using Standard Network Simulator

Text Book:

1. *Data and Computer Communication*, William Stallings, 10th Edition, 2013, PHI.
2. *Data Communications and Networking*, Behrouz A Forouzan, 4th Edition, 2017, Tata McGraw Hill
3. *Computer Networks*, Tannenbaum, 5th Edition, 2014, Pearson Education.

Reference Books:

1. L.L. Peterson & B.S. Davie, *Computer Networks: A Systems Approach*, 5th Edition, 2011, Morgan Kaufmann
2. Anuranjan Misra, *Computer Networks*, 2006, Acme Learning, Morgan Kaufman Publication, New Delhi
3. BhushanTrivedi, *Computer Networks*, Reprint Edition, 2011, Oxford press

Facilitating the Achievement of Course Learning Outcomes

Course Learning Outcomes	**Teaching And Learning Activity**	**Assessment Task**
After completion of the course the students are expected to ● To understand the organization of computer networks, factors influencing computer network development and the reasons for having variety of different types of networks. ● To apply knowledge of different techniques of error detection and correction to detect and solve error bit during data transmission. ● To determine proper usage of the IP address, subnet masks and default gateway in a routed network. ● To understand internals of main protocols such as HTTP, FTP, SMTP, TCP, UDP, IP	Written tests, assignments, quizzes, presentations as announced by the instructor in the class.	(h) Participation in class discussions (b) Continuous Evaluation(30Marks) (i) 15 markson ● Assignments ● classtests. ● viva-voce or presentation (xx) Mid-term examinations :10 marks (xxi) Class attendance -5 marks (c) End-term examinations.-70 marks.

Paper IX/Subject Name: Communication and Presentation Skills		Subject Code: CEN982A401
L-T-P-C – 1-0-0-1	Credit Units: 01	Scheme of Evaluation: T

Objective:

The objectives of the course are:

- To develop report writing skills after detailed inquiry and investigation, tailored to the context of given situation and audience.
- To create, develop and deliver an effective presentation.
- To understand the increasing importance of group communication.
- To learn the different forms of technology-enabled communication in the 21st century businesses.

Prerequisites: None

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Writing Reports, Business Proposals and Business Plans**	Formats of reports Developing a report outline Report planning Writing a report Using different visual representations for writing a report Developing an outline for a business proposal Developing an outline for business plan	**3**
II	**Designing and Developing Business Presentations**	Planning an effective Business Presentation, Organising the content Designing compelling presentation visuals Refining your delivery Special presentation situations	**3**
III	**Focusing on Group Communication**	Increasing focus on groups Characteristics of Effective Groups Group Conflicts Meeting Management	**3**
IV	**Technology Enabled Communication**	Role of Technology-enabled communication in the 21st century businesses Different forms of technology-enabled communication tools used in organisations Telephone, Teleconferencing, Fax, Email, Instant messaging , Blog, podcast, Videos, videoconferencing, social media	**3**
Total			**12**

Text Book:

1. *Business Communication: Essential Strategies for twenty-first century Manager;* Verma, S; 2nd Edition; 2015;Vikas Publishing House Pvt Ltd; pp 267-298, 243-259.

Reference Books:

2. *BCOM: An Innovative Approach to learning and teaching Business Communication;* Lehman, Dufrene, Sinha; 2011;Cengage Learning Pvt. Ltd.;pp. 50-63, 302-322.

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching And Learning Activity	Assessment Task
I	Helps to develop report writing skills after detailed inquiry and investigation, tailored to the context of given situation and audience.	Written tests, assignments, quizzes,presentations as announced by the instructor in the class.	(i) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 markson • Assignments • classtests. • viva-voce or presentation (xxii) Mid-term examinations :10 marks (xxiii) Class attendance -5 marks (c) End-term examinations.-70 marks.
II	Educates on how to create, develop and deliver an effective presentation.		
III	Develops and helps to Understand the increasing importance of group communication.		
IV	Learn the different forms of technology-enabled communication in the 21st century businesses		

SYLLABUS (5th SEMESTER)

Paper I/Subject Name: Introduction to Probability and Statistics		**Subject Code: INT052C501**
L-T-P-C – 4-0-0-4	**Credit Units: 04**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are:

- To teach the basic rules of probability and to use them in modelling uncertainty in obtaining and recording data.
- To explain the utilization of graphical and numerical summaries of data in understanding data generating processes.
- To explain the logic of statistical inference to apply to common inferential procedures.

Prerequisites: Basic concepts of Mathematics

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Univariate Data and Probability**	Types of data, Mean and Median, Standard Deviation and Variance, Range, IQR and Finding Outliers, Graphs and Describing Distributions, Counting Techniques, Combinations and Permutations, Sets and Venn Diagrams, Basic Probability Models, General Probability Rules	**12**
II	**Discrete and Continuous Distributions**	Probability Distributions: Random Variable, Discrete random variable, Mean and Standard deviation of discrete random variable, Discrete Probability Distributions: Binomial, Poisson and Hypergeometric probability distribution, Continuous Probability distribution: Normal distribution, Density Curves, The Normal Distribution, Standard Normal Calculations, Sampling Distribution of x and pˆ	**12**
III	**Sampling**	Sampling Distribution: sampling plans and experimental designs, Sampling distribution of a statistic, Central Limit theorem, Sampling distribution of the Sample mean and Proportion. Large Sample Estimation: Point estimation, Interval estimation, Confidence interval of population mean, Population proportion, difference between two population means, difference between two population proportions.	**12**
IV	**Variance and Linear Regression**	Analysis of Variance: One-way classification, Two-way classification. Linear regression and Correlation: Method of least squares, Analysis of variance for linear regression, Testing the usefulness of the linear regression model, Estimation and Prediction using the fitted line. Carl Pearson's coefficient of Correlation, Test of hypothesis concerning the Correlation coefficient.	**12**
Total			**48**

Text Book:

1. *Probability and Statistics*, William Mendenhall, Robert J. Beaver, Barbara M. Beaver, 14th Edition, CENGAGE Learning.
2. *Probability and Statistics*, E. Rukmangadachari, 1st Edition, 2012, Pearson Education.

Reference Books:

1. Vijay K. Rohatgi, *An Introduction to Probability and Statistics*, 2nd Edition, 2008, Wiley

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching And Learning Activity	Assessment Task
I	Learn about the types of data, Mean and Median, Standard Deviation and Variance, Range, IQR and Finding Outliersetc.	Written tests, assignments, quizzes, presentations as announced by the instructor in the class.	) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 markson • Assignments • classtests. • viva-voce or presentation xxiv) Mid-term examinations :10 marks xxv) Class attendance -5 marks (c) End-term examinations.-70 marks.
II	Understand Probability Distributions: Random Variable, Discrete random variable, Mean and Standard deviation of discrete random variable etc.		
III	Understand the Sampling Distribution, Central Limit theorem, Sampling distribution of the Sample mean and Proportion. Large Sample Estimation, Point estimation etc.		
IV	Learn about analysis of Variance, Linear regression and Testing the usefulness of the linear regression model, Estimation and Prediction using the fitted line etc.		

Paper II/Subject Name: Web Technology	Subject Code: INT052C502
L-T-P-C – 4-0-0-4	Credit Units: 04Scheme of Evaluation: T

Objective:

The objectives of the course are:

- To teach the basic web concepts and Internet protocols.
- To make the students familiar with Scripting Languages.
- To explain DHTML, XML, SERVELETS AND JSP.

Prerequisites: Basics of computer programming

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Introduction, to Web Technology**	World Wide Web: Introduction to TCP/IP and WAP, DNS, Email, TelNet, HTTP and FTP. Introduction to Browser and search engines, Working of the search engines, Miscellaneous Web Browser details, Introduction to Web Servers: Features of web servers, caching, case study-IIS, Apache, Configuring web servers. Internet Principles – Basic Web Concepts – Client/Server model – retrieving data from Internet – HTM and Scripting Languages – Standard Generalized Mark –up languages – Next Generation – Internet –Protocols and Applications.	**12**
II	**HTML,CSS, Java Script**	Web Pages - types and issues, tiers; comparisons of Microsoft and java technologies, WWW-Basic concepts, web client and web server, http protocol (frame format), universal resource locator (url), HTML different Tags, sections, image & pictures, listings, tables, frame, frameset, form. The need of dynamic web pages; an overview of DHTML, cascading style sheet (css), comparative studies of different technologies of dynamic page creation. Java Script : Data types, variables, operators, conditional statements, array object, date object, string object, Dynamic Positioning and front end validation, creating rollovers, building smarter forms, Event Handling, working with cookies, DOM, node and objects, creating sliding menu, pop-up menu, slideshow with caption	**12**
III	**XML and AJAX**	XML – Server side includes – communication – DTD – Vocabularies – DOM methods – Introduction of XML, Validation of XML documents, DTD, Ways to use XML, XML for data files, HTML Vs XML, Embedding XML into HTML documents, Converting XML to HTML for Display, Rewriting HTML as XML, Firewalls– Proxy Servers. AJAX technologies, Action, XML Http Request database operations, security, issues	**12**
IV	**J2SE, J2EE, Severlet and JSP**	Data Types, Arrays, Type Casting, Classes and Objects, Inheritance, Interfaces, Exception Handling, Multithreading,J2EE as a framework, Client Server Traditional model, Comparison amongst 2-tier, 3-tier and N-tier Architectures, Thin and Thick Clients. J2EE Servlet 2.x Specification, Writing small Servlet Programs, Deployment Descriptor, Inter Servlet Collaboration, Session: Definition, State on web, Different ways to track sessions, JSP Technology Introduction-JSP and Servlets- Running JSP Applications Basic JSP- JavaBeans Classes - Support for the Model- View- Controller Paradigm- Case Study- Related Technologies.	**12**
Total			**48**

Text Book:

1. *Internet and World Wide Web How to program*, Deitel H.M. and Deitel P.J, 4th Edition, 2012, Pearson International, New Delhi

2. *Web Technology*, Gopalan N.P. and Akilandeswari J., 2nd Edition, 2014, Prentice Hall of India, New Delhi.
3. *Java How to Program*, Paul Dietel and Harvey Deitel, 8th Edition, 2014, Prentice Hall of India, New Delhi

Reference Books:

1. Uttam K. Roy, *Web Technologies*, 2010, Oxford University Press.
2. Godbole A. S. & Kahate A., *Web Technologies*, 2nd Edition, 2006, TMH, New Delhi.

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching And Learning Activity	Assessment Task
I	Understand about TCP/IP ,WAP, DNS, Email, Introduction to Browser and search engines, Web Servers, Client/Server model etc.	Written tests, assignments, quizzes, presentations as announced by the instructor in the class.	(a) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 markson • Assignments • classtests. • viva-voce or presentation (xxvi) Mid-term examinations :10 marks (xxvii) Class attendance -5 marks (c) End-term examinations.-70 marks.
II	Learn HTML Tags**, CSS and Java Script and creation of dynamic webpages.**		
III	Understand XML, DTD, DOM , AJAX etc.		
IV	Learn J2EE Servlet 2.x Specification, JSP Technology etc.		

Paper III/Subject Name: Advanced Database Management Systems		**Subject Code: INT054C503**
L-T-P-C – 4-0-0-4	**Credit Units: 04**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are:

- To give students an introduction to Database Management Systems, Relational Model, Relational Algebra and Relational Calculus.
- To impart detailed concepts on Relational Database Modeling and the Structured Query Language.
- To explain advanced concepts on Database Design including Normalization and Functional Dependencies.
- To give students the understanding of the advanced topics like Query Optimization, Transaction Processing.

Prerequisites: None

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Relational Database Modeling, Relational Algebra and Relational Calculus**	The Relational Data Model and Relational Database Constraints- Concepts, Constraints, Schemas Constraint Violations. The Relational Algebra and Relational Calculus- Unary Relational Operations, Set Theoretic Operations, Binary Relational Operations, additional Relational Operations. Overviews of Tuple Relational Calculus and Domain Relational Calculus. Data Modeling using the Entity-Relationship (ER) Model- Using High-Level Conceptual Data Models for Database Design, Entity Types, Entity Sets, Attributes, and Keys, Relationship Types, Relationship Sets, Roles, and Structural Constraints, Weak Entity Types, ER Diagrams, Naming Conventions, and Design Issues. The Enhanced Entity-Relationship (EER) Model- Subclasses, Superclasses, and Inheritance; Specialization and Generalization. Relational Database Design by ER and EER-to-Relational Mapping- Relational Database Design Using ER-to-Relational Mapping, Mapping EER Model Constructs to Relations.	**12**
II	**The Structured Query Language**	Basic SQL- SQL Data Definition and Data Types, Specifying Constraints, Basic Retrieval Queries, INSERT, DELETE, and UPDATE Statements, Additional Features, More Complex SQL Retrieval Queries, Specifying Constraints as Assertions and Actions as Triggers, Views (Virtual Tables), Schema Change Statements. Introduction to SQL Programming Techniques - Database Programming Techniques and Issues, Embedded SQL, Dynamic SQL, and SQLJ; Database Programming with Function Calls, Database Stored Procedures. Overview of Web Database Programming.	**12**
III	**Advanced Concepts on Database Design**	Basics of Functional Dependencies and Normalization for Relational Databases- Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form. Relational Database Design Algorithms and Further Dependencies- Inference Rules, Equivalence, and Minimal Cover, Properties of Relational Decompositions, Algorithms for Relational Database Schema Design.	**12**
IV	**Query Optimization, Transaction Processing**	Query Processing and Optimization- Translating SQL Queries into Relational Algebra, Algorithms for External Sorting, Algorithms for SELECT and JOIN Operations, Algorithms for PROJECT and Set Operations, Implementing Aggregate Operations and OUTER JOINs, Combining Operations Using Pipelining, Using Heuristics in Query Optimization, Using Selectivity and Cost Estimates in Query Optimization. Transaction Processing- Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties of Transactions, Characterizing Schedules Based on Recoverability, Characterizing Schedules Based on Serializability, Transaction Support in SQL. Concurrency Control Techniques- Two-Phase Locking, Concurrency Control Based on Timestamp Ordering, Multiversion Concurrency Control, Validation (Optimistic) Concurrency Control, Granularity of Data Items and Multiple Granularity Locking, Using Locks for Concurrency Control in Indexes. Database Recovery Techniques- Recovery Concepts, Shadow Paging, The ARIES Recovery Algorithm.	**12**
Total			**48**

Text Books:

1. *Fundamentals of Database Systems,* Elmasri and Navathe, 7th Edition, 2017, Pearson Education.
2. *Database System Concepts,* Henry F Korth and Abraham Silbershatz, 6th Edition, 2013, McGraw Hill.

Reference Books:

1. Atul Kahate, *Introduction to Database Management System*, 1st Edition, 2004, Pearson Education.
2. C. J. Date, *An Introduction to Database Systems*, 8th Edition, 2012, Pearson Education.

3. Raghu Ramakrishnan and Johannes Gehrke, *Database Management Systems*, 3rd Edition, 2014, McGraw Hill Education.
4. G K Gupta, *Database Management Systems*, 1st Edition, 2011, McGraw Hill Education.

Facilitating the Achievement of Course Learning Outcomes

Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
• Learn about basic database related concepts. • Have an insight on Relational Database Modeling and the Structured Query Language. • Learn about Database Design including Normalization and Functional Dependencies. • Have the understanding of the advanced topics like Query Optimization, Transaction Processing	i) Each topic to be expounded with adequate examples. ii) Class discussions and question-answer rounds are encouraged iii) theoretical problems solving is part of the class to grasp the underlying concepts iv) Students have to go through case studies for real time experience v) Students to be encouraged to give short presentations.	(a) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on Assignments Class tests. viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations: 70 marks.

Paper IV/Subject Name: Advanced Computer Organization and Architecture **Subject Code: INT054C504**

L-T-P-C – 4-0-0-4 **Credit Units: 04** **Scheme of Evaluation: T**

Objective:

The objectives of the course are:

- To make the students understand the machine instructions and basic computer organization
- To give an idea of representation of information in computers
- To explain memory hierarchy and various memory mapping techniques
- To teach I/O subsystems and pipelining processing.

Prerequisites: Basics of Digital Logic

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Overview of Computer Organization and Architecture**	Introduction- Organization versus Architecture, Structure and Function. Computer Evolution and Performance- Designing for Performance, Performance Assessment. Computer Function and Interconnection- Computer Components, Computer Function, Interconnection Structures, Bus Interconnection. Computer Arithmetic- Integer Representation, Integer Arithmetic, Floating-Point Representation, Floating-Point Arithmetic.	**12**
II	**The Computer System**	Cache Memory- Computer Memory System Overview, Cache Memory Principles, Elements of Cache Design. Internal Memory Technology- Semiconductor Main Memory, Error Correction, Advanced DRAM Organization. External Memory- Magnetic Disk, RAID, Optical Memory, Magnetic Tape. Input/Output- External Devices, I/O Modules, Programmed I/O, Interrupt-Driven I/O, Direct Memory Access, I/O Channels and Processors. Operating System Support- Operating System Overview, Scheduling, Memory Management.	**12**

III	**The Central Processing Unit**	Characteristics and Functions of Instruction Sets- Machine Instruction Characteristics, Types of Operands, Types of Operations. Addressing Modes and Formats- Addressing, Instruction Formats, Assembly Language. Processor Structure and Function- Processor Organization, Register Organization, the Instruction Cycle, Instruction Pipelining. Reduced Instruction Set Computers (RISCs)- Instruction Execution Characteristics, the use of a Large Register File, Compiler-Based Register Optimization, Reduced Instruction Set Architecture, RISC Pipelining. Control Unit Operation- Micro-operations, Control of the Processor, Hardwired Implementation. Micro-programmed Control- Basic Concepts, Microinstruction Sequencing, Microinstruction Execution.	**12**
IV	**Parallel Organization**	Instruction-Level Parallelism and Superscalar Processors- Overview, Design Issues. Parallel Processing- the use of Multiple Processors, Symmetric Multiprocessors, Cache Coherence and the MESI Protocol, Multithreading and Chip Multiprocessors, Clusters, Non Uniform Memory Access Computers, Vector Computation. Multicore Computers- Hardware Performance Issues, Software Performance Issues, Multicore Organization.	**12**
Total			**48**

Text Books:

1. *Computer Organization and Architecture: Designing For Performance,* William Stallings, 6th Edition, 2004, Prentice Hall.
2. *Computer System Architecture*, M. Morris Mano, 3rd Edition, 2017, Pearson Education.
3. *Computer Organization,* Carl Hamacher, Zvonko Vranesic and Safwat Zaky, 5th Edition, 2011, McGraw-Hill Higher Education.

Reference Books:

1. V. Rajaraman and T. Radhakrishnan, *Computer Organization and Architecture*, 1st Edition, 2007, Prentice Hall India Learning Private Limited.
2. P. Chakraborty, *Computer Architecture and Organization*, 1st Edition, 2006, Jaico Publishing House.
3. B. Govindarajalu, *Computer Architecture and Organization: Design Principles and Applications*, 2nd Edition, 2017, McGraw Hill Education.

Facilitating the Achievement of Course Learning Outcomes

Learning Outcomes	**Teaching and Learning Activity**	**Assessment Tasks**
•Understand overview of Computer Organization and Architecture. •Define Computer System and Components •To give students detailed concepts on the Central Processing Unit. •To give students exposure to Multicore computing and Parallel Organization of	i) Each topic to be expounded with adequate examples. ii) Class discussions and question- answer rounds are encouraged iii) theoretical problems solving is part of the class to grasp the underlying concepts iv) Students have to go through case studies for real time experience	(a) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on □ Assignments □ Class tests. □ viva-voce or presentation (ii) Mid-term examinations :10 marks

Computers	v) Students to be encouraged to give short presentations.	(iii) Class attendance -5 marks (c) End-term examinations: 70 marks.

Paper VI/Subject Name: Web Technology Lab **Subject Code: INT052C512**

L-T-P-C – 0-0-4-4 **Credit Units: 02Scheme of Evaluation: P**

Objective:

The objectives of the course are:

- To teach the basic web concepts and Internet protocols.
- To make the students familiar with Scripting Languages.
- To explain DHTML, XML, SERVELETS AND JSP.

Prerequisites: Computer Programming Concepts

Detailed Syllabus:

Minimum 20 Laboratory experiments based on the following-

1. Basic use of html tag, linking image table, frame, form design.
2. DHTML- inline styles, creating style sheets with the style element, linking external style sheet,positioning elements, user style sheet.
3. Creating event handler that respond to mouse and keyboard event: Onload, onmouseover,onmouseout, onfocus, onblur, onsubmit, onresult, onclick, onchange.
4. Structuring data with xml, xml parser, extensible style language (xsl); customising mark uplanguage.
5. Configuring apache-tomcat server.
6. Building simple jsp: Declaring variables and methods in jsp, inserting java expression in jsp, processing request from user, generating dynamic response for the user. Accessing database fromjsp, inserting applet into jsp.

Text Book:

1. *Internet and World Wide Web How to program*, Deitel H.M. and Deitel P.J, 4th Edition, 2012, Pearson International, New Delhi
2. *Web Technology*, Gopalan N.P. and Akilandeswari J., 2nd Edition, 2014, Prentice Hall of India, New Delhi.
3. *Java How to Program*, Paul Dietel and Harvey Deitel, 8th Edition, 2014, Prentice Hall of India, New Delhi

Reference Books:

1. Uttam K. Roy, *Web Technologies*, 2010, Oxford University Press.
2. Godbole A. S. & Kahate A., *Web Technologies*, 2nd Edition, 2006, TMH, New Delhi.

Facilitating the Achievement of Course Learning Outcomes

Course Learning Outcomes	**Teaching And Learning Activity**	**Assessment Task**
i) Web design ii) Learn HTML Tags**, CSS and Java Script and creation of dynamic webpages.** iii) Creation of XML files, DTD, DOM , AJAX etc. iv)Learn web application using J2EE Servlet, JSP Technology etc.	Written tests, assignments, quizzes, presentations as announced by the instructor in the class.	) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 markson • Assignments • classtests. • viva-voce or presentation xviii)Mid-term examinations :10 marks xix) Class attendance -5 marks (c) End-term examinations.-70 marks.

Paper VII/Subject Name: Advanced Database Management Systems Lab		Subject Code: INT054C513
L-T-P-C – 0-0-4-2	Credit Units: 02	Scheme of Evaluation: P

Objective:

The objectives of the course are:

- To provide an introduction to Database Management Systems, Relational Model, Relational Algebra and Relational Calculus.
- To give students detailed concepts on Relational Database Modeling and the Structured Query Language.
- To teach advanced Concepts on Database Design including Normalization and Functional Dependencies.
- To give students the understanding of the advanced topics like Query Optimization.

Prerequisites: None

Detailed Syllabus:

Minimum 20 Laboratory experiments based on the following-

1. Data Modeling using the Entity-Relationship (ER) Model- Using High-Level Conceptual Data Models for Database Design, Entity Types, Entity Sets, Attributes, and Keys, Relationship Types, Relationship Sets, Roles, and Structural Constraints, Weak Entity Types, ER Diagrams, Naming Conventions, and Design Issues.
2. Relational Database Design by ER and EER-to-Relational Mapping- Relational Database Design Using ER-to-Relational Mapping, Mapping EER Model Constructs to Relations.
3. Basic SQL- SQL Data Definition and Data Types, Specifying Constraints, Basic Retrieval Queries, INSERT, DELETE, and UPDATE Statements, Additional Features, More Complex SQL Retrieval Queries, Specifying Constraints as Assertions and Actions as Triggers, Views (Virtual Tables), Schema Change Statements.
4. Introduction to SQL Programming Techniques - Database Programming Techniques and Issues, Embedded SQL, Dynamic SQL, and SQLJ; Database Programming with Function Calls, Database Stored Procedures.
5. Overview of Web Database Programming.

Text Books:

1. *Fundamentals of Database Systems,* Elmasri and Navathe, 7th Edition, 2017, Pearson Education.
2. *Database System Concepts,* Henry F Korth and Abraham Silbershatz, 6th Edition, 2013, McGraw Hill.

Reference Books:

1. Atul Kahate, *Introduction to Database Management System*, 1st Edition, 2004, Pearson Education.
2. C. J. Date, *An Introduction to Database Systems*, 8th Edition, 2012, Pearson Education.
3. Raghu Ramakrishnan and Johannes Gehrke, *Database Management Systems*, 3rd Edition, 2014, McGraw Hill Education.
4. G K Gupta, *Database Management Systems*, 1st Edition, 2011, McGraw Hill Education.

Facilitating the Achievement of Course Learning Outcomes

Learning Outcomes	Teaching and Learning Activity	Assessment Tasks

*Learn Data Modeling through various diagrams •Learn and Practice different Structured Query Language. •Gain knowledge on query processing and optimization *Able to create small DBMS systems	i) Familiarization with essential tools , language and software has been inducted ii) Related concept are discussed before each practical iii) student are encourage to take up real problem and solve in group iv) Case study and its practical implementation is a part of the curriculum v) Students to be encouraged to take up software development in related fields	(a) Participation in Practical Assignments (b)Continuous Evaluation(30Marks) (i)15 marks on □ Lab Assignments □ viva-voce (ii) Skill Test crries:10 marks (iii) Class attendance -5 marks (c) End-term examinations: 70 marks.

Paper VIII/Subject Name: Ethics and Business Communication		**Subject Code: CEN982A501**
L-T-P-C – 1-0-0-1	**Credit Units: 01**	**Scheme of Evaluation: TP**

Objective:

The objectives of the course are:

- To introduce students to truthfulness, accuracy, honesty, and reason as essential to the integrity of communication.
- Ethics will enable a student to use specific capacities and skills to make moral decisions.

- Students should develop, demonstrate and act out their ethical abilities.

Prerequisites: Previous knowledge of communication

Detailed Syllabus:

Modules	Topics	Course Contents	Hours
I	**Why ethics in organizational communication?**	Characteristics of Ethical Communication, ethical code in communication, Ethical Perspectives)values, religious, economic, legal, utilitarian, humanistic, dialogic, situational, universalistic), Ethical issues involved in Business communication (honesty, respect, sensitivity to cultural differences)	**3**
II	**What does a professional communicator do?**	Practices and behaviours of a professional communicator, ethical dilemmas (secrecy, whistle blowing, leaks, rumours and gossips, Lying, ambiguity), Strategic approaches to corporate ethics, Ethical communication on the intern	**3**
III	**Areas of Concern**	Ethical communication on the internet, freedom of expression, ethical implication of privacy of electronic mail, Ethics in advertising, Advertising and social responsibility, plagiarism, Social Media and responsible handling.	**3**
IV	**Corporate image, PR, CSR and Advertising**	Employee relations and employee communication – key tasks and communicative objectives, forms of employee involvement and tools of communication, PR and corporate mission, Advertising, PR and Publicity, Corporate social responsibility, financial communication, customer relations,	**3**
TOTAL			**12**

Text Books:

1. *Business Communication*, Raman, Meenakshi and Singh, Prakash. 2nd Edition, 2012, Oxford University Press, pp. 546-585.
2. *Lean, Ethical Business Communication*, Sundararajan, Binod and Macdonald, Linda, 2017, Oxford University Press, pp 212 – 220.

Reference Books:

1. Sengupta. Sengupta, *Business and Managerial Communication*, 2nd Edition, 2011, Vikas Publishing House Pvt Ltd, pp. 529 – 603.

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching And Learning Activity	Assessment Task
I	Understand about Ethical Perspectives, Business communication etc.	Written tests, assignments, quizzes, presentations as announced by the	n) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 markson

II	Learn about corporate ethics, Practices and behaviours of a professional communicator.	instructor in the class.	• Assignments • classtests. • viva-voce or presentation (xx) Mid-term examinations :10 marks (xxi) Class attendance -5 marks (c) End-term examinations.-70 marks.
III	Understand about advertising and social responsibility, ethical communication on the internet etc.		
IV	Learn about PR and corporate mission, Advertising, Publicity, Corporate social responsibility		

SYLLABUS (6th SEMESTER)

Paper I/Subject Name:Artificial Intelligence		**Subject Code: INT052C601**
L-T-P-C – 4-0-0-4	**Credit Units: 04**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are:

- To make the students learn the concepts of Artificial Intelligence.
- To teach the methods of solving problems using Artificial Intelligence.
- To introduce the concepts of Expert Systems and machine learning.

Prerequisites: Concepts of Mathematics, Programming Languages, Data Analytic Techniques
Detailed Syllabus

Modules	Topics	Course Contents	Hours
I	**Introduction and Production Systems**	Introduction to AI-Problem formulation, Problem Definition - Production systems, Control strategies, Search strategies. Problem characteristics, Production system characteristics - Specialized production system- Problem solving methods - Problem graphs, Matching, Indexing and Heuristic functions -Hill Climbing-Depth first and Breath first, Constraints satisfaction - Related algorithms, Measure of performance and analysis of search algorithms.	**9**
II	**Knowledge Representation and Inference**	Game playing - Knowledge representation, Knowledge representation using Predicate logic, Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic-Structured representation of knowledge Knowledge representation -Production based system, Frame based system. Inference - Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning - Certainty factors, Bayesian Theory-Bayesian Network-Dempster - Shafer theory.	**9**
III	**Planning and Machine Learning**	Basic plan generation systems - Strips -Advanced plan generation systems – K strips -Strategic explanations -Why, Why not and how explanations. Learning- Machine learning, adaptive Learning	**13**
IV	**Expert Systems**	Expert systems - Architecture of expert systems, Roles of expert systems - Knowledge Acquisition – Meta knowledge, Heuristics. Typical expert systems - MYCIN, DART, XOON, Expert systems shells.	**5**
		TOTAL	**36**

Text Book:

1. *AI: A Modern Approach,* Stuart Russel and Peter Norvig, 2nd Edition, 2007, Pearson Education
2. *Artificial Intelligence,* Kevin Night, Elaine Rich, Nair B., 3rd Edition, 2008, Mc Graw Hill
3. *Introduction to AI and ES*, Dan W. Patterson, 3rd Edition, 2007, Pearson Education.

Reference Books:

1. Peter Jackson, *Introduction to Expert Systems*, 3rd Edition, 2007, Pearson Education
2. Deepak Khemani, *Artificial Intelligence*, 2013, Tata Mc Graw Hill Education.

Facilitating the Achievement of Course Learning Outcomes

Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
On completion of this course the students will be expected to: ● Identify problems that are amenable to solution by AI methods. ● Identify appropriate AI methods to solve a given	● Each topic to be explained with examples. ● Students to be motivated to discover the relevant concepts	● Participation in class discussions ● Continuous Evaluation: 30 Marks ● 15 marks on ○ Assignments ○ class tests

problem. ● Formalise a given problem in the language/framework of different AI methods. ● Implement basic AI algorithms. ● Design and carry out an empirical evaluation of different algorithms on a problem formalisation, and state the conclusions that the evaluation supports.	to take part in discussions and ask questions. ● Students to be given homework/assignments to make their concept clear. ● Discuss and solve the theoretical problems in the class	○ viva-voce or presentation ● Mid-term examinations :10 marks ● Class attendance: 5 marks ● End-term examinations: 70 marks

Paper II/Subject Name:System Analysis and Design		**Subject Code: INT052C602**
L-T-P-C – 4-0-0-4	**Credit Units: 04**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are:

- To explain how to determine specific needs of system.
- To discuss approaches and tasks of system.
- To teach evaluation tools and techniques.
- To explain the use of appropriate methods and techniques to design software.

Prerequisites: Fundamentals of Computer Science and Management Information System

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Introduction to System**	Systems Development Approaches Function, Oriented, Object Oriented Development Process, Methodologies, Tools ,Modelling Methods, Processing Types and Systems, Batch Processing, Real Time Processing, Management Process, Management, System Analysis, Programmers, Computer Operators,	**12**

		End Users, System Structure, People Processes and Data, Databases, Personal Systems, Centralized Systems, Data Warehousing, Data Mining, Distributed Systems, Evolution of Distributed Processing, Client Server Systems, Agent Oriented Systems.	
II	**System Development**	System Development Life Cycle, Linear or Waterfall Cycle, Linear Cycle Phase, Problem Definition, System Specification, System Design, System Development, Testing, Maintenance Problem with Linear Life Cycle, Iterative Cycles, Spiral Model Requirements Analysis, Importance of Communication, Identifying Requirements, Data and Fact Gathering Techniques, Feasibility Studies, Introduction to Prototyping, Rapid Prototyping Tools, Benefits of Prototyping	**12**
III	**Data & Process modelling**	Interface Design Tools, User Interface Evaluations, Introduction to Process Modelling, Introduction to Data Modelling. System Design Techniques, Document Flow Diagrams, Documents, Physical Movement of Documents, Usefulness of Document Flow Diagram, Data Flow Diagrams, DFD Notation, Context Diagram DFD Levelling, Process Descriptions Structured English, Decision Trees and Decision Tables, Entity Relationship Diagrams, Entities, Attributes, Relationship, Degree, Optionality, Resolving Many to Many Relationship, Exclusive Relationship, Structure Charts, Modules, Parameter Passing, Execution Sequence, Structured Design, Conversion from Data Flow Diagrams to Structure Charts.	**12**
IV	**System Maintenance**	System Implementation, Maintenance and Documentation, Testing, Evaluation, Maintenance Activities, Documentation, Document Configuration Maintaining a Configuration.	**12**
Total			**48**

Text Books:

1. *System Analysis and Design,* Elias m. Awad, 2nd Edition, 2010, Galgotia Publications Pvt. Ltd.
2. *System Analysis & design,* Perry Edwards, 2nd Edition, Tata McGraw-Hill Education.

Reference Books:

1. S. Skidmore, *Introduction to system Analysis*, 2nd Edition, 2000, Macmillan Education.
2. S. Skidmore, *system Design*, 2nd Edition, 2000, Macmillan Education.

Facilitating the Achievement of Course Learning Outcomes

Module	**Course Learning Outcomes**	**Teaching And Learning Activity**	**Assessment Task**
I	Understand about Systems Development Approaches ,Object Oriented Development Process, Data Warehousing, Data Mining, Distributed Systems.	Written tests, assignments, quizzes, presentations as announced by the instructor in the class.	(a) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 markson • Assignments • classtests. • viva-voce or presentation (xxii) Mid-term examinations :10 marks (xxiii) Class attendance -5 marks
II	Learn about System Development Life Cycle , Testing, Maintenance Identifying Requirements.		
III	Understand about Interface Design Tools, Document Flow Diagrams, Decision Trees ,Entity Relationship Diagrams.		

IV	Learn about System Implementation, Maintenance and Documentation, Testing, etc.		(c) End-term examinations.-70 marks.

Paper III/ Subject Name: Advanced Computer Networks		**Subject Code: INT054C603**
L-T-P-C – 4-0-0-4	**Credit Units: 04**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are:

- To give students an overview of Computer Networks and introduction to the Physical Layer.
- To provide detailed concepts on the Data-Link Layer
- To explain detailed concepts on the Network Layer.
- To give students the understanding of the Transport Layer and the Physical Layer.

Prerequisites: Basics of trees and graphs

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Overview of Computer Networks and the Physical**	Introduction- Data Communications, Network Criteria and Structures, Network Types. Network Models- Protocol Layering, TCP/IP Protocol Suite, the OSI Model. Introduction to Physical Layer- Data and Signals, Periodic Analog Signals, Digital Signals, Transmission Impairment, Data Rate Limits, Performance. Digital Transmission- Digital-To-Digital Conversion, Analog-To-Digital	**12**

	Layer	Conversion, Transmission Modes. Analog Transmission- Digital-To-Analog Conversion, Analog-To-Analog Conversion. Bandwidth Utilization: Multiplexing And Spectrum Spreading- Multiplexing, Spread Spectrum. Transmission Media- Guided Media, Unguided Media. Switching- Introduction, Circuit-Switching, Packet Switching.	
II	**The Data-Link Layer**	The Data-Link Layer- Introduction, Link-Layer Addressing. Error Detection and Correction- Basic concepts, Block Coding, Cyclic Codes, Checksum, Forward Error Correction. Data Link Control (DLC)- DLC Services, Data-Link Layer Protocols. Media Access Control (MAC)- Random Access, Controlled Access, Channelization. Wired LANs: Ethernet- Ethernet Protocol, Standard Ethernet, Fast Ethernet, Gigabit Ethernet. Wireless LANs- Introduction, IEEE 802.11 Project, Bluetooth, WiMAX. Connecting Devices and Virtual LANs- Connecting Devices, Virtual Lans.	**12**
III	**The Network Layer**	Introduction to Network Layer- Network-Layer Services, Packet Switching, Performance, IPv4 Addresses, Forwarding of IP Packets. Network-Layer Protocols- INTERNET PROTOCOL (IP), ICMPv4, MOBILE IP. Unicast Routing- Basic concepts, Routing Algorithms, Unicast Routing Protocols. Multicast Routing- Unicasting versus Multicasting versus Broadcasting, Multicasting Basics, Intradomain Multicast Protocols, Interdomain Multicast Protocols. Next Generation IP- IPv6 Addressing, The IPv6 Protocol, The ICMPv6 Protocol, Transition From IPv4 to IPv6.	**12**
IV	**The Transport Layer and The Physical Layer**	The Transport Layer- Introduction, Transport-Layer Protocols, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP. The Application Layer- Introduction, Client-Server Programming. Standard Client-Server Protocols- HTTP, Electronic Mail, TELNET, SSH, DNS.	**12**
		Total	**48**

Text Books:

1. *Data Communications and Networking,* Forouzan, 4th Edition, 2017, McGraw Hill Education.
2. *Computer Networks*, Andrew. S. Tanenbaum and David J. Wetherall, 5th Edition, 2013, Pearson Education India.
3. *Computer Networking: A Top - Down Approach,* James F. Kurose, 6th Edition, 2017, Pearson Education.

Reference Books:

1. Sanjay Sharma, *Computer Networks*, 1st Edition, 2013, S. K. Kataria & Sons.
2. Forouzan, *Computer Networks: A Top - Down Approach*, 1st Edition, 2017, McGraw Hill Education.
3. Narasimha Karumanchi, *Elements of Computer Networking: An Integrated Approach*, 1st Edition, 2017, Careermonk Publications.
4. Peterson, *Computer Networks - A System Approach*, 5th Edition, 2011, Elsevie

Facilitating the Achievement of Course Learning Outcomes

Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
Independently understand basic computer network technology and identify the different types of network topologies and protocols. • Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer. • Identify the different types of network devices and their functions within a network • Understand and building the skills of subnetting and routing mechanisms. • Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.	i) Each topic to be expounded with adequate examples. ii) Class discussions and question- answer rounds are encouraged iii) theoretical problems solving is part of the class to grasp the underlying concepts iv) Students have to go through case studies for real time experience v) Students to be encouraged to give short presentations.	(a) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on Assignments Class tests. viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations: 70 marks.

Paper IV/Subject Name: Multimedia Theory and Applications		**Subject Code: INT054C604**
L-T-P-C – 4-0-0-4	**Credit Units: 04**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are:

- To explain technical aspect of Multimedia Systems.
- To teach the standards available for different audio, video and text applications.
- To make the students understand various networking aspects used for multimedia applications.

Prerequisites: None

Detailed Syllabus:

Modules	Topics	Course content	Hours
I	**Introduction To Multimedia Systems**	Define Multimedia Signal, Elements Of Multimedia Communication Systems, Challenges Involved With Multimedia Communication, Types Of Multimedia (Image, Text, Audio, and Video).	**12**
II	**Image and Text Compression Techniques**	Fundamentals of Image, Redundancy In Image, Lossless And Lossy Image Compression Techniques, Measurements Quality of Reconstructed Image (MSE, SNR, PSNR), Huffman Coding, GIF,TIFF, JPEG. Recent advancements in Image Compression. Compression Principles, Entropy And Source Encoding, Static Huffman Coding, Dynamic Huffman Coding, Arithmetic Coding, LZW Coding.	**12**
III	**Audio and Video Compression**	Audio Compression, PCM, DPCM, ADPCM, Adaptive Predictive Coding, Linear Predictive Coding, Code-Excited Coding, Perceptual Coding, Mpeg Audio Coder, Digital Video Coding Fundamentals, Video Compression Principles, Video Compression Standards.	**12**
IV	**Multimedia Networking and Applications**	Networking Systems- Multimedia communication Systems; Database Systems. Multimedia Architecture- Multimedia Documents, Hypertext and MPEG. User Interfaces- Synchronization, Abstractions For Programming; Multimedia Application Development. Virtual Reality- Applications, Future Directions.	**12**
Total			**48**

Text Books:

1. *Multimedia Systems Design,* Prabhat K. Andleigh, Kiran Thakrar, 1st Edition, 2015, Pearson India.
2. *Multimedia Communications: Application, Network, Protocols and Standards*, Fred Halsall, 1st Edition, 2002, Pearson Education.
3. *Multimedia Computing Communications & Applications*, 1st Edition, 2002, Ralf Steinmetz and Klara Nahrstedt, Pearson Education.

Reference Books:

1. Parekh Ranjan, *Principles of Multimedia,* 2nd Edition, 2017,Tata McGraw-Hill.
2. Steinmetz, *Multimedia: Computing Communications & Applications*, 1st Edition, 2002, Pearson Education.

Facilitating the Achievement of Course Learning Outcomes

Learning Outcomes	**Teaching and Learning Activity**	**Assessment Tasks**
• Developed understanding of technical aspect of Multimedia Systems. • Understand various file formats for audio, video and text media. • Apply various networking protocols for multimedia applications. • To evaluate multimedia application for its optimum performance	i) Each topic to be expounded with adequate examples. ii) Class discussions and question- answer rounds are encouraged iii) theoretical problems solving is part of the class to grasp the underlying concepts iv) Students have to go through case studies for real time experience v) Students to be encouraged to give short presentations.	(a) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on □ Assignments □ Class tests. □ viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations: 70 marks.

Paper V/Subject Name:System Analysis and Design Lab		Subject Code: INT052C612
L-T-P-C – 0-0-4-4	Credit Units: 02	Scheme of Evaluation: P

Objective:

The objectives of the course are:

- To explain how to determine specific needs of system.
- To discuss approaches and tasks of system.
- To teach evaluation tools and techniques.
- To explain the use of appropriate methods and techniques to design software.

Prerequisites: Fundamentals of Computer Science and Management Information System

Detailed Syllabus:

Minimum 20 Laboratory experiments based on the following-

1. Choose a hypothetical system of significant complexity and write an SRS for the same.
2. Draw one or more Use Case diagrams for capturing and representing requirements of the system.
3. Draw Use case diagrams that include template showing description and steps of the Use Case for various scenarios.
4. Draw basic class diagrams to identify and describe key concepts like classes, types in your system and their relationships.
5. Draw sequence diagrams OR communication diagrams with advanced notation for your system to show objects and their message exchanges.
6. Draw activity diagrams to display either business flows or like flow charts.
7. Draw component diagrams assuming that you will build your system using existing components along with a few new ones.
8. Draw deployment diagrams to model the runtime architecture of your system

Text Books:

1. *System Analysis and Design,* Elias m. Awad, 2nd Edition, 2010, Galgotia Publications Pvt. Ltd.
2. *System Analysis & design,* Perry Edwards, 2nd Edition, Tata McGraw-Hill Education.

Reference Books:

1. S. Skidmore, *Introduction to system Analysis*, 2nd Edition, 2000, Macmillan Education.
2. S. Skidmore, *System Design*, 2nd Edition, 2000, Macmillan Education.

Facilitating the Achievement of Course Learning Outcomes

Course Learning Outcomes	Teaching And Learning Activity	Assessment Task
i) Write an SRS ii) Draw Use case diagrams iii)Draw class diagrams, activity diagrams etc iv)Draw deployment	Written tests, assignments, quizzes, presentations as announced by the instructor in the class.	)Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 markson • Assignments • classtests.

diagrams		• viva-voce or presentation xxxiv) Mid-term examinations :10 marks xxxv) Class attendance -5 marks (c) End-term examinations.-70 marks.

Paper VI/Subject Name: Advanced Computer Networks Lab		**Subject Code: INT054C613**
L-T-P-C – 0-0-4-2	**Credit Units: 02**	**Scheme of Evaluation: P**

Objective:

The objectives of the course are:

- To give students practical experience on the use of various devices as well as simulation tools for Have practical experience on the use of various devices as well as simulation tools for Computer Networking.
- To provide a practical experience on the implementation on various protocols of Computer Networks.
- To teach the analysis of the performance of the protocols in different layers.
- To give a practical experience on the analysis of various routing algorithms.

Prerequisites: None

Detailed Syllabus:

Minimum 10 Laboratory experiments based on the following-

1. Installation of Operating System, Installation of Utility Software and Applications.
2. Study of Local Area Network (LAN) with emphasis to the following-
    1. Study of different network cables and devices.
    2. Study of college LAN with references to network IP and design a LAN for it.
    3. Study of basic network command and network configuration command.
    4. Study of LAN transmission media's, topologies, interconnection devices & LAN standards.
    5. Implementation of Subnetting.
3. Token bus and token ring protocol to create scenario and study the performance of token bus and token ring protocols through simulation.
4. Case study of client/server scenario. Observing the difference between UDP and TCP servers. Study of Socket Programming and Client – Server model.
5. To observe the working of TCP three-way hand-shaking procedure. Locating different packets like, SYN, SYN-ACK and ACK. Comparing different fields of these packets.
6. Write a program for Hamming Code generation for error detection and correction.
7. Using TCP/IP sockets, write a client-server program to make client sending the file name and the server to send back the contents of the requested file if present.

8. Implementation of Stop and Wait Protocol and Sliding Window Protocol.
9. Write a code simulating ARP /RARP protocols.
10. Write a code simulating PING and TRACEROUTE commands.
11. Create a socket for HTTP for web page upload and download.
12. Write a program to implement RPC (Remote Procedure Call).
13. Applications using TCP Sockets like Echo client & echo server, Chat etc.
14. File Transfer Applications using TCP and UDP Sockets like DNS, SNMP, File Transfer.
15. Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS.
16. Perform a case study about the different routing algorithms to select the network path with its optimum and economical during data transfer, like Link State routing, Flooding, Distance vector, etc.

Text Books:

1. *Data Communications and Networking,* Forouzan, 4th Edition, 2017, McGraw Hill Education.
2. *Computer Networks*, Andrew. S. Tanenbaum and David J. Wetherall, 5th Edition, 2013, Pearson Education India.
3. *Computer Networking: A Top - Down Approach,* James F. Kurose, 6th Edition, 2017, Pearson Education.

Reference Books:

1. Sanjay Sharma, *Computer Networks*, 1st Edition, 2013, S. K. Kataria & Sons.
2. Forouzan, *Computer Networks: A Top - Down Approach*, 1st Edition, 2017, McGraw Hill Education.
3. Narasimha Karumanchi, *Elements of Computer Networking: An Integrated Approach*, 1st Edition, 2017, Careermonk Publications.
4. Peterson, *Computer Networks - A System Approach*, 5th Edition, 2011, Elsevier.

Facilitating the Achievement of Course Learning Outcomes

Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
•Know about different Network components. •Learn about client-server programming •Learn and differentiate between TCP and UDP servers •Learn about network simulators.	i) Each topic to be expounded with adequate examples. ii) Class discussions and question- answer rounds are encouraged iii) theoretical problems solving is part of the class to grasp the underlying concepts iv) Students have to go through case studies for real time experience v) Students to be encouraged to give short presentations.	(a) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on □ Assignments □ Class tests. □ viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations: 70 marks.

Paper IX/Subject Name: Effective Workplace Communication Subject Code: CEN982A601

L-T-P-C – 1-0-0-1 **Credit Units: 01** **Scheme of Evaluation: TP**

Objective:

The objectives of the course are:

- To introduce students to areas of concern in the workplace environment like culture, business etiquettes, decision making, and workplace interpersonal relationships

Prerequisites: Basic knowledge of interpersonal communication and organizational communication paradigms.

Detailed Syllabus:

Modules	Topics	Course Contents	Hours
I	**Communicating Across Cultures in a Diverse Work Environment**	What is Culture, Workplace culture, Communicating across different cultures, Culture and writing skills, Culture and non-verbal communication, Managing Global Teams. Cross cultural communication (view of authority – Egalitarian versus Hierarchy and status; view of society – individualist or collectivist society teamwork versus individualism; view of time – linear and flexible punctuality, technology; cultural contexts, international communication, high and low context culture, intercultural communication and the workplace, cultural conflicts, resolving conflicts.	**3**
II	**Business Etiquette**	What is etiquette, Constituents of etiquette (First Impression, Dressing and Grooming etiquette, Conduct at the workplace, Body Language, Introducing yourself and others, Business Cards, Dining and Gifts, Meeting Customers and Clients, Travelling, Gender issues, Small talks etiquette, General business meeting etiquettes, Offline Networking etiquette) Business Etiquette and modern technology (emails, Instant Messaging, Text messages and Mobile Phones, Social Networking sites, , Using Software and Hardware, Audio/Videoconferencing)	**3**
III	**Managing Relationship at Work**	Peer-to-peer relationship, peer-to-superior relationship, peer-to subordinate relationship, Communicating Effectively within your team, Gateways to effective interpersonal communication, conflicts in a team. Theories of Interpersonal and Organizational Communication. Classical Rhetoric, Contagion Theory, Enactment theory, Groupthink, Network theory, Media richness and media naturalness theory, Reduced social cues approach, Sense making, Uncertainty reduction theory.	**3**
IV	**Corporate Communication**	Organizational Decision Making tools – Brainstorming, Nominal Group Technique, Delphi Technique Why corporate communication, Focus areas of Corporate communication (Internal – employees, departments; External – reputation, corporate social responsible, government, financial communication, media, crisis communication)	**3**
TOTAL			**36**

Text Books:

1. *Business Communication: Essential Strategies for Twenty-first Century Managers,* Verma, Shalini, 2nd Edition, Vikas Publishing House Pvt. Ltd, pp. 30-47, 100-116, 140-147, 155-159, 415-443.

Reference Books:

1. Mukherjee, Hory Sankar,*Business Communication: Connecting At Work*, 1st Edition, 2013, Oxford University Press, pp. 530 – 543, 501-528

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching And Learning Activity	Assessment Task
I	Understand about Workplace culture, Cross cultural communication international communication.	Written tests, assignments, quizzes, presentations as announced by the instructor in the class.	)) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 markson • Assignments • classtests. • viva-voce or presentation xxxvi) Mid-term examinations :10 marks xxxvii) Class attendance -5 marks (c) End-term examinations.-70 marks.
II	Learn about Dressing and Grooming etiquette, Gender issues, Social Networking sites.		
III	Understand about Peer-to-peer relationship, Interpersonal and Organizational Communication. Sense making, Uncertainty reduction theory.		
IV	Learn about organizational Decision Making ,Corporate communication etc.		

SYLLABUS (7th SEMESTER)

Paper I/Subject Name:Introduction to Machine Learning		**Subject Code: INT054C701**
L-T-P-C – 4-0-0-4	**Credit Units: 04**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are:

- To build a foundational understanding of machine learning models.

- To demonstrate how the models can solve complex problems in a variety of industries.
- To teach how to perform supervised and reinforcement learning, with images and temporal sequences.

Prerequisites: Basic programming skills, algorithm design, basics of probability and statistics

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Introduction**	Introduction to Machine Learning, learning task- illustration, Approaches to Machine Learning, Machine Learning algorithms- Theory, Experiment in biology and Psychology. Introduction, Concept Learning Task- Notation, Concept Learning Search, Version spaces, Candidate Elimination Algorithm, Inductive Bias, Biased hypothesis Space, Unbiased Learner, Bias-free Learning, Active queries, and Mistake bound/PAC model – basic results. Overview of issues regarding data sources, success criteria	**9**
II	**Decision Tree and Neural Network**	**Decision Tree Learning:** Decision Tree Representation, Basic decision Tree Learning, Inductive bias in Decision tree Learning, Issues in Decision Tree Learning, Minimum Description Length Principle, Occam's razor, Learning with active queries **Neural Network Learning:** Neural Network Representation, Problems for Neural Network Learning, Perceptions and gradient descent, Multi-Layer Network and Back propagation Algorithm, Illustrative Example of Back Propagation Algorithm- Face Recognition, Advanced Topics in ANN.	**9**
III	**Bayesian Approaches**	Basics of Bayes Theorem and Concept Learning, Expectation Maximization, Minimum Description Length Principle, Navie Bayes Classifier, Bayesian Belief Networks, EM Algorithm, K-Means Algorithm, Hidden Markov Models Instance-Based Techniques; Lazy vs. eager generalization, k nearest neighbour, Locally Weight Representation, Case-based Reasoning	**9**
IV	**Analytical Learning & Genetic Algorithm**	Inductive and Analytical Learning problems, Learning with perfect Domain Theory, Explanation Based Learning, Inductive Bias in EBL, Search Control Knowledge with EBL, Inductive- Analytical Approaches to Learning, Using prior Knowledge for Initialize the Hypothesis, and Altering Search objective, FOCL Algorithm. **Genetic Algorithm**: Representation of Hypothesis as GA,, Genetic Operators, Fitness function and Selection, Hypothesis Space search, Genetic Programming, Models of Evolution and Learning, Parallelizing GA, Different search methods for induction	**9**
		Total	**36**

Text Books:

1. *Machine Learning.* Tom Mitchell. 1st Edition, 1997, McGraw- Hill.
2. *Introduction to Machine Learning,* Ethem Alpaydin, 2nd Edition, 2010, MIT Press

Reference Books:

1. Richard 0. Duda, Peter E. Hart and David G. Stork, *Pattern Classification,*2001, John Wiley & Sons Inc.
2. Chris Bishop, *Neural Networks for Pattern Recognition*, 1995, Oxford University Press

Facilitating the Achievement of Course Learning Outcomes

Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
• Recognize the characteristics of machine learning that make it useful to real-world problems. • Understand the basic underlying concepts for supervised discriminative and generative learning. • Understand the concepts of cross-validation and regularization; be able to use them for estimation of algorithm parameters. • Characterize machine learning algorithms as supervised, semi-supervised, and unsupervised. • Effectively use machine learning toolboxes. •	i) Each topic to be expounded with adequate examples. ii) Class discussions and question- answer rounds are encouraged iii) theoretical problems solving is part of the class to grasp the underlying concepts iv) Students have to go through case studies for real time experience v) Students to be encouraged to give short presentations.	(a) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on Assignments Class tests. viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations: 70 marks.

Paper II/Subject Name: Compiler Design		**Subject Code: INT054C702**
L-T-P-C – 4-0-0-4	**Credit Units: 04**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are:

- To give students an exposure to the basic concepts of Compiler Design.
- To explain the concepts of syntax analysis.
- To teach in detail practical concepts on various kinds of parsing.
- To provide hands-on concepts on machine code generation and optimization.

Prerequisites: Concepts of Theory of Computation

Detailed Syllabus:

Modules	Topics	Course content	Hours
I	**Introduction Compilation and**	The structure of a compiler and applications of compiler technology; Lexical analysis - The role of a lexical analyzer,	**8**

	Syntax Analysis	specification of tokens, recognition of tokens, hand-written lexical analyzers, LEX, examples of LEX programs. Role of a parser, use of context-free grammars (CFG) in the specification of the syntax of programming languages, techniques for writing grammars for programming languages (removal left recursion, etc.), non- context-free constructs in programming languages, parse trees and ambiguity, examples of programming language grammars.	
II	**Parsing and Syntax Directed Definitions**	FIRST & FOLLOW sets, LL(1) conditions, predictive parsing, recursive descent parsing, error recovery. LR-parsing - Handle pruning, shift-reduce parsing, viable prefixes, valid items, LR(0) automaton, LR-parsing algorithm, SLR(1), LR(1), and LALR(1) parsing. YACC, error recovery with YACC and examples of YACC specifications. Synthesized and inherited attributes, examples of SDDs, evaluation orders for attributes of an SDD, dependency graphs. S-ttributed and L-attributed SDDs and their implementation using LR-parsers and recursive descent parsers respectively.	**11**
III	**Semantic Analysis**	Symbol tables and their data structures. Representation of "scope". Semantic analysis of expressions, assignment, and control-flow statements, declarations of variables and functions, function calls, etc., using S- and L-attributed SDDs (treatment of arrays and structures included). Semantic error recovery. Different intermediate representations –quadruples, triples, trees, flow graphs, SSA forms, and their uses. Translation of expressions (including array references with subscripts) and assignment statements. Translation of control-flow statements – it- then-else, while-do, and switch. Short-circuit code and control-flow translation of Boolean expressions. Back patching. Examples to illustrate intermediate code generation for all constructs.	**14**
IV	**Run Time Environments, Machine Code Generation and Optimization**	Stack allocation of space and activation records. Access to non-local data on the stack in the case of procedures with and without nesting of procedures. Simple machine code generation, examples of machine-independent code optimizations.	**6**
Total			**39**

Text Books:

1. *Compilers: Principles, Techniques, and Tools,* A.V. Aho, Monica Lam, Ravi Sethi, and J.D. Ullman, 2nd Edition, 2006, Addison Welsley
2. *Engineering a Compiler,* K.D. Cooper, and Linda Torczon, 2nd Edition, 2011, Morgan Kaufmann

Reference Books:

1. K.C. Louden, *Compiler Construction: Principles and Practice,* 1st Edition, Cengage Learning
2. D. Brown, J. Levine, and T. Mason, *LEX and YACC,* 2nd Edition, 2011, O"Reilly Media

Facilitating the Achievement of Course Learning Outcomes

Learning Outcomes	**Teaching and Learning Activity**	**Assessment Tasks**
•Have a practical introduction to the basic concepts of Compiler Design. •Have practical exposure to the concepts of syntax analysis. •Have detailed practical concepts on various kinds of parsing. •Have detailed hands-on	i) Each topic to be expounded with adequate examples. ii) Class discussions and question- answer rounds are encouraged iii) theoretical problems solving is part of the class to grasp the underlying concepts iv) Students have to go through	(a) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on ⍰ Assignments ⍰ Class tests. ⍰ viva-voce or presentation

concepts on machine code generation.	case studies for real time experience v) Students to be encouraged to give short presentations.	(ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations: 70 marks.

Paper III/Subject Name: Object Oriented Programming and Design		**Subject Code: INT054C703**
L-T-P-C – 4-0-0-4	**Credit Units: 04**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are:

- To make the students familiar to the basic concepts of Object-Oriented Programming using C++.
- To give students detailed concepts on Object-Oriented Design using UML.
- To explain concepts on Advanced Structural Modeling using UML.
- To give students exposure to the advanced topics in Object-Oriented Design like Behavioral and Architectural Modeling.

Prerequisites: None

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Introduction to OOP using C++**	Conventional(Procedural) Programming versus Object Oriented Programming, Advantages of OOP, Structure of a C++ Program, Functions, Recursions. Classes and Objects in C++, Access Specifiers and their scope, Data Hiding and Encapsulation, Static Members, Objects as Function Arguments, Friend Functions, Overloading Member Functions,	**12**

		Nested Class. Use of Constructors and Destructors, Characteristics of Constructors & Destructors, parameterized Constructor, Overloading Constructors , Constructors with Default Arguments, Copy Constructors, Destructors, Calling Constructors and Destructors, Dynamic Initialization using Constructors.	
II	**Advanced Concepts in OOP using C++**	Inheritance- Introduction, Reusability, Access Specifiers, Types, Virtual Base Classes, Abstract classes, Constructors and Destructors in Derived class, Pointers and Inheritance. Binding in C++, Static (Early) Binding, Dynamic(late) Binding, Virtual Functions, Abstract classes. Templates in C++: Need of Template, Class Template, Function Template. Exception Handling in C++: principles, keywords, Exception Handling Mechanism, Catching Multiple Exceptions, Controlling Uncaught Exceptions.	**12**
III	**Object Oriented Design Using UML**	Introduction to UML- importance of Modeling, principles of Modeling, object oriented Modeling, conceptual model of the UML, UML Architecture, Software Development Life Cycle. Basic Structural Modeling- Classes, Relationships, common Mechanisms, and diagrams. Class & Object Diagrams- Terms, concepts, Modeling techniques for Class & Object Diagrams.	**12**
IV	**Behavioral and Architectural Modelling**	Basic Behavioral Modelling- Interactions, Interaction diagrams, Use cases, Use case Diagrams, Activity Diagrams. Advanced Behavioral Modelling- Events and signals, state chart diagrams. Architectural Modelling - Component, Deployment, Component diagrams and Deployment diagrams.	**12**
Total			**48**

Text Books:

1. *Object Oriented Programming with C++*, Reema Thareja, 1st Edition, 2015, Oxford University Press.
2. *Object Oriented Programming with C++,* E. Balaguruswamy, 7th Edition, 2017, McGraw Hill Education.
3. *Object-Oriented Programming in C++,* Robert Lafore, 4th Edition, 2008, Sams Publishing.
4. *The Unified Modeling Language User Guide,* Grady Booch, James Rumbaugh and Ivar Jacobson, 1st Editiom, 2002, Pearson Education.

Reference Books:

1. Ray Lischner, *Exploring C++: The Programmer's Introduction to C++ (Expert's Voice in C++)*, 1st Edition, 2008, Apress.
2. Mahapatra P. B., *Programming in C++*, 1st Edition, 2008, S Chand & Company.
3. Meilir Page-Jones, *Fundamentals of Object Oriented Design in UML*, 1st Edition, 2011, Pearson Education.
4. Pascal Roques, *Modeling Software Systems Using UML2*, 1st Edition, 2002, Wiley- Dreamtech India Pvt. Ltd.
5. John W. Satzinger, Robert B Jackson and Stephen D Burd, *Object-Oriented Analysis and Design with the Unified Process*, 1st Edition, 2007, Cengage Learning.

Facilitating the Achievement of Course Learning Outcomes

Learning Outcomes	Teaching and Learning Activity	Assessment Tasks

•Learn the basic concepts of object oriented paradigm. •Understand concepts on Object-Oriented Modelling using UML diagrams.	i) Each topic to be expounded with adequate examples. ii) Class discussions and question- answer rounds are encouraged iii) theoretical problems solving is part of the class to grasp the underlying concepts iv) Students have to go through case studies for real time experience v) Students to be encouraged to give short presentations.	(a) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on • Assignments • Class tests. • viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations: 70 marks.

Paper V/Subject Name: Introduction to Machine Learning Lab		**Subject Code: INT054C711**
L-T-P-C – 0-0-4-2	**Credit Units: 02**	**Scheme of Evaluation: P**

Objective:

The objectives of the course are:

- To build a foundational understanding of machine learning models and demonstrate how the models can solve complex problems in a variety of industries.
- To teach the implementation of ML models via python
- To teach how to perform supervised and reinforcement learning, with images and temporal sequences.

Prerequisites: Basic programming skills, algorithm design, basics of probability and statistics

Detailed Syllabus:

Minimum 20 Laboratory experiments based on the following-

1. Basics of R/ python programming
2. Implement and demonstratethe FIND-Salgorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
3. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithmto output a description of the set of all hypotheses consistent with the training examples.
4. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge toclassify a new sample.

5. Build an Artificial Neural Network by implementing the Back-propagation algorithm and test the same using appropriate data sets.
6. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
7. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
8. Write a program to construct aBayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
9. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
10. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
11. Implement the non-parametric Locally Weighted Regressionalgorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Text Books:

1. *Machine Learning.* Tom Mitchell. 1st Edition, 1997, McGraw- Hill.
2. *Introduction to Machine Learning,* Ethem Alpaydin, 2nd Edition, 2010, MIT Press

Reference Books:

1. Richard 0. Duda, Peter E. Hart and David G. Stork, *Pattern Classification,*2001, John Wiley & Sons Inc.
2. Chris Bishop, *Neural Networks for Pattern Recognition*, 1995, Oxford University Press

Facilitating the Achievement of Course Learning Outcomes

Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
• To understand complexity of Machine Learning algorithms and their limitations. • To be capable of confidently applying common Machine Learning algorithms in practice and implementing their own • To be capable of performing experiments in Machine Learning using real-world data.	i) Each topic to be expounded with adequate examples. ii) Class discussions and question- answer rounds are encouraged iii) theoretical problems solving is part of the class to grasp the underlying concepts iv) Students have to go through case studies for real time experience v) Students to be encouraged to give short presentations.	(a) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on Assignments Class tests. viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations: 70 marks.

Paper V/Subject Name: Compiler Design Lab		Subject Code: INT054C712
L-T-P-C – 0-0-4-2	Credit Units: 02	Scheme of Evaluation: P

Objective:

The objectives of the course are:

- To provide a practical introduction to the basic concepts of Compiler Design.
- To explain the concepts of syntax analysis.
- To provide practical concepts on various kinds of parsing.
- To give hands-on concepts on machine code generation and optimization.

Prerequisites: Fundamentals of Theory of Computation and computer programming

Detailed Syllabus:

Minimum 20 Laboratory experiments based on the following-

1. Familiarization with LEX by writing simple specifications for tokens such as, identifiers, numbers, comments in C/C++, etc. All LEX specifications must be compiled and executed with appropriate inputs.
2. LEX specification for tokens of the small language
3. Complete the specifications in Experiment No. 2 above to make a complete lexical analyzer.
4. Familiarization with YACC by writing simple specifications for desk calculator, variable declarations in C (only numbers and array). All YACC specifications must be compiled and executed with appropriate inputs. Note that this exercise also requires LEX specifications of the tokens involved.
5. YACC specifications for the syntax of the small language.
6. Adding error recovery to Experiment No. 5 above to make a complete parser.
7. S-attributed specification of the semantics of the small language to be incorporated into YACC specifications produced in Experiment No. 6 above.
8. Adding semantic error recovery to the semantic analyzer in Experiment No. 7 above to make a complete semantic analyzer.
9. Intermediate code generation for the constructs of the small language to be incorporated into the semantic analyzer of Experiment No. 8 above.

Text Books:

1. *Compilers: Principles, Techniques, and Tools,* A.V. Aho, Monica Lam, Ravi Sethi, and J.D. Ullman, 2nd Edition, 2006, Addison Welsley
2. *Engineering a Compiler,* K.D. Cooper, and Linda Torczon, 2nd Edition, 2011, Morgan Kaufmann

Reference Books:

1. K.C. Louden, *Compiler Construction: Principles and Practice,* 1st Edition, Cengage Learning
2. D. Brown, J. Levine, and T. Mason, *LEX and YACC,* 2nd Edition, 2011, O"Reilly Media

Facilitating the Achievement of Course Learning Outcomes

Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
•Have a practical introduction to the basic concepts of Compiler Design. •Have practical exposure to the concepts of syntax analysis. •Have detailed practical concepts on various kinds of parsing. •Have detailed hands-on concepts on machine code generation.	i) Familiarization with essential tools , language and software has been inducted ii) Related concept are discussed before each practical iii) student are encourage to take up real problem and solve in group iv) Case study and its practical implementation is a part of the curriculum v) Students to be encouraged to take up software development in related fields	(a) Participation in Practical Assignments (b)Continuous Evaluation(30Marks) (i)15 marks on • Lab Assignments • viva-voce (ii) Skill Test crries:10 marks (iii) Class attendance -5 marks (c) End-term examinations: 70 marks.

Paper VI/Subject Name: Object Oriented Programming and Design Lab		Subject Code: INT054C713
L-T-P-C – 0-0-4-2	Credit Units: 02	Scheme of Evaluation: P

Objective:

The objectives of the course are:

- To give students an in-depth practical experience on various advanced concepts in OOP using C++.
- To give students detailed practical experience on Object-Oriented Design using UML.
- To give students practical exposure to the advanced topics in Object-Oriented Design like Behavioral and Architectural Modeling.

Prerequisites: None

Detailed Syllabus:

Minimum 10 Laboratory experiments based on the following-

1. Structure of a C++ Program, Functions, Recursions.
2. Classes and Objects in C++, Access Specifiers and their scope, Data Hiding and Encapsulation, Static Members, Objects as Function Arguments, Friend Functions, Overloading Member Functions, Nested Class.
3. Use of Constructors and Destructors, Characteristics of Constructors & Destructors, parameterized Constructor, Overloading Constructors, Constructors with Default Arguments, Copy Constructors, Destructors, Calling Constructors and Destructors, Dynamic Initialization using Constructors.
4. Overloading Unary Operators, Overloading Binary Operators, Overloading with Friend Function, Type Conversions.
5. Inheritance- Introduction, Reusability, Access Specifiers, Types, Virtual Base Classes, Abstract classes, Constructors and Destructors in Derived class, Pointers and Inheritance.
6. Binding in C++, Static (Early) Binding, Dynamic (late) Binding, Pointer to Base and Derived class objects, Virtual Functions, Abstract classes.
7. Templates in C++: Need of Template, Class Template, Function Template.
8. Exception Handling in C++: principles, keywords, Exception Handling Mechanism, Catching Multiple Exceptions, Exceptions in Constructor and Destructors, Controlling Uncaught Exceptions.
9. UML Modeling- principles, object oriented Modeling. Use of any software tool for UML modeling.
10. Basic Structural Modeling- Classes, Relationships, common Mechanisms, and diagrams.
11. Advanced Structural Modeling- Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages.
12. Class & Object Diagrams- Terms, concepts, Modeling techniques for Class & Object Diagrams.
13. Basic Behavioral Modeling- Interactions, Interaction diagrams, Use cases, Use case Diagrams, Activity Diagrams.

14. Advanced Behavioral Modeling- Events and signals, state machines, processes and Threads, time and space, state chart diagrams. Architectural Modeling- Component, Deployment, Component diagrams and Deployment diagrams.

Text Books:

1. *Object Oriented Programming with C++*, Reema Thareja, 1st Edition, 2015, Oxford University Press.
2. *Object Oriented Programming with C++,* E. Balaguruswamy, 7th Edition, 2017, McGraw Hill Education.
3. *Object-Oriented Programming in C++,* Robert Lafore, 4th Edition, 2008, Sams Publishing.
4. *The Unified Modeling Language User Guide,* Grady Booch, James Rumbaugh and Ivar Jacobson, 1st Editiom, 2002, Pearson Education.

Reference Books:

1. Ray Lischner, *Exploring C++: The Programmer's Introduction to C++ (Expert's Voice in C++)*, 1st Edition, 2008, Apress.
2. Mahapatra P. B., *Programming in C++*, 1st Edition, 2008, S Chand & Company.
3. Meilir Page-Jones, *Fundamentals of Object Oriented Design in UML*, 1st Edition, 2011, Pearson Education.
4. Pascal Roques, *Modeling Software Systems Using UML2*, 1st Edition, 2002, Wiley- Dreamtech India Pvt. Ltd.

Facilitating the Achievement of Course Learning Outcomes

Learning Outcomes	**Teaching and Learning Activity**	**Assessment Tasks**
•Learn programming through C++. •Learn data modelling through UML diagrams. •Be able to differentiate between procedural and object oriented programming paradigm.	i) Familiarization with essential tools , language and software has been inducted ii) Related concept are discussed before each practical iii) student are encourage to take up real problem and solve in group iv) Case study and its practical implementation is a part of the curriculum v) Students to be encouraged to take up software development in related fields	(a) Participation in Practical Assignments (b)Continuous Evaluation(30Marks) (i)15 marks on □ Lab Assignments □ viva-voce (ii) Skill Test crries:10 marks (iii) Class attendance -5 marks (c) End-term examinations: 70 marks.

Paper IX/Subject Name: Kinesics and Effective Communication		Subject Code: CEN984A701
L-T-P-C – 1-0-0-1	Credit Units: 01	Scheme of Evaluation: TP

Objective:

The objectives of the course are:

- To enhance communication skills by giving adequate exposure in Non-verbal communication, conversation skills, group discussions and other related skills.

Prerequisites: Basic awareness of tools of communication.

Detailed Syllabus:

Modules	Topics	Course content	Hours
I	**Non-verbal Communication**	Kinesic Communication, Characteristics of non-verbal communication, Classification of non-verbal communication (Ekman's classification of communicative movements, face facts, positive genres, negative genres, lateral genres, Responding to power posturing, Guidelines for developing non-verbal communication, Communication breakdown	**8**
II	**Conversations, Dialogues and Debates**	Purpose of general conversation (Tips and features of good conversation), Short conversations, Telephonic skills, Situational Dialogues and Role plays	**11**
III	**CVs, Personal Interviews and Group Discussions**	Applying for jobs, Writing a CV, The relationship between a Resume and an Application Letter, Guidelines for preparing a good CV, Guidelines for preparing a good application letter, Interviews, Group Discussion – Practical	**14**
IV	**Developing Reading Skills**	Introduction, Purpose of reading, Soft skills for reading, Reading Comprehension: types of texts, Reading Practice	**6**
Total			**39**

Text Books:

1. *Business Communication: Concepts, Cases and Applications*, Chaturvedi, P.D. and Chaturvedi, Mukesh, 2nd Edition, 2011, Dorling Kindersley (India)Pvt. Ltd, pp: 99-108, 217-230

Reference Books:

1. Kumar, Sanjay and Lata, Pushp, *Communication Skills: A Workbook,* 1st Edition, Oxford University Press, pp: 329-348.

Facilitating the Achievement of Course Learning Outcomes

Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
Have a sound knowledge of non-verbal communication and develop skills like Conversation, Group discussions and Reading skills	i) Each topic to be expounded with adequate examples. ii) Class discussions and question-answer rounds are encouraged iii) theoretical problems solving is part of the class to grasp the underlying concepts iv) Students have to go through case studies for real time experience v) Students to be encouraged to give short presentations.	(a) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on Assignments Class tests. viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations: 70 marks.

SYLLABUS (8th SEMESTER)

Paper I/Subject Name:Soft Computing		**Subject Code: INT054C801**
L-T-P-C – 4-0-0-4	**Credit Units: 04**	**Scheme of Evaluation: T**

Objectives:

The objectives of the course are:

- To make the students understand the basics of soft computing and fuzzy logic
- To give an idea of artificial neural networks and its applications
- To explain genetic algorithms with example
- Introduction to Rough set and understand different soft computing tools to solve real life problems.

Prerequisites: Basics of Digital Logic and Artificial Intelligence

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Soft Computing and Fuzzy Logic**	Introduction- Overview of Soft Computing, Difference between Soft and Hard computing, Brief descriptions of different components of soft computing including Artificial intelligence systems Neural networks, fuzzy logic, genetic algorithms. Fuzzy sets and Fuzzy logic: Introduction, Fuzzy sets versus crisp sets, operations on fuzzy sets, Extension principle, Fuzzy relations and relation equations, Fuzzy numbers, Linguistic variables, Fuzzy logic, Linguistic hedges, Applications, fuzzy controllers, fuzzy pattern recognition, fuzzy image processing, fuzzy database.	**12**
II	**Artificial Neural Network**	Artificial Neural Network: Introduction, basic models, Hebb's learning, Adaline, Perceptron, Multilayer feed forward network, Back propagation, Different issues regarding convergence of Multilayer Perceptron, Competitive learning, Self-Organizing Feature Maps, Adaptive Resonance Theory, Associative Memories, Applications.	**12**
III	**Genetic Algorithm**	Evolutionary and Stochastic techniques: Genetic Algorithm (GA), different operators of GA, analysis of selection operations, Hypothesis of building blocks, Schema theorem and convergence of Genetic Algorithm, Simulated annealing and Stochastic models, Boltzmann Machine, Applications.	**12**
IV	**Rough Set**	Rough Set: Introduction, Imprecise Categories Approximations and Rough Sets, Reduction of Knowledge, Decision Tables, and Applications.	**12**
Total			**48**

Text Books:

1. *Neural Fuzzy Systems*, Chin-Teng Lin & C. S. George Lee, Prentice Hall PTR.
2. *Fuzzy Sets and Fuzzy Logic,* Klir & Yuan, PHI, 1997.
3. *Neural Networks,* S. Haykin, Pearson Education, 2ed, 2001.
4. *Genetic Algorithms in Search and Optimization, and Machine Learning*, D. E. Goldberg, Addison-Wesley, 1989.

Reference Books:

1. Jang, Sun, & Mizutani, Neuro-Fuzzy and Soft Computing, PHI.
2. V. Kecman, Learning and Soft Computing, MIT Press, 2001.
3. Z. Pawlak, Rough Sets, Kluwer Academic Publisher, 1991.

Facilitating the Achievement of Course Learning Outcomes

Learning Outcomes	**Teaching and Learning Activity**	**Assessment Tasks**
• Discuss the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience • Relate with neural networks that can learn from available examples and generalize to form appropriate rules for inference systems • Describe with genetic algorithms and other random search procedures useful while seeking global optimum in self-learning situations • Develop some familiarity with current research problems and research methods in Soft Computing Techniques.	i) Each topic to be expounded with adequate examples. ii) Class discussions and question- answer rounds are encouraged iii) theoretical problems solving is part of the class to grasp the underlying concepts iv) Students have to go through case studies for real time experience v) Students to be encouraged to give short presentations.	(a) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on □ Assignments □ Class tests. □ viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations: 70 marks.

Paper II/Subject Name: Cryptography and Network Security		Subject Code: INT054C802
L-T-P-C – 4-0-0-4	Credit Units: 04	Scheme of Evaluation: T

Objective:

The objectives of the course are:

- To provide basic concepts of Cryptography.
- To provide the basic difference between the symmetric and asymmetric encryption techniques.
- To explain various threats in the network.

Prerequisites: Concepts of Networking

Detailed Syllabus:

Modules	Topics	Course content	Hours
I	**Introduction**	Need for Security, Security Approaches, Principles of Security, Types of Attacks, Brute Force Attack, Encryption, Decryption, Crptosystem, Cryptographic Techniques: Substitution Ciphers, Transposition Ciphers, Product Ciphers, Stegenography, Block Cipher, Stream Cipher.	**12**
II	**Symmetric and Asymmetric Key Cryptography**	Overview, Algorithm Modes and Types, Data Encryption Standard: Simplified DES, The Strength of DES, Differential and Linear Cryptanalysis. Triple DES, Blowfish. Confidentiality using Conventional Encryption: Placement of Encryption Function, Traffic Confidentiality, Key Distribution, Random Number Generation. Modular Arithmetic, Public Key Cryptography and RSA: Principles of Public Key Cryptosystems, Difference with Symmetric Key Cryptography, The RSA Algorithms, Key Management, Diffie Hellman Key Exchange.	**12**
III	**Authentication Protocols**	Message Authentication: Authentication Requirements, Authentication Functions, Message Authentication Codes, MD5 Message Digest Algorithms, Digital Signatures and Authentication Protocols: Digital Signatures, Authentication Protocols, Digital Signature Standards.	**12**
IV	**Security Protocols**	Security Applications and Protocols- Authentication Applications: Secure HTTP, HTTPS, ERT, SSH, Kerberos. Email Security: PGP, S/MIME. IP Security: Overview, IPSec architecture.	**12**
Total			**48**

Text Book:

1. *Cryptography and Network Security- Principles and Practice,* William Stallings, 6th Edition, 2013, Pearson Education.

Reference Books:

1. Behrouz A. Forouzan*, Cryptography & Network Security,* 3rd Edition, 2016, Tata McGraw Hill.

Facilitating the Achievement of Course Learning Outcomes

Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
•Grasp complete knowledge of various issues in the network. •Solve problems based on symmetric and asymmetric cryptography techniques. •Have network management capabilities.	i) Each topic to be expounded with adequate examples. ii) Class discussions and question- answer rounds are encouraged iii) theoretical problems solving is part of the class to grasp the underlying concepts iv) Students have to go through case studies for real time experience v) Students to be encouraged to give short presentations.	(a) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on □ Assignments □ Class tests. □ viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations: 70 marks.

Paper III/Subject Name: Modern Operating Systems		Subject Code: INT054C803
L-T-P-C – 4-0-0-4	Credit Units: 04	Scheme of Evaluation: T

Objective:

The objectives of the course are:

- To give students an introduction to Operating Systems and Process Management.
- To explain detailed concepts on the CPU, Deadlocks, and Memory Management.
- To teach the concepts of Storage and Input/ Output Management.
- To provide an understanding of the advanced topics like Protection, Security, Virtual machines and Distributed Systems.

Prerequisites: Fundamentals of Computer Organization and Architecture

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Operating Systems Overview**	Computer System Overview-Basic Elements, Instruction Execution, Interrupts, Memory Hierarchy, Cache Memory, Direct Memory Access, Multiprocessor and Multicore Organization. Operating system overview-objectives and functions, Evolution of Operating System.- Computer System Organization Operating System Structure and Operations-System Calls, System Programs, OS Generation and System Boot, OS Operations, Kernel Data Structures, OS Services	**12**
II	**Process Management**	Processes – Process Concept, Process Scheduling, Operations on Processes, Inter-process Communication; CPU Scheduling – Scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real time scheduling; Threads-Overview, Multithreading models, Threading issues; Process Synchronization – The critical-section problem, Synchronization hardware, Mutex locks, Semaphores, Classic problems of synchronization, Critical regions, Monitors; Deadlock – System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.	**12**
III	**Memory Management and File Systems**	Main Memory – Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation, Segmentation with paging, 32 and 64 bit architecture Examples; Virtual Memory – Background, Demand Paging, Page Replacement, Allocation, Thrashing; Allocating Kernel Memory. File-System Interface- The concept of Files, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing, Protection. File-System Implementation- File-System Structure, Directory Implementation, Allocation Methods, Free-Space Management, Disk Scheduling, Disk Management, Swap-Space Management, RAID Structure, Stable-Storage.	**12**
IV	**Case Study**	OS Security, Unix Primer, Search and sort tools, AWK tool in Unix, Unix Kernel Architecture, Shell Script in Unix, AWK tool in Unix, Make tool in UNIX, System Administration in Unix, Source Code control system in Unix, X Windows in Unix, Linux System – Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, Input-	**12**

		Output Management, File System, Inter-process Communication;	
Total			**48**

Text Books:

1. *Operating System Concepts,* Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, 7th Edition, 2006, Wiley.

Reference Books:

1. William Stallings, *Operating Systems: Internals and Design Principles*, 7th Edition, 2013, Pearson Education India.
2. Andrew S. Tanenbaum and Herbert Bos, *Modern Operating Systems*, 4th Edition, 2014, Pearson Education India
3. Achyut Godbole and Atul Kahate, *Operating Systems*, 3rd Edition, 2017, McGraw Hill Education.

Facilitating the Achievement of Course Learning Outcomes

Learning Outcomes	**Teaching and Learning Activity**	**Assessment Tasks**
•Learn the fundamentals of Operating Systems and the mechanisms of OS to handle processes and threads and their communication. •Learn the mechanisms involved in memory management in contemporary OS. •Gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols. •Know the components and management aspects of concurrency management. •Learn programmatically to implement simple OS mechanisms.	i) Each topic to be expounded with adequate examples. ii) Class discussions and question- answer rounds are encouraged iii) theoretical problems solving is part of the class to grasp the underlying concepts iv) Students have to go through case studies for real time experience v) Students to be encouraged to give short presentations.	(a) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on □ Assignments □ Class tests. □ viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations: 70 marks.

Paper IV/Subject Name: Modern Operating System Lab		Subject Code: INT054C813
L-T-P-C – 0-0-4-2	Credit Units: 02	Scheme of Evaluation: P

Objective:

The objectives of the course are:

- To give students a practical introduction to Operating System Structures, Shell Scripts, and System Calls.
- To provide a practical experience on management of Processes and Threads including synchronization.
- To explain implementation of CPU scheduling and Deadlock handling.
- To give students a practical exposure to File System management.

Prerequisites: Computer Programming Fundamentals

Detailed Syllabus:

Minimum 20 Laboratory experiments based on the following-

1. Introduction- OS Structure, OS Operations, Shell Scripts, Kernel Data Structures.
2. Operating-System Structures- OS Services, User Interface to OS, System Calls, System Programs.
3. Processes- Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication, Communication in Client–Server Systems.
4. Threads- Overview, Multithreading Models, Thread Libraries, Implicit Threading, Threading Issues.
5. Process Synchronization- Introduction, Mutex Locks, Semaphores.
6. CPU Scheduling- Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Thread Scheduling, Multiple-Processor Scheduling, Real-Time Scheduling.
7. Deadlocks- Algorithms for Deadlock Detection/Prevention/Avoidance/Recovery.
8. File-System Interface- The concept of Files, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing, Protection.

Text Books:

1. *Operating System Concepts,* Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, 7th Edition, 2006, Wiley.

Reference Books:

1. William Stallings, *Operating Systems: Internals and Design Principles*, 7th Edition, 2013, Pearson Education India.
2. Andrew S. Tanenbaum and Herbert Bos, *Modern Operating Systems*, 4th Edition, 2014, Pearson Education India
3. Achyut Godbole and Atul Kahate, *Operating Systems*, 3rd Edition, 2017, McGraw Hill Education.

Facilitating the Achievement of Course Learning Outcomes

Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I. Learn Shell Scripting. II. To perform scheduling operations on the OS. III. Learn the use of system calls. IV. Understand practically about threads, process synchronization, deadlocks, etc.	i) Familiarization with essential tools , language and software has been inducted ii) Related concept are discussed before each practical iii) student are encourage to take up real problem and solve in group iv) Case study and its practical implementation is a part of the curriculum v) Students to be encouraged to take up software development in related fields	(a) Participation in Practical Assignments (b)Continuous Evaluation(30Marks) (i)15 marks on □ Lab Assignments □ viva-voce (ii) Skill Test crries:10 marks (iii) Class attendance -5 marks (c) End-term examinations: 70 marks.

Paper VIII/Subject Name: Advance Corporate Communication		Subject Code: CEN98A801
L-T-P-C – 1-0-0-1	Credit Units: 01	Scheme of Evaluation: TP

Objective:

The objectives of the course are:

- To enhance communication skills by giving adequate exposure in Negotiation skills, organizational communication and other related skills.

Prerequisites: Basic understanding of 3rd semester syllabus.

Detailed Syllabus:

Modules	Topics	Course content	Hours
I	**Introduction to Modern Communication Media**	Introduction, Technology-based communication tools (Telephone and Voicemail, Fax, Computers, Internet, Conferencing, instant messaging, Emails, Types of instructions (Oral & written), Outsourcing Technology for Managing Communication , Latest trends in Technology, Online Etiquettes	**8**
II	**Negotiation Skills**	Nature & need of negotiation, Factors affecting negotiation, Stages in the negotiating process, Negotiating strategies	**11**
III	**Organisational Communication**	The importance of communication in management, Communication concerns of the Manager, Communication training for managers, Information to be communicated in a workplace, Etiquettes and Professionalism, Applying Ethics	**14**
IV	**Conducting Meetings and Writing Proposals and Business Plan**	Why do teams meet, arranging a meeting, preparing for a meeting, writing notices for a meeting, leading a meeting, writing the notes and minutes of a meeting, agenda Definition and Characteristics , Types of Proposals, Making a proposal, What is an RFP and How do you respond to it, Elevator Pitch, Techniques of Proposal writing Making a Itinerary, Business Plans	**6**
Total			**39**

Text Books:

1. *Business Communication: Concepts, Cases and Applications*, Chaturvedi, P.D. and Chaturvedi, Mukesh, 2nd Edition, 2011, Dorling Kindersley (India)Pvt. Ltd, pp: 99-108, 217-230

Reference Books:

1. Raman, Meenakshi and Sharma, Sangeeta, *Technical Communication: Principles and Practice*, 2nd Edition, 2011,Oxford University Press, pp579-560
2. Verma, Salini, *Business Communication: Essential Strategies for twenty-first century Managers*, 2nd Edition, 2015, Vikas Publishing House Pvt Ltd. pp 119-165.

Facilitating the Achievement of Course Learning Outcomes

Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
• Have a sound understanding of Negotiation skills, Organizational outcomes like conducting meetings writing Business Proposals and Plans.	i) Each topic to be expounded with adequate examples. ii) Class discussions and question- answer rounds are encouraged iii) theoretical problems solving is part of the class to grasp the underlying concepts iv) Students have to go through case studies for real time experience v) Students to be encouraged to give short presentations.	(a) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on □ Assignments □ Class tests. □ viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations: 70 marks.

10. Detailed Syllabus of Department Specific Electives

ELECTIVE-I

Paper IV/Subject Name:Introduction to Data Mining		Subject Code: INT052D501
L-T-P-C – 4-0-0-4	Credit Units: 04	Scheme of Evaluation: T

Objective:

The objectives of the course are:

- To give students an introduction to the basic concepts of Data and Data Mining.
- To provide an exposure to Classification and Clustering of Data Mining.
- To explain the idea of Association and correlation analysis.
- To give students an exposure to Data Mining applications.

Prerequisites: Concepts of Database Management Systems.

Detailed Syllabus:

Modules	Topics	Course content	Hours
I	**Introduction and basics of Data**	Basic concepts of data mining, including motivation and definition; different types of data repositories; data mining functionalities; concept of interesting patterns; data tasks; current trends, major issues and ethics in data mining. Types of data and data quality; Data Preprocessing: data cleaning, data integration and transformation, data reduction, discretization and concept hierarchy generation; Exploring Data: summary statistics, visualization, multidimensional data analysis.	**15**
II	**Classification and Clustering**	Binary Classification - Basic concepts, Bayes theorem and Naive Bayes classifier, Association based classification, Rule based classifiers, Nearest neighbour classifiers, Decision Trees. Concept of clustering, measures of similarity, Clustering algorithms: Partitioning methods, Hierarchical methods, Density based methods. Other methods.	**12**
III	**Association and Correlation Analysis**	Basic concepts: frequent patterns, association rules - support and confidence; Frequent item set generation - Apriori algorithm, FP-Growth algorithm; Rule generation, Applications of Association rules; Correlation analysis.	**12**
IV	**Data Mining Applications**	Text mining, Web Mining, Business Data Analytics, Overview of Big Data Analytics.	**9**
Total			**48**

Text Book:

1. *Introduction to Data Mining,Pang*-Ning Tan, Michael Steinbach and Vipin Kumar, 1st Edition, 2016, Pearson Education India.
2. *Data Mining: Concepts and Techniques,* Jiawei Han and MichelineKamber,3rd Edition, 2011, Morgan Kaufmann.

Reference Books:

1. Ian H. Witten and Eibe Frank, *Data Mining: Practical Machine Learning Tools and Techniques,* 3rd Edition, 2011, Morgan Kaufmann.
2. K. P. Soman, ShyamDiwakar and V. Ajay, *Insight into Data Mining: Theory and Practice,* New Edition, 2006, Prentice Hall India.

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Learn the basic applications, concepts, and techniques of data mining.	(i) Each topic to be expounded with examples. (ii) Students to be motivated to take part in discussions and ask questions. (iii) Students to be given homework/assignments. (iv) Discuss and solve the theoretical and practical problems in the class. (v) Students to be encouraged to give short presentations	a) Participation in class presentations b) Continuous Evaluation (30 Marks) i) 15 marks on • Assignments • class tests. • viva-voce or presentation ii) Mid-term examinations: 10 marks iii) Class attendance: 5 marks c) End-term examinations: 70 marks
II	Learn the different algorithms of Classification and Clusterings		
III	Understand the basic concepts of Association rules		
IV	Familiarize with text mining, web mining and Big data analytics		

Paper V/Subject Name:System Administration		Subject Code: INT052D502
L-T-P-C – 4-0-0-4	Credit Units: 04	Scheme of Evaluation: T

Objective:

The objectives of the course are:

- To teach the students how to install and maintain a Unix/Linux server
- To explain how to connect a Unix/Linux server to the network, and share resources on the network.
- To impart the skills and knowledge needed to be qualified system administrators

Prerequisites: Basic Knowledge of Operating Systems

Detailed Syllabus:

Modules	Topics	Course content	Hours
I	**The System Administrator and User Management**	Information resources: Books, Internet, Online documents, System administrator duties and tasks Boot and Shut Down: Run levels, Processes and daemons, Configure startup scripts. User Management: Add user, User groups, User and system security, Collapse User environment, Shell startup scripts, What not to do in startup scripts, Other dot files	**12**
II	**File Management, Networking and Backup**	File system structure: Manage disk storage, Partition, Format, Fix errors on disk, Mount Links: hard, symbolic, Permission Permission bits, Special permission, ACLs, Quotas. Networking: Network concepts overview, History, ISO/OSI., Layers description, Name to address translation, File sharing with NFS, NIS, Services and inetd. Backup strategy, Selecting the backup devices and software, Automating the backup procedure, Third party product overview, Auto-mounter Requirements and Mechanism	**12**
III	**Backup System Administration Tools**	Monitor processes: truss/strace, ps top.\, Monitor network: lsof, netstat, Working with files: strings, awk, od, du, df, find, Misc: which, whereis, dmesg, Logfiles, Operating System Installation, System installation, Linux/Solaris installation, Patches, Installing and removing packages (RPM), Download compile and install using source code, Kernel reconfig, Get the kernel source code, Add new adapter and update drivers, Kernel upgrade.	**12**
IV	**The proc File system and System Monitoring**	Map of /proc, Process entries, Hardware information, Kernel information, Kernel settings, Swap space tunings, Detecting physical memory shortage, System resource loads: CPU, I/O, Disk, Raid disks, Setting limits to processes, Measuring network load.	**12**
Total			**48**

Text Book:

1. *Essential System Administration: Tools and Techniques for Linux and Unix Administration,* Aeleen Frisch, 3rd Edition, 2013, O'Reilly Media

Reference Books:

1. Evi Nemeth, Synder, Hein, Whaley, MAckin, *UNIX and Linux System Administration Handbook,* 5th Edition, 2017, Addison Welsley

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Acquire the basic skills and knowledge needed to administer Unix/Linux machines as standalone workstations or in a network environment.	i) Basic preliminary topics to be explained with illustrations. ii) Students to be encouraged to develop their learning ability. iii) Students be given homework/assignments. iv) Discuss and solve the theoretical problems and its application in the class. v) Students to be encouraged to apply concepts of vector calculus to develop other mathematical techniques.	a) Participation in class discussions b) Continuous Evaluation (30 Marks) i) 15 marks on • Assignments • class tests. • viva-voce or presentation ii) Mid-term examinations: 10 marks iii) Class attendance: 5 marks c) End-term examinations: 70 marks
II	Learn the detailed concepts of file management and network layers		
III	Understand the basic system administration tools		
IV	Familiarize with the kernel, kernel settings and system resource loads		

ELECTIVE-II		
Paper V/Subject Name:Introduction to Cloud Computing		**Subject Code: INT052D503**
L-T-P-C – 4-0-0-4	**Credit Units: 04**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are:

- To explain current cloud computing technologies, including technologies for different cloud services.
- To teach large data processing and resource management in the cloud
- To help the students analyze the components of cloud computing showing how business agility in an organization can be created
- To make the students critically analyze case studies to derive the best practice model to apply when developing and deploying cloud based applications.

Prerequisites: Concepts of Database Management Systems, Networking

Detailed Syllabus:

Modules	Topics	Course content	Hours
I	**Introduction**	The vision of cloud computing, Characteristics and benefits, Challenges ahead, A short history Client – Server Computing, Peer-to-Peer Computing, Distributed Computing, Collaborative Computing, Cloud Computing, Functioning of Cloud Computing, Cloud Architecture, Cloud Storage, Cloud Services, Infrastructure Services, Platform Services, Software Services - Software as service modes- Massively scaled software as a service- Scale of Economy, Management and Administration.	**12**
II	**Cloud Computing Technology**	Service Level Agreements and Monitoring-Support Services- Accounting Services, Resource Management- IT Security- Performance Management- Provisioning- Service Management, Untangling Software Dependencies. Introduction-Objectives, Clients – Mobile – Thin – Thick, Security - Data Linkage - Offloading Work - Logging - Forensics - Development – Auditing, Network- Basic Public Internet- The Accelerated Internet- Optimised Internet Overlay- Site-to-Site VPN- Cloud Providers- Cloud Consumers - Pipe Size- Redundancy, Services- Identity- Integration- Mapping- Payments- Search	**12**
III	**Accessing the Cloud**	Introduction-Objectives, Platforms- Web Application Framework- Web Hosting Services- Proprietary Methods, Web Applications- API's in Cloud Computing, Browsers for Cloud Computing- Internet Explorer- Mozilla Firefox- Safari- Chrome.	**12**
IV	**Data Management and Information Storage**	Introduction- Objectives, Data Security- Data Location- Data Control- Securing data for transport, Scalability and Cloud Services- Large Scale Data Processing- Databases and Data Stores- Data Archival. Introduction- Objectives, Storage as a Service, Storage Providers- Amazon Simple Storage Service- Nirvanix- Google Bigtable Datastore- MobileMe- Live Mesh, Storage Security, Merits and Demerits of Storage.	**12**

Total			**48**

Text Book:

1. *Mastering Cloud Computing - Foundations and Applications Programming,* Rajkumar Buyya, Christian Vecchiola and S. Thamarai Selvi, 1st Edition, 2013, MK publications
2. *Enterprise Cloud Computing: Technology, Architecture, Applications*, Gautam Shroff, 1st Edition, 2010, Cambridge University Press.

Reference Books:

1. Michael J.Kavis, *Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, and IaaS),* 1st Edition, 2014, John Wiley & Sons Inc.

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Understand the fundamental principles of distributed computing	i) Each topic to be explained with illustrations. (ii) Students to be encouraged to discover the relevant concepts. (iii) Students to be given homework/assignments. (iv) Discuss and solve the theoretical and practical problems in the class. (v) Students to be encouraged to apply concepts to real world problems.	a) Participation in class discussions b) Continuous Evaluation (30 Marks) i) 15 marks on • Assignments • class tests. • viva-voce or presentation ii) Mid-term examinations: 10 marks iii) Class attendance: 5 marks c) End-term examinations: 70 marks
II	Understand the importance of virtualization in distributed computing and how this has enabled the development of Cloud Computing		
III	Understand the business models that underlie Cloud Computing		
IV	Understand concepts of IAAS, SASS, PAAS		

Paper IV/Subject Name:Social Networking		Subject Code: INT052D504
L-T-P-C – 4-0-0-4	Credit Units: 04	Scheme of Evaluation: T

Objective:

The objectives of the course are:

- To explain the concept of semantic web and related applications.
- To teach knowledge representation using ontology.
- To explain human behaviour in social web and related communities.
- To provide visualization of social networks.

Prerequisites: Basic Knowledge of Computer Programming and Graph Theory

Detailed Syllabus:

Modules	Topics	Course content	Hours
I	**Introduction**	Introduction to Semantic Web: Limitations of current Web, Development of Semantic Web, Emergence of the Social Web, Social Network analysis: Development of Social Network Analysis, Key concepts and measures in network analysis, Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities, Web-based networks, Applications of Social Network Analysis.	**12**
II	**Modelling, Aggregating and Knowledge Representation**	Ontology and their role in the Semantic Web: Ontology-based knowledge Representation, Ontology languages for the Semantic Web: Resource Description Framework, Web Ontology Language, Modelling and aggregating social network data: State-of-the-art in network data representation, Ontological representation of social individuals, Ontological representation of social relationships, Aggregating and reasoning with social network data, Advanced representations.	**12**
III	**Extraction and Mining Communities in Web Social Networks**	Monitor processes: truss/strace, ps top.\, Monitor network: lsof, netstat, Working with files: strings, awk, od, du, df, find, Misc: which, whereis, dmesg, Logfiles, Operating System Installation, System installation, Linux/Solaris installation, Patches, Installing and removing packages (RPM), Download compile and install using source code, Kernel reconfig, Get the kernel source code, Add new adapter and update drivers, Kernel upgrade.	**12**
IV	**Predicting Human Behaviour and Privacy Issues and Applications**	Understanding and predicting human behaviour for social communities, User data management, Inference and Distribution, Enabling new human experiences, Reality mining, Context, Awareness, Privacy in online social networks, Trust in online environment, Trust models based on subjective logic, Trust network analysis, Trust transitivity analysis, Combining trust and reputation, Trust derivation based on trust comparisons, Attack	**12**

		spectrum and countermeasures. Graph theory, Centrality, Clustering, Node-Edge Diagrams, Matrix representation, Visualizing online social networks, and Visualizing social networks with matrix-based representations. Matrix and Node-Link Diagrams, Hybrid representations, Applications, Cover networks, Community welfare, Collaboration networks, Co-Citation networks.	
Total			**48**

Text Book:

1. *Social Networks and the Semantic Web*, Peter Mika, 1st Edition, 2007, Springer.
2. *Handbook of Social Network Technologies and Applications*, Borko Furht, 1st Edition, 2010, Springer.

Reference Books:

1. Dion Goh and Schubert Foo, *Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively,* 2008, IGI Global Snippet.

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Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Understand the key concepts and measures of social network analysis	(i) Each topic to be expounded with examples. (ii) Students to be motivated to take part in discussions and ask questions. (iii) Students to be given homework/assignments. (iv) Discuss and solve the theoretical problems in the class. (v) Students to be encouraged to give short presentations	a) Participation in class discussions b) Continuous Evaluation (30 Marks) i) 15 marks on ● Assignments ● class tests. ● viva-voce or presentation ii) Mid-term examinations: 10 marks iii) Class attendance: 5 marks c) End-term examinations: 70 marks
II	Learn the represent knowledge using ontology.		
III	Analyze the monitor processes		
IV	Predict human behaviour in social web and related communities		

ELECTIVE-III		
Paper IV/Subject Name:Introduction to Big Data Analytics		**Subject Code: INT052D601**
L-T-P-C – 4-0-0-4	**Credit Units: 04**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are:

- To explain the basic concepts of big data.
- To teach the methodologies for analyzing structured and unstructured data with emphasis on the relationship between the Data Scientist and the business needs

Prerequisites: Concepts of Database Management Systems, Java

Detailed Syllabus:

Modules	Topics	Course content	Hours
I	**Introduction**	Big Data and its Importance, Challenges of Conventional Systems, Four V's of Big Data, Drivers for Big Data, Introduction to Big Data Analytics, Big Data Analytics applications, Intelligent data analysis, Nature of Data: Analytic Processes and Tools, Analysis Vs. Reporting, Introduction To Streams Concepts, Stream Data Model and Architecture, Stream Computing, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream.	**12**
II	**Big Data Technologies**	History of Hadoop, The Hadoop Distributed File System, Components of Hadoop, Analyzing the Data with Hadoop, Scaling OutHadoop Streaming, HDFS basics, developing a Map Reduce Application, How Map Reduce Works.	**14**
III	**Big Data Tools and Techniques**	Applications on Big Data Using Pig, Comparison with Databases, Pig Latin, User-Defined Functions, Data Processing Operators in Pig. Introduction of Hive - HiveQL, Querying Data in Hive, User-Defined Functions	**14**
IV	**Real Time Database using HBase**	HBase Overview, Data Model, Architecture, Downloading, Installing and Configuring HBase, HBase Shell, HBase Java API for CRUD Operations.	**8**
Total			**48**

Text Book:

1. *The Big Data Revolution,* Jason Kolb, Jeremy Kolb, 2013, Jason Kolb Publishers.
2. *Big Data Analytics with R and Hadoop,* Vignesh Prajapati, 2013, Packet Publishing

Reference Books:

1. WAGmob , *Big Data and Hadoop*, 1.5 Edition, 2013, WAGmob Publisher

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Familiar with the Big Data models	(i) Each topic to be explained with illustrations. (ii) Students to be encouraged to discover the relevant concepts. (iii) Students to be given homework/assignments. (iv) Discuss and solve the theoretical and practical problems in the class. (v) Students to be encouraged to apply concepts to real world problems.	a) Participation in class discussions b) Continuous Evaluation (30 Marks) i) 15 marks on • Assignments • class tests. • viva-voce or presentation ii) Mid-term examinations: 10 marks iii) Class attendance: 5 marks c) End-term examinations: 70 marks
II	Learn the big data techniques like Hadoop with data		
III	Learn the different applications of big data, user defined functions		
IV	Understand real time data with HBase		

Paper IV/Subject Name:Mobile Application Development		Subject Code: INT052D602
L-T-P-C – 4-0-0-4	Credit Units: 04	Scheme of Evaluation: T

Objective:

The objectives of the course are:

- To teach how to install and maintain a Unix/Linux server
- To explain connecting a Unix/Linux server to the network, and share resources on the network.
- To impart the skills and knowledge needed to be qualified system administrators

Prerequisites: Fundamental concepts of Computer Programming using C++/JAVA

Detailed Syllabus:

Modules	Topics	Course content	Hours
I	**Introduction**	Introduction to Mobile Computing, Android Development Environment, Factors in Developing Mobile Applications, Mobile Software Engineering, Frameworks and Tools, Generic UI Development, Android User, More on UIs, VUIs and Mobile Apps, Text-to-Speech Techniques. Designing the Right UI c. Multichannel and Multimodal UIs	**12**
II	**Intent, Services, Data Retrieval and Communication**	Android Intents and Services, Characteristics of Mobile Applications, Successful Mobile Development, Synchronization and Replication of Mobile Data, Getting the Model Right, Android Storing and Retrieving Data, Working with a Content Provider, State Machine, Correct Communications Model, Android Networking and Web	**12**
III	**Telephony, Notifications and Graphics**	Deciding Scope of an App, Wireless Connectivity and Mobile Apps, Android Telephony, Performance, Performance and Memory Management, Android Notifications and Alarms, Performance and Multithreading, Graphics and UI Performance, Android Graphics and Multimedia, Mobile Agents and Peer-to-Peer Architecture, Android Multimedia	**12**
IV	**Location, Security and Additional Issues**	Mobility and Location Based Services, Android, Packaging and Deploying, Performance Best Practices, Android Field Service App, Active Transactions, More on Security, Hacking Android, Development Process, Architecture, Design, Technology Selection, Mobile App Development Hurdles, Testing	**12**
Total			**48**

Text Book:

1. *Android Programming: The Big Nerd Ranch Guide,* Bill Phillips, Chris Stewart, Brian Hardy, and Kristin Marsicano, 3rd Edition, 2017, Big Nerd Ranch LLC.
2. *Android SDK 3 for Dummies,* Rajiv Ramnath, Roger Craw, and Paolo Sivilotti, Wiley.

Reference Books:

1. Maximiliano Firtman, *Programming the Mobile Web*, 2nd Edition, 2013, O'Reilly Media, Inc.
2. Brian Fling, *Mobile Design and Development*, 2009, O'Reilly Media, Inc.

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Expose to technology and business trends impacting mobile applications	(i) Each topic to be expounded with examples. (ii) Students to be motivated to take part in discussions and ask questions. (iii) Students to be given homework/assignments. (iv) Discuss and solve the theoretical problems in the class. (v) Students to be encouraged to give short presentations	a) Participation in class discussions b) Continuous Evaluation (30 Marks) i) 15 marks on • Assignments • class tests. • viva-voce or presentation ii) Mid-term examinations: 10 marks iii) Class attendance: 5 marks c) End-term examinations: 70 marks
II	Understand the characterization and architecture of mobile applications.		
III	Learn the performance and multi-threading		
IV	Understand the security and testing of mobile applications		

ELECTIVE-IV		
Paper V/Subject Name:E-Commerce		**Subject Code: INT052D603**
L-T-P-C – 4-0-0-4	**Credit Units: 04**	**Scheme of Evaluation: T**

Objective:
The objectives of the course are:

- To provide basic concepts of E-commerce.
- To explain integrated E-commerce system for order processing, payments and updating information on the web
- To teach various security related issues in the web.

Prerequisites: None

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Introduction**	Defining Commerce; Main Activities of Electronic Commerce; Benefits of E-Commerce; Broad Goals of Electronic Commerce; Main Components of E-Commerce; Functions of Electronic Commerce – Communication, Process Management, Service Management, Transaction Capabilities; Process of E-Commerce; Types of E-Commerce; Role of Internet and Web in E-Commerce; Technologies Used; E-Commerce Systems; Pre-requisites of E-Commerce; Scope of E-Commerce; E-Business Models.	**12**
II	**The Internet and WWW**	Evolution of Internet, Domain Names and Internet Organization (.edu, .com, .mil, .gov;.net etc.),Types of Network, Internet Service Provider(ISP), World Wide Web, Internet & Extranet, Role of Internet in B2B Application, building own website, Cost, Time, Reach, Registering a Domain Name, Web promotion, Target email, Baner, Exchange, Shopping Bots	**12**
III	**Internet Security**	Secure Transaction, Computer Monitoring, Privacy on Internet, Corporate Email privacy, Computer Crime(Laws , Types of Crimes), Threats, Attack on Computer System, Software Packages for privacy, Hacking, Computer Virus (How it spreads, Virus problem, virus protection, Encryption and Decryption, Secret key Cryptography, DES, Public Key Encryption, RSA, Authorization and Authentication, Firewall, Digital Signature(How it Works)	**12**
IV	**Electronic Data Exchange**	Introduction, Concepts of EDI and Limitation, Applications of EDI, Disadvantages of EDI, EDI model, Electronic Payment System: Introduction, Types of Electronic Payment System, Payment Types, Value Exchange System, Credit Card System, Electronic Fund Transfer, Paperless bill, Modern Payment Cash, Electronic Cash	**12**
Total			**48**

Text Book:

1. *E-Commerce Concepts, Models, Strategies,* Murthy, G.S.V, 1st Edition, 2011, Himalaya Publishing House.
2. *E-Commerce,* Bajaj, K. Kamlesh and Nag,Debjani, 2nd Edition, 2005, Tata McGraw-Hill Education

Reference Books:

1. Schneider, P. Gray, *Electronic commerce*, 11th Edition, 2015, Cengage Learning.
2. Henry Chan, Raymond lee, Tharam Dillon, Elizabeth Chang, *E-Commerce, Fundamentals and Applications*, 1st Edition, 2001, Wiely, India.

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Gain a comprehensive understanding of the E-Commerce landscape, current and emerging business models, and the technology and infrastructure underpinnings of the business.	(i) Each topic to be expounded with examples. (ii) Students to be motivated to take part in discussions and ask questions. (iii) Students to be given homework/assignments. (iv) Discuss and solve the theoretical problems in the class. (v) Students to be encouraged to give short presentations	a) Participation in class discussions b) Continuous Evaluation (30 Marks) i) 15 marks on • Assignments • class tests. • viva-voce or presentation ii) Mid-term examinations: 10 marks iii) Class attendance: 5 marks c) End-term examinations: 70 marks
II	Understanding the basics of Internet and WWW		
III	Gain an understanding on the importance of security, privacy, and ethical issues as they relate to E-Commerce.		
IV	Gain an understanding on how innovative use of the E-Commerce can help developing competitive advantage.		

Paper VI/Subject Name:Introduction to Embedded Systems		Subject Code: INT052D604
L-T-P-C – 4-0-0-4	Credit Units: 04	Scheme of Evaluation: T

Objective:

The objectives of the course are:

- To introduce the fundamentals of Embedded System Design using Ardunio Board and Rasberry Pi Pico .
- Introduction to basic C language/MicroPython programs that perform I/O functions and implement simple data structures, manipulate numbers in multiple formats, interfacing of LED, Sensors, etc. and understand how software is used to Program Embedded System (Arduino/Rasberry Pi Pico)

Detailed Syllabus:

Modules	Topics (if applicable) & Course Contents	Periods
I.	BASIC FUNDAMENTALS Fundamental concepts: number system, basic electronics components, digital logic fundamentals, Microprocessor and Computer systems, Introduction to Raspberry Pi Pico, Introduction to Arduino Board	**9**
II.	EMBEDDED SYSTEM BOARDS AND PROGRAMMING. Introduction to basic Embedded C function, Introduction to IDE Software for programming of Arduino Board. Board, Input/Output Programming, using Libraries.. Introduction to Raspberry Pi Pico Board and its features.	**9**
III.	INTRODUCTION TO MICROPYTHON AND RASBERRY PI PICO PROGRAMMING Introduction to Python, Micro Python and its features, Advantages of MicroPython in Embedded System programming, basic programming using MicroPython. Physical computing using Raspberry Pi Pico	**9**
IV	DESIGN PROCESS OF EMBEDDED SYSTEM Design of Embedded System, using ADC, DAC, Interrupts, Switches. Different case studies of Embedded Project Design Using Arduino board and Raspberry Pi Pico	**9**
TOTAL		**36**

Text Book:

1. "*Programming Arduino: Getting Started with Sketches*"Simon Monk - Second Edition
2. "*Get started with MicroPython on Raspberry Pi Pico*"by Gareth Halfacree and Ben EverReady-Raspberry Pi Publication

Reference Books:

1. Michael Margolis, Brian Jepson, Nicholas Robert Weldin, *Arduino Cookbook,* 3rdEdition, April 2020, Media, Inc.
2. Pan, Tianhong Zhu, Yi, *Designing embedded systems with Arduino a fundamental technology for makers,* ,Springer Publication.

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Know the Fundamentals of Embedded System Design and will be	(i) Each topic to be expounded with examples. (ii) Students to be motivated to take part in discussions and ask questions. (iii) Students to be given homework/assignments. (iv) Discuss and solve the theoretical problems in the class. (v) Students to be encouraged to give short presentations	a) Participation in class discussions b) Continuous Evaluation (30 Marks) i) 15 marks on • Assignments • class tests. • viva-voce or presentation ii) Mid-term examinations: 10 marks iii) Class attendance: 5 marks c) End-term examinations: 70 marks
II	Able to design simple Embedded System Design using Arduino and Raspberry Pi Pico for a specific application. .		

ELECTIVE-V

Paper VII/Subject Name: Digital Image Processing		Subject Code: INT054D701
L-T-P-C – 4-0-0-4	Credit Units: 04	Scheme of Evaluation: T

Objective:

The objectives of the course are:

- To explain the image fundamentals and mathematical transforms necessary for image processing.
- To teach the image enhancement techniques and image restoration procedures.
- To explain the image compression procedures

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Introduction**	Scope and application of digital image processing, Image acquisition and display, Mathematical preliminaries, Human visual perception	**8**
II	**Image Transforms, Enhancement and Restoration**	Different transforms : 2D-Fourier Transforms, 2D DFT, KLT, 2D DCT, Haar transform and their properties Spatial Filtering, Histogram processing. Frequency Domain Filtering. Degradation Model, Inverse Filtering, Wiener Filtering	**15**
III	**Edge Detection and Segmentation and Binary and Color Image Processing**	Edge detection, Line detection, Segmentation, Texture Analysis and Classification. Binarization, morphological image processing, distance transform. Color model. color image processing, color image quantization, histogram of a color image.	**15**
IV	**Image Compression**	Lossy Compression. Loss-less compression. Run-length and Huffman Coding. Transform Coding. Image Compression Standards.	**10**
Total			**48**

Textbooks:

1. *Digital Image Processing,* R. C. Gonzalez & R. E. Woods, 3rd Edition, 2004, Addison Wesley.

References:

1. A. K. Jain, *Fundamentals of Digital Image Processing,* 1st Edition, 2004 PHI
2. K. R. Castleman, *Digital Image Processing,* 1st Edition, PHI.

Facilitating the Achievement of Course Learning Outcomes

Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
• Learn the fundamental concepts of a digital image processing system. • Analyze images in the frequency domain using various transforms. • Evaluate the techniques for image enhancement and image restoration. • Categorize various compression techniques. • Interpret Image compression standards, image segmentation and representation techniques.	i) Each topic to be expounded with adequate examples. ii) Class discussions and question-answer rounds are encouraged iii) theoretical problems solving is part of the class to grasp the underlying concepts iv) Students have to go through case studies for real time experience v) Students to be encouraged to give short presentations.	(a) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on □ Assignments □ Class tests. □ viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations: 70 marks.

Paper VII / Subject Name: Data Warehousing	Subject Code: INT054D702	
L-T-P-C – 4-0-0-4	Credit Units: 04	Scheme of Evaluation: T

Objective:

The objectives of the course are:

- To give students an introduction to data warehouse design.
- To provide detailed concepts on data modeling, data warehouse planning, design and implementation.
- To provide detailed concepts on data marts, data lakes, and schemas.

Prerequisites:

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Data Warehouse Fundamentals**	OLTP Systems; Differences between OLTP Systems and Data Warehouse: Characteristics of Data Warehouse; Functionality of Data Warehouse: Advantages and Applications of Data Warehouse; Applications: Top- Down and Bottom-Up Development Methodology: Tools for Data warehouse development: Data Warehouse Types, Key Issues, Planning and Project Management in constructing Data warehouse, Data Warehouse development Life Cycle, Kimball Lifecycle Diagram, Requirements Gathering Approaches: Team organization, Roles, and Responsibilities:	**12**
II	**Data Warehouse Architecture**	Design Approaches : Top Down, Bottom up, their characteristics, advantages, disadvantages, Types of data, ware house architecture, components, multitier architecture, Operational Data Stores, ETL, ETL vs ELT , Data Warehouse Modelling, Data Warehouse Design, Data Warehouse Implementation, Meta Data, Data Mart, Delivery Process	**12**
III	**OLAP , dimensional Modelling and schemas**	OLAP, Characteristics of OLAP, OLTP vs OLAP, OLAP Operations ,Types of OLAP, ROLAP vs MOLAP vs HOLAP, Dimensional Modelling, Multi-Dimensional Data Model, Data Cube, Star Schema, Snowflake Schema, Star vs Snowflake Schemas, Fact Constellation Schema, Process Architecture, Types of Database Parallelism, Data Warehouse Tools, Partitioning strategy,	**12**
IV	**Implementation, maintenance and security**	Physical Design Steps, Physical Storage: Storage Area Data Structures ,Optimizing Storage, Using RAID Technology, Estimating Storage ,Sizes, Indexing the Data Warehouse : B-Tree Index, Bitmapped Index, Clustered Index, Performance Enhancement Techniques: Data Partitioning , Data clustering, Parallel Processing System Managers, Process Managers, Security, Backup, Tuning, Testing, Future Aspects	**12**
Total			**48**

Text Books:

1. *Data Mining Techniques*, Arun K Pujari, 3rd Edition, Universities Press.
2. *Data Ware Housing Fundamentals*, Pualraj Ponnaiah, Wiley Student Edition.

Reference Books:

1. Alex Berson and Stephen J.Smith, *Data Warehousing, Data Mining and OLAP*, Tata McGraw – Hill Edition, 35th Reprint 2016.

Facilitating the Achievement of Course Learning Outcomes

Learning Outcomes	**Teaching and Learning Activity**	**Assessment Tasks**
• have a deeper understanding of database systems and their underlying theory • to be able to improve the decision-making process. • understand the technology of data warehousing. • be able to develop applications of higher order database systems	i) Each topic to be expounded with adequate examples. ii) Class discussions and question- answer rounds are encouraged iii) theoretical problems solving is part of the class to grasp the underlying concepts iv) Students have to go through case studies for real time experience v) Students to be encouraged to give short presentations.	(a) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on □ Assignments □ Class tests. □ viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations: 70 marks.

ELECTIVE-VI

Paper VIII/Subject Name: Distributed Operating Systems		**Subject Code: INT054D703**
L-T-P-C – 4-0-0-4	**Credit Units: 04**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are:

- To impart knowledge of distributed systems techniques and methodologies.
- To explain the design and development of distributed systems and distributed systems applications.
- To explain the application of fundamental Computer Science methods and algorithms in the development of distributed systems and distributed systems applications.

Prerequisites: Concepts of Operating Systems

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Distributed Systems: Introduction and Communication**	Definition Of Distributed System. Goals- Advantages Of Distributed Systems, Disadvantages Of Distributed Systems. Hardware Concepts- Bus-Based Multiprocessors, Switched Multiprocessors, Busbased Multicomputers, Switched Multicomputers. Software Concepts- Network Operating Systems, True Distributed Systems, Multiprocessor Timesharing Systems. Design Issues- Transparency, Flexibility, Reliability, Performance, Scalability The Client-Server Model- Clients And Servers, Examples, Addressing, Blocking Versus Nonblocking Primitives, Buffered Versus Unbuffered Primitives, Reliable Versus Unreliable Primitives, Client-Server Model Implementation Issues. Remote Procedure Call- Basic Rpc Operation, Parameter Passing, Dynamic Binding, Rpc Semantics In The Presence Of Failures, Implementation Issues, Problem Areas. Group Communication- Introduction, Design Issues.	**12**
II	**Synchronization**	Clock Synchronization- Logical Clocks, Physical Clocks, Clock Synchronization Algorithmscristians Algorithm, The Berkeley Algorithm, Averaging Algorithms, Multiple External Time Sources; Use Of Synchronized Clocks- At-Most-Once Message Delivery. Mutual Exclusion- Centralized Algorithm, Distributed Algorithm, Token Ring Algorithm, Comparison Of The Three Algorithms. Election Algorithms- Bully Algorithm, Ring Algorithm. Atomic Transactions- Introduction To Atomic Transactions, The Transaction Model, Implementation, Concurrency Control. Deadlocks In Distributed Systemsdistributed Deadlock Detection (Centralized Versus Distributed), Distributed Deadlock Prevention	**12**
III	**Processes and Processors**	Threads- Introduction, Usage, Design Issues, Implementing A Threads Package, Threads And Rpc. System Models- The Workstation Model, The Processor Pool Model, Hybrid	**12**

		Model. Processor Allocation- Allocation Models, Design Issues, Implementation Issues, Examples. Scheduling In Distributed Systems. Fault Tolerance- Component Faults, System Failures, Synchronous Versus Asynchronous Systems, Use Of Redundancy, Fault Tolerance Using Active Replication, Fault Tolerance Using Primary Backup, Agreement In Faulty Systems. Real-Time Distributed Systemsdefinition, Design Issues, Clock Synchronization, Real-Time Communication, Real-Time Scheduling	
IV	**File System and Shared Memory**	Distributed File System Design- The File Service Interface, The Directory Server Interface, Semantics Of File Sharing, Distributed File System Implementation- File Usage, System Structure, Caching, Replication. Case Study: Suns Network File System- Nfs Architecture, Nfs Protocols, Nfs Implementation.Introduction. Shared Memory- On-Chip Memory, Bus-Based Multiprocessors, Ring-Based Multiprocessors, Switched Multiprocessors, Numa Multiprocessors, Comparison Of Shared Memory Systems.	**12**
Total			**48**

Text Book:

1. *Distributed Operating Systems,* Andrew S. Tanenbaum, 1st Edition, 2002, Pearson Education India
2. *Distributed Systems: Concepts and Design,* Coulouris, Dollimore, 5th Edition, 2011, Pearson

Reference Books:

1. Andrew S. Tanenbaum, *Distributed Systems: Principles and Paradigms,* 2nd Edition, 2006, Pearson
2. Sunita Mahajan & Seema Shah, *Distributed Computing*, 1st Edition, 2010, Oxford University Press

Facilitating the Achievement of Course Learning Outcomes

Learning Outcomes	**Teaching and Learning Activity**	**Assessment Tasks**
•To identify the core concepts of distributed systems: the way in which several machines orchestrate to correctly solve problems in an efficient, reliable and scalable way. •To examine how existing systems have applied the concepts of distributed systems in designing large systems.	i) Each topic to be expounded with adequate examples. ii) Class discussions and question- answer rounds are encouraged iii) theoretical problems solving is part of the class to grasp the underlying concepts iv) Students have to go through case studies for real time experience v) Students to be encouraged to give short presentations.	(a) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on Assignments Class tests. viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations: 70 marks.

L-T-P-C – 4-0-0-4 **Credit Units: 04** **Scheme of Evaluation: T**

Objective:

The objectives of the course are:

- To make the students understand the basic concepts of mobile computing.
- To make them familiar with the network protocol stack.
- To teach the basics of mobile telecommunication system.
- To provide an exposure to Ad-Hoc networks.
- To impart knowledge about different mobile platforms and application development

Prerequisites: Concepts of Computer Networks

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Introduction**	Mobile Computing – Mobile Computing Vs wireless Networking – Mobile Computing Applications – Characteristics of Mobile computing – Structure of Mobile Computing Application. MAC Protocols – Wireless MAC Issues – Fixed Assignment Schemes – Random Assignment Schemes – Reservation Based Schemes.	**12**
II	**Mobile Internet Protocol & Transport**	Overview of Mobile IP – Features of Mobile IP – Key Mechanism in Mobile IP route Optimisation. Overview of TCP/IP – Architecture of TCP/IP- Adaptation of tCP Window-Improvement in TCP Performance.	**12**
III	**Mobile Tele-communication**	Global System for Mobile Communication (GSM) – General Packet Radio Service (GPRS) – Universal Mobile Telecommunication System (UMTS).	**8**
IV	**Mobile AD-Hoc Networks, Mobile Platforms & Applications**	Ad-Hoc Basic Concepts – Characteristics – Applications – Design Issues – Routing – Essential of Traditional Routing Protocols –Popular Routing Protocols – Vehicular Ad Hoc networks (VANET) – MANET Vs VANET – Security.Mobile Device Operating Systems – Special Constrains & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – MCommerce – Structure – Pros & Cons – Mobile Payment System – Security Issues.	**16**
Total			**48**

Text Book:

1. *Wireless Network and Mobile Computing,*Koushik Sinha, Sasthi C Ghosh, Bhabani P. Sinha, 1st Edition, 2016, CRC Press
2. *Introduction to Wireless and Mobile Technology,*Dharma Prakash Agarval, Qing and An Zeng, 2nd Edition, 2006, Pearson Education

Reference Books:

1. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, *Principles of Mobile Computing,* 2nd Edition, 2002, Springer
2. C.K.Toh, *Ad-hoc Mobile Wireless Networks,* 1st Edition, 2015, Pearson Education

Facilitating the Achievement of Course Learning Outcomes

Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
•Understand the basic concepts of mobile computing and the network protocol stack. •Learn the basics of mobile telecommunication system and Ad-Hoc networks. •Gain knowledge about different mobile platforms and application development	i) Each topic to be expounded with adequate examples. ii) Class discussions and question- answer rounds are encouraged iii) theoretical problems solving is part of the class to grasp the underlying concepts iv) Students have to go through case studies for real time experience v) Students to be encouraged to give short presentations.	(a) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on □ Assignments □ Class tests. □ viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations: 70 marks.

ELECTIVE-VII

Paper V/Subject Name: Cyber Forensics		**Subject Code: INT054D801**
L-T-P-C – 4-0-0-4	**Credit Units: 04**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are:

- To provide an understanding Computer forensics fundamentals.
- To explain various computer forensics technologies and computer forensics systems.
- To explain methods for data recovery.
- To teach the methods for preservation of digital evidence

Prerequisites: Fundamentals of Networking and Cryptography.

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Computer Forensics Fundamentals**	Introduction to Computer Forensics, Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceedings, Computer Forensics Services, Benefits of Professional Forensics Methodology.	**7**
II	**Forensics Technologies**	Types of Military Computer Forensic Technology, Types of Law Enforcement: Computer Forensic Technology, Types of Business Computer Forensic Technology, Specialized Forensics Techniques, Hidden Data and How to Find It, Spyware and Adware. Encryption Methods and Vulnerabilities ,Protecting Data from Being Compromised ,Internet Tracing Methods ,Security and Wireless Technologies ,Avoiding Pitfalls with Firewalls ,Biometric Security Systems.	**7**
III	**Forensics Systems**	Internet Security Systems, Intrusion Detection Systems, Firewall Security Systems, Storage Area Network Security Systems, Network Disaster Recovery Systems, Public Key Infrastructure Systems, Wireless Network Security Systems. Satellite Encryption Security Systems, Instant Messaging (IM) Security Systems, Net Privacy Systems, Identity Management Security	**7**
IV	**Data Recovery, Evidence Collection and Data Seizure, Duplication and Preservation of Digital Evidence**	Data Recovery Defined ,Data Backup and Recovery ,The Role of Backup in Data Recovery ,The Data-Recovery Solution ,Hiding and Recovering Hidden Data Why Collect Evidence?, Collection Options ,Obstacles ,Types of Evidence ,The Rules of Evidence ,Volatile Evidence ,General Procedure Collection and Archiving, Methods of Collection, Artifacts. Preserving the Digital Crime Scene, Computer Evidence Processing Step.Computer Image Verification and AuthenticationSpecial Needs of Evidential	**15**

		Authentication, Practical Considerations	
Total			**48**

Text Book:

1. *Computer Forensics and Investigations*, Nelson, Phillips, Enfinger, Steuart, 3rd Edition, 2008, Cengage Learning, India Edition.
2. *Computer Forensics: Computer Crime Scene Investigation,* John R. Vacca, 2nd Edition, 2005, Charles, River Media.

Reference Books:

1. John R.Vacca, *Computer Forensics,* 3rd Edition, 2005, Cengage Learning
2. Richard E.Smith, *Internet Cryptography*, 3rd Edition, 2008, Pearson Education, 2008.
3. Marjie T.Britz, *Computer Forensics and Cyber Crime: An Introduction*, 3rd Edition, 2013, Prentice Hal,.
4. ChristofPaar, Jan Pelzl, *Understanding Cryptography: A Textbook for Students and Practitioners,* 2nd Edition, 2010, Springer's

Facilitating the Achievement of Course Learning Outcomes

Learning Outcomes	**Teaching and Learning Activity**	**Assessment Tasks**
•Understand the definition of computer forensics fundamentals. •Describe the types of computer forensics technology. •Analyze various computer forensics systems. •Illustrate the methods for data recovery, evidence collection and data seizure. •Summarize duplication and preservation of digital evidence.	i) Each topic to be expounded with adequate examples. ii) Class discussions and question- answer rounds are encouraged iii) theoretical problems solving is part of the class to grasp the underlying concepts iv) Students have to go through case studies for real time experience v) Students to be encouraged to give short presentations.	(a) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on Assignments Class tests. viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations: 70 marks.

Paper V/Subject Name: Pattern Recognition		Subject Code: INT054D802
L-T-P-C – 4-0-0-4	Credit Units: 04	Scheme of Evaluation: T

Objective:

The objectives of the course are:

- To explain the design and construction and a pattern recognition system and the major approaches in statistical and syntactic pattern recognition.
- To provide an exposure to the theoretical issues involved in pattern recognition system design.
- To teach the working knowledge of implementing pattern recognition techniques and the scientific Python computing environment.

Prerequisites: Concepts of Data Mining and Digital Image Processing

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Introduction**	Pattern Recognition: Definition, Applications and Examples, Clustering Vs Classification, Supervised Vs Unsupervised, Basic of Linear Algebra, Vector Spaces, Basics of Probability, Basics of Estimation Theory, Decision Boundaries, Decision Regions, Metric Spaces	**12**
II	**Classification**	Bayes Decision Rules, Error Probability, Examples, Normal Distribution, Linear Discriminant Function, Non-Linear Decision Boundaries, Mahalanobis Distance, K-NN Classifier, Single and Multi-Layer Perceptron, Training Set, Test Set, Standardization and Normalization	**12**
III	**Clustering**	Basics, Similarity/Dissimilarity Measures, Clustering Criteria, Different distance functions and similarity measures, within cluster distance criterion, K-means algorithm, Single linkage and complete linkage algorithms, MST,K-medoids, DBSCAN, Data sets: Visualization, Unique Clustering	**12**
IV	**Decision Making, Cluster Analysis and Feature Extraction**	Baye's theorem, multiple features, decision boundaries, estimation of error rates, histogram, kernels, window estimators, nearest neighbour classification, maximum distance pattern classifiers, adaptive decision boundaries. Unsupervised learning, hierarchical clustering, graph theories approach to pattern clustering, fuzzy pattern classifiers, application of pattern recognition in medicine.Structural PR, SVMs, FCM ,Soft-Computing and Neuro-Fuzzy Techniques, Real-Life Examples	**12**
Total			**48**

Text Book:

1. *Pattern Recognition and Image Analysis,*Earl Gose, Richard Johnsonbaugh, Steve Jost, DSKT Edition, PHI
2. *Pattern Classification and Scene Analysis,* Duda & Hart, 1st Edition, Wiley

Reference Books:

1. K. Fukunaga , *Statistical pattern Recognition*, 2nd Edition, 2000, Academic Press
2. S.Theodoridis and K.Koutroumbas, Pattern Recognition, 4th Edition, 2005, Academic Press.

Facilitating the Achievement of Course Learning Outcomes

Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
•Learn the design and construction and a pattern recognition system •Understand the working knowledge of implementing pattern recognition techniques and the scientific Python computing environment. Analyze the different features extracted from datasets	i) Each topic to be expounded with adequate examples. ii) Class discussions and question-answer rounds are encouraged iii) theoretical problems solving is part of the class to grasp the underlying concepts iv) Students have to go through case studies for real time experience v) Students to be encouraged to give short presentations.	(a) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on □ Assignments □ Class tests. □ viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations: 70 marks.

ELECTIVE-VIII

Paper VI/Subject Name: Bioinformatics		Subject Code: INT054D803
L-T-P-C – 4-0-0-4	Credit Units: 04	Scheme of Evaluation: T

Objective:

The objectives of the course are:

- To improve the programming skills of the student.
- To let the students know the recent evolution in biological science

Prerequisites: Fundamentals of Databases and Data Mining

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Introduction to Bioinformatics and Computational Biology**	Biological sequences, Biological databases, Genome specific databases, Data file formats, Data life cycle, Database management system models, Basics of Structured Query Language (SQL).	**12**
II	**Dynamic Programming Algorithms**	Sequence Analysis, Pairwise alignment, Dynamic programming algorithms for computing edit distance, string similarity, shotgun DNA sequencing, end space free alignment. Multiple sequence alignment, Algorithms for Multiple sequence alignment, Generating motifs and profiles, Local and Global alignment, Needleman and Wunsch algorithm, Smith Waterman algorithm, BLAST, PSIBLAST and PHIBLAST algorithms.	**12**
III	**Phylogenetics**	Introduction to phylogenetics, Distance based trees UPGMA trees, Molecular clock theory, Ultrametric trees, Parsimonious trees, Neighbour joining trees, trees based on morphological traits, Bootstrapping. Protein Secondary structure and tertiary structure prediction methods, Homology modeling, abinitio approaches, Threading, Critical Assessment of Structure Prediction, Structural genomics.	**12**
IV	**Machine Learning Techniques**	Machine learning techniques: Artificial Neural Networks in protein secondary structure prediction, Hidden Markov Models for gene finding, Decision trees, Support Vector Machines. Introduction to Systems Biology and Synthetic Biology, Microarray analysis, DNA computing, Bioinformatics approaches for drug discovery, Applications of informatics techniques in genomics and proteomics: Assembling the genome, STS content mapping for clone contigs,Functional annotation, Peptide massFingerprinting	**12**
Total			**48**

Text Book:

1. *Introduction to Bioinformatics*, Lesk, A. K., 4th Edition, 2013, Oxford University Press.

2. *Algorithms on Strings, Trees and Sequences: Computer Science and Computational Biology*, Gusfield, Dan, Cambridge University Press.

Reference Books:

1. Baldi, P, Brunak, S.; *Bioinformatics: The Machine Learning Approach*, 2nd Edition, 2001, MIT Press

Facilitating the Achievement of Course Learning Outcomes

Learning Outcomes	**Teaching and Learning Activity**	**Assessment Tasks**
•Develop bioinformatics tools with programming skills. •Apply computational based solutions for biological perspectives. •Practice life-long learning of applied biological science	i) Each topic to be expounded with adequate examples. ii) Class discussions and question- answer rounds are encouraged iii) theoretical problems solving is part of the class to grasp the underlying concepts iv) Students have to go through case studies for real time experience v) Students to be encouraged to give short presentations.	(a) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on □ Assignments □ Class tests. □ viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations: 70 marks.

Paper VI/Subject Name: Optimization Techniques		Subject Code: INT054D804
L-T-P-C – 4-0-0-4	Credit Units: 04	Scheme of Evaluation: T

Objective:

The objectives of the course are:

- To give students an introduction to various optimization techniques.
- To impart concepts on how to formalize various optimization problems using mathematical concepts.
- To provide students concepts on analyze and appreciate variety of performance measures for various optimization problems.

Prerequisites: Fundamentals of Mathematics

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Introduction**	Operation Research approach, scientific methods, introduction to models and modelling techniques, general methods for Operation Research models, methodology and advantages of Operation Research, history of Operation Research.	**12**
II	**Linear Programming**	Introduction to LP and formulation of Linear Programming problems, Graphical solution method, alternative or multiple optimal solutions, Unbounded solutions, Infeasible solutions, Maximization – Simplex Algorithm, Minimization – Simplex Algorithm using Big-M method, Two phase method, Duality in linear programming, Integer linear programming.	**12**
III	**Some Specific Optimization Problems**	Introduction to Transportation problems, various methods of Transportation problem, Variations in Transportation problem, introduction to Assignment problems, variations in Assignment problems. Introduction to sequencing problems, processing N jobs through two machines, processing N jobs through three machines, processing N jobs through m machines. Introduction to inventory control, deterministic inventory model, EOQ model with quantity discount.	**12**
IV	**Queuing Models And Simulation**	Concepts relating to queuing systems, basic elements of queuing model, role of Poisson & exponential distributions, concepts of birth and death process. Introduction & steps of simulation method, distribution functions and random number generation.	**12**
Total			**48**

Text Book:

1. *Operations Research: Theory and Applications,* J.K. Sharma, 5th Edition, 2012, MacMillan India Ltd.
2. *Operations Research- An Introduction,* Hamdy A. Taha, 9th Edition, 2010, Prentice Hall.

Reference Books:

1. N. D. Vohra, *Quantitative Techniques in Management,* 3rd Edition, 2006, Tata McGraw Hill.

Facilitating the Achievement of Course Learning Outcomes

Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
•Formulate the problem quantitatively and use appropriate arithmetical, and/or statistical methods to solve the problem. •Recall Formulae. •Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions. •Interpret quantitative information (i.e., formulas, graphs, tables, models, and schematics) and draw implications from them. •Critically evaluate various real life situations by resorting to analysis of key issues and factors.	i) Each topic to be expounded with adequate examples. ii) Class discussions and question- answer rounds are encouraged iii) theoretical problems solving is part of the class to grasp the underlying concepts iv) Students have to go through case studies for real time experience v) Students to be encouraged to give short presentations.	(a) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on □ Assignments □ Class tests. □ viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations: 70 marks.

ELECTIVE-IX

Paper VII/Subject Name: Python Programming		Subject Code: INT054D805
L-T-P-C – 4-0-0-4	Credit Units: 04	Scheme of Evaluation: TP

Objective:

The objectives of the course are:

- To provide an understanding of the role that computation can play in solving problems.
- To make the students feel confident of their ability to write small programs that allows them to accomplish useful goals.
- To explain the difference between expressions and statements
- To teach how to write and call a simple function and read from and write to a text file

Prerequisites: Fundamentals of Computer Programming

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Introduction**	History, Features, Setting up path, working with python, basic syntax, variable data types, operator, If, if-else, nested if, for, while, nested loops, break continue, pass.	**12**
II	**String manipulation, lists, tuple**	Accessing string, basic operation, string slices, accessing list, working with lists, accessing tuples, operations, functions, methods.	**12**
III	**Functions and Modules**	Defining and calling a function, types of functions, function arguments, anonymous functions, Global and local functions, importing module, math module, random module, packages, and composition.	**12**
IV	**Exception handling and OOPS concept**	Exception, except clause, Try? Finally clause, user defined exceptions, class, object, attributes, inheritance, and overloading, overriding, data hiding.	**12**
Total			**48**

Text Book:

1. *Think Python: How to Think Like a Computer Scientist,* Downey, Allen B., 2nd Edition, 2012, O'Reilly

Reference Books:

1. Charles Severance, *Python for Everybody: Exploring Data in Python 3*, 1st Edition, 2017, Shorff Publishers

Facilitating the Achievement of Course Learning Outcomes

Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
i. Understand the modern version control tools with a Linux command line environment. ii. Understand the role of testing in scientific computing, and write unit tests in Python. iii. Use command line tools to write and edit code to perform mathematical calculations and scientific simulations. iv. Produce publication-ready graphics from a dataset.	i) Each topic to be expounded with adequate examples. ii) Class discussions and question- answer rounds are encouraged iii) theoretical problems solving is part of the class to grasp the underlying concepts iv) Students have to go through case studies for real time experience v) Students to be encouraged to give short presentations.	(a) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on □ Assignments □ Class tests. □ viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations: 70 marks.

Paper VII/Subject Name: Robotics		Subject Code: INT054D806
L-T-P-C – 4-0-0-4	Credit Units: 04	Scheme of Evaluation: T

Objective:

The objectives of the course are:

- To teach about the basics of robot
- To explain about end effectors and robot controls and Robot Transformations and Sensors

Prerequisites: Fundamentals of Artificial Intelligence

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Introduction**	Robot anatomy-Definition, law of robotics, History and Terminology of Robotics-Accuracy and repeatability of Robotics-Simple problems- Specifications of Robot-Speed of Robot-Robot joints and links-Robot classifications-Architecture of robotic systems-Robot Drive systems-Hydraulic, Pneumatic and Electric system	**12**
II	**End Effectors and Robot Controls**	Mechanical grippers-Slider crank mechanism, Screw type, Rotary actuators, cam type-Magnetic grippers-Vacuum grippers-Air operated grippers-Gripper force analysis-Gripper design- Simple problems-Robot controls-Point to point control, Continuous path control, Intelligent robot-Control system for robot joint-Control actions-Feedback devices-Encoder, Resolver, LVDT-Motion Interpolations-Adaptive control.	**12**
III	**Robot Transformation and Sensors**	Robot kinematics-Types- 2D, 3D Transformation-Scaling, Rotation, Translation- Homogeneous coordinates, multiple transformation-Simple problems. Sensors in robot – Touch sensors-Tactile sensor – Proximity and range sensors – Robotic vision sensor-Force sensor-Light sensors, Pressure sensors.	**12**
IV	**Robot Cell Design and Applications**	Robot work cell design and control-Sequence control, Operator interface, Safety monitoring devices in Robot-Mobile robot working principle, actuation using MATLAB, NXT Software Introductions-Robot applications- Material handling, Machine loading and unloading, assembly, Inspection, Welding, Spray painting and undersea robot.	**12**
Total			**48**

Text Book:

1. *Robotics Technology and flexible automation*, Deb,S. R., 2009, Tata McGraw-Hill Education.
2. *Kinematic Analysis of Robot manipulators*, Crane, Carl D. Duffy, Joseph, 1st Edition, 2008, Cambridge University Press.

Reference Books:

1. Raman, P.A. Janaki, *Robotics and Image Processing an Introduction*, Tata McGraw Hill Publishing

2. Fu. K. S., Gonzalez. R. C. & Lee C.S.G., *Robotics control, sensing, vision and intelligence*, McGraw Hill Book co.

Facilitating the Achievement of Course Learning Outcomes

Learning Outcomes	**Teaching and Learning Activity**	**Assessment Tasks**
•Learn about Robot cell design and applications •Know about Micro/Nano robotic systems	i) Each topic to be expounded with adequate examples. ii) Class discussions and question- answer rounds are encouraged iii) theoretical problems solving is part of the class to grasp the underlying concepts iv) Students have to go through case studies for real time experience v) Students to be encouraged to give short presentations.	(a) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on □ Assignments □ Class tests. □ viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations: 70 marks.

Paper VIII/Subject Name: Neural Networks and Fuzzy Logic		Subject Code: INT054D807
L-T-P-C – 4-0-0-4	Credit Units: 04	Scheme of Evaluation: T

Objective:

The objectives of the course are:

- To teach the concepts of artificial neural networks
- To explain the basic theory and algorithm formulation of Fuzzy logic.
- To describe real world problems

Prerequisites: Concepts of Artificial Intelligence and Mathematics

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Introduction**	Biological neurons and McCulloch and Pitts models of neuron, Types of activation functions, Neural networks architectures, Linearly separable and linearly non-separable systems and their examples, Features and advantages of neural networks over statistical techniques, Knowledge representation, learning process, error-correction learning, concepts of supervised learning, and unsupervised learning, Applications of Neural Networks	**12**
II	**Supervised and Unsupervised Learning Neural Networks**	Single layer perception and multilayer perceptron neural networks, their architecture, Error back propagation algorithm, generalized delta rule, learning factors, step learning, Momentum learning, Concept of training, testing and cross-validation data sets for design and validation of the networks. Competitive earning networks, kohonen self-organizing networks, K-means and LMS algorithms, RBF neural network, its structure and Hybrid training algorithm for RBF neural networks, Comparison of RBF and MLP networks Learning, Vector Quantization neural network architecture and its training algorithm, Hebbian learning, Hopfield networks.	**12**
III	**Fuzzy Logic**	Basic Fuzzy logic theory, sets and their properties, Operations on fuzzy sets, Fuzzy relation and operations on fuzzy relations and extension principle, Fuzzy membership functions and linguistic variables, Fuzzy rules and fuzzy reasoning, Fuzzification and defuzzification and their methods, Fuzzy inference systems, Mamdani Fuzzy models, and Fuzzy knowledge based controllers	**12**
IV	**Applications of Fuzzy Logic and Fuzzy Systems**	Fuzzy pattern recognition, Fuzzy image processing, Simple applications of Fuzzy knowledge based controllers like washing machines, traffic regulations, and lift control	**12**
Total			**48**

Text Books:

1. *Neural Networks, Fuzzy Logic, and Genetic Algorithms,*Rajsekaran and G. A. Vijaylakshmi Pai,1st Edition, 2003, PHI

2. *Neural Network- A Comprehensive Foundation,* Simon Haykin, 2nd Edition, 9th Reprint, 2005, Pearson Education

Reference Books:

1. Timothy J. Ross, *Fuzzy Logic with Engineering Applications*, 3rd Edition, 2010, Wiley India Publications
2. Laurence Fausett, *Fundamentals of Neural Networks*, 1st Edition, 2004, Pearson Education
3. S. N. Sivanandam, S. Sumathi, and S. N. Deepa, *Introduction to Neural Network Using MATLAB*, 1ST Edition, 2012, Tata McGraw-Hill Publications

Facilitating the Achievement of Course Learning Outcomes

Learning Outcomes	**Teaching and Learning Activity**	**Assessment Tasks**
•Know about different neural networks, their architecture and training algorithm. •Learn the concept of Fuzzy logic, Fuzzy Sets, fuzzy rules and fuzzy reasoning •Get exposed to the applicability of neural networks and fuzzy logic	i) Each topic to be expounded with adequate examples. ii) Class discussions and question- answer rounds are encouraged iii) theoretical problems solving is part of the class to grasp the underlying concepts iv) Students have to go through case studies for real time experience v) Students to be encouraged to give short presentations.	(a) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on □ Assignments □ Class tests. □ viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations: 70 marks.

11. Detailed Syllabus of Ability Enhancement Elective Courses

Paper VIII/Subject Name: Office Automation		**Subject Code: INT052S301**
L-T-P-C – 2-0-0-2	**Credit Units: 02**	**Scheme of Evaluation: TP**

Objective:

The objectives of the course are:

- To give the students fundamentals of Office Automation using Computers.
- To give the students concepts of Document creation and management using software available under Office Suites.
- To give the students concepts of Spreadsheet management using software available under Office Suites.
- To give the students concepts of Presentation management using software available under Office Suites.

Prerequisites: None

Detailed Syllabus:

Modules	**Topics**	**Course content**	**Hours**
I	**Office Automation Fundamentals**	Overview of Personal Computing Software, Installation of Operating System, Installation of Utility Software and Applications. Use of System Tools for disk management, different file formats, file & directory managers, GUI, partitions, Networking tools and application, Web Browning, use of Web Browsers, Multimedia applications, Printer/Scanner software, Image editing.	**6**
II	**Document Management**	Creation and management of text documents using MS-Word/Open-Office Writer/Libre-Office Writer. Text formatting, Paragraph formatting, handling colors, page-numbering, tables, layouts, cut-copy-paste, handling graphics and shapes, multiple columns, page settings, mail-Merge, printing, using built-in templates.	**6**
III	**Spreadsheet Management**	Creation and management of spreadsheets and workbooks using MS-Excel/Open-Office Calc/Libre-Office Calc. Cell formatting, handling colors, layouts, cut-copy-paste, page settings, printing, cell editing commands and functions, using mathematical functions, using logical operators, generating graphs and charts.	**6**
IV	**Presentation Management**	Creation and management of presentation slides using MS-PowerPoint/Open-Office Impress/Libre-Office Impress. Adding slides, Text formatting, Paragraph formatting, handling colors, slide-numbering, tables, layouts, cut-copy-paste, handling graphics and shapes, slide settings, printing handouts, using built-in design templates, adding animations, controlling shows.	**6**
Total			**24**

Text Books:

1. *PC Software: Made Simple,*S. C. Jain, 1st Edition, 2004, BPB.
2. *PC Software Made Easy (Sixteen-In-One),* Ramesh Bangia, 2009 Edition, 2014, Arihant.

Reference Books:

1. Raja Raman, *Fundamentals* of *Computers,* 5th Edition, 2010, Prentice Hall of India.
2. Gautam Roy, *PC Software and IT Tools*, 1st Edition, 2008, S. Chand.
3. Patrick Bultema, *PC Software Essentials: A 4-In-1 Guide to the Most Popular PC Programs*. 1998.

Facilitating the Achievement of Course Learning Outcomes

MODULE	COURSE LEARNING OUTCOMES	TEACHING AND LEARNING ACTIVITY	ASSESSMENT TASK
I	Have adequate idea on Office Automation using Computers.	Written tests, assignments, quizzes, presentations as announced by the instructor in the class.	(a)Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 markson • Assignments • classtests. • viva-voce or presentation (c)Mid-term examinations :10 marks (d)Class attendance -5 marks (e) End-term examinations.-70 marks.
II	Have expertise on Document creation and management using software available under Office Suites.		
III	Have expertise on Spreadsheet management using software available under Office Suites.		
IV	Have expertise on Presentation management using software available under Office Suites		

Paper VIII/Subject Name: Problem Solving using C++		Subject Code: INT052S401
L-T-P-C – 2-0-0-2	Credit Units: 02	Scheme of Evaluation: TP

Objective:

The objectives of the course are:

- Acquire an understanding of basic object-oriented concepts and the issues involved in effective class design.
- Write C++ programs that use: object-oriented concepts such as information hiding, constructors, destructors, inheritance

Prerequisites: Basics of Computer Programming

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Introduction**	What is Object Oriented Programming? Why we need Object Oriented Programming? Programming characteristics of OOP. Difference between OOP and procedure-oriented programming; Basic Concepts of OOPs, feature of OOPs, Application of OOPs, and. Review of Data Types (user define and derived data types), Keywords, Tokens, Identifies, Constants, Reference variables, different Operators and Control statements	**6**
II	**Classes and Objects**	Introduction to Objects and classes, Difference between Class and Structure, Class definition and syntax, Defining member functions, Access control to other functions (Private, Public, Protected). Objects-Dynamic Creation and initialization, Passing and Returning objects, Object assignment and array of objects, Constructors-Types, Destructors, Nesting member function, Private member function, Inline functions, Static class members, Function prototyping, Call by reference, Return by reference, Default Argument, Friend functions, this pointer	**6**
III	**Inheritance**	Types of Inheritance; Base and Derived classes – Syntax of derived classes, access to the base class; Types of Inheritance,Multiple inheritance – Virtual Base classes, Constructors and Destructors in Inheritance, Abstract Class.	**6**
IV	**Polymorphism**	Compile time (Early/Static binding)-Overloading functions and operators, Overloading new and delete operators; Run time polymorphism(Late/Dynamic Binding) – Virtual functions, Pure Virtual functions, Virtual Destructors, Review of Virtual base classes,	**6**
Total			**24**

Text Books:

1. *Object Oriented Programming With C++,* E. Balaguruswamy, 4th Edition, 2011,Tata McGraw Hill.
2. C++, *The Complete Reference,* Herbert Schildt, 4th Edition, 2017, McGraw Hill Education.

Reference Books:

1. Deital and Deital, *C++ How To Program,* 9th Edition, 2016, Pearson Education India.
2. R. Lafore, *Object Oriented Programming In Turbo C++*, 4th Edition, 2013, Galgotia, New Delhi
3. P.B. Mahapatra, *Thinking In C-Including Object Oriented Programming With C++*, 1998, Wheeler Publishing

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching And Learning Activity	Assessment Task
I	Learns about the various concepts associated with object oriented programming.	Written tests, assignments, quizzes, presentations as announced by the instructor in the class.	(a)Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 markson • Assignments • classtests. • viva-voce or presentation (c)Mid-term examinations :10 marks (d)Class attendance -5 marks (e) End-term examinations.-70 marks.
II	Learns to implement class and object, the concept of member functions, data members, constructors and destructors.		
III	Learns about the concept of inheritance and its types.		
IV	Learns about polymorphism.		

Paper IX/Subject Name: General Aptitude and Quantitative Reasoning		Subject Code: INT054S701
L-T-P-C – 2-0-0-2	Credit Units: 02	Scheme of Evaluation: T

Objective:

The objectives of the course are:

- To formulate the problem quantitatively and use appropriate arithmetical, and/or statistical methods to solve the problem.
- To demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.
- To interpret quantitative information (i.e., formulas, graphs, tables, models, and schematics) and draw implications from them.

Prerequisites: None

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Quantitative Aptitude-I**	Profit loss, ratio, proportion, Sequence and series, permutation, Probability	**6**
II	**Quantitative Aptitude-II**	Simple interest, Combination, Number system, Compound Interest, Surds, Logarithm.	**6**
III	**Reasoning-I**	Logical Reasoning basics, Coded Inequalities, Alphanumeric series	**6**
IV	**Reasoning-II**	Syllogism, Input and Output, Coding and Decoding.	**6**
Total			**24**

Text Books:

1. *Quantitative Aptitude*, Dr. R.S. Aggarwal, Old Edition, 2008, S.Chand Publication, New Delhi.
2. *A Modern Approach to Verbal & Non- Verbal Reasoning* , Dr. R.S Agarwal , 2016 Edition, S.Chand Publication, New Delhi.

Reference Books:

1. Abhijit Guha, *Quantitative Aptitude for Competitive Examinations*, 4th Edition, 2014, McGraw Hill Education
2. Arun Sharma, *How to Prepare for Logical Reasoning for the CAT*, 2015, McGraw Hill Education

Facilitating the Achievement of Course Learning Outcomes

Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
•Formulate the problem quantitatively and use appropriate arithmetical, and/or statistical methods to solve the problem. •Recall Formulae. •Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions. •Interpret quantitative information (i.e., formulas, graphs, tables, models, and schematics) and draw implications from them. Critically evaluate various real life situations by resorting to analysis of key issues and factors	i) Each topic to be expounded with adequate examples. ii) Class discussions and question-answer rounds are encouraged iii) theoretical problems solving is part of the class to grasp the underlying concepts iv) Students have to go through case studies for real time experience v) Students to be encouraged to give short presentations.	(a) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 marks on □ Assignments □ Class tests. □ viva-voce or presentation (ii) Mid-term examinations :10 marks (iii) Class attendance -5 marks (c) End-term examinations: 70 marks.

12. Detailed Syllabus of Generic Electives

Paper VI/Subject Name: Computer Fundamentals		**Subject Code: INT052G101**
L-T-P-C – 3-0-0-3	**Credit Units: 03**	**Scheme of Evaluation: T**

Objective:
The objectives of the course are:

- To give the students the basic idea about Computer Systems.
- To explain about the various components of a computer system.
- To teach issues related to data processing with computers.
- To give the students idea about computer software and computer programming.

Prerequisites: None
Detailed Syllabus:

Modules	**Topics**	**Course content**	**Periods**
I	**Computer Appreciation and Organization**	Overview of Computers, Characteristics, Block Diagram, Types of Computers and features, Applications, Types of Memory, I/O Devices, Number Base Systems, Central Processing Unit - Processor Speed, Cache, Memory, RAM, ROM, Booting, Memory- Secondary Storage Devices: Floppy and Hard Disks, Optical Disks CD-ROM, DVD, Mass Storage Devices: USB thumb drive. Managing disk Partitions, File System Input Devices - Keyboard, Mouse, joystick, Scanner, web cam, Output Devices- Monitors, Printers – Dot matrix, inkjet, laser, Multimedia- What is Multimedia, Text, Graphics, Animation, Audio, Images, Video; Multimedia Application in Education, Entertainment, Marketing. Names of common multimedia file formats, Computer Software- Relationship between Hardware and Software; System Software, Application Software, Compiler, names of some high level languages, free domain software.	**9**
II	**Operating Systems**	Definition of Operating System Objectives, types, and functions of Operating Systems, Microsoft Windows- An overview of different versions of Windows, Basic Windows elements, File management through Windows. Using essential accessories: System tools – Disk cleanup, Disk defragmenter, Entertainment, Games, Calculator, Imaging – Fax, Notepad, Paint, WordPad. Command Prompt- Directory navigation, path setting, creating and using batch files. Drives, files, directories, directory structure. Application Management: Installing, uninstalling, Running applications. Linux- An overview of Linux, Basic Linux elements: System Features, Software Features, File Structure, File handling in Linux: H/W, S/W requirements, Preliminary steps before installation, specifics on Hard drive repartitioning and booting a Linux system.	**9**
III	**Computer Software and Virus**	Need, Types of Software's – System Software, Application Software. System Software – Operating System, utility Program, Programming languages, Assemblers, Compilers and Interpreter. Types of software, systems software, GUI, Operating System– Functions, Types-Batch, Single, Multiprogramming, and Multiprocessing. Programming Languages – Machine, Assembly, High level, 4GL their merits and demerits. Application Software – Word Processing, Spread sheet, presentation Graphics, Data Base Management Software, Characteristics, uses and examples and area of application of each of them. Virus working principals, Types of Viruses, Virus detection and Prevention, Virus detection and Prevention	**9**

IV	Information Technology and Society	Indian IT Act, Intellectual Property Rights – issues. Application of information Technology in Railways, Airlines, Banking, Insurance, Inventory Control, Financial systems, Hotel management, Education, Video games, Telephone exchanges, Mobile phones, Information kiosks, special effects in Movies.	**9**
Total			**36**

Text Books:

1. *Information Technology: The Breaking Wave*, Dennis P Curtain, 1st Edition, 2017, McGraw Hill.
2. *Introduction to Computers*, Peter Norton, 7th Edition, 2017, McGraw Hill.

Reference Books:

1. S. K. Bansandra*, Computer Today*,1st Edition, 1995, Galgotia publication Pvt. Ltd.
2. E. Balaguruswamy,*Fundamentals of Computers*,1st Edition, 2009, McGraw Hill.
3. P.K. Sinha,*Computer Fundamentals*,6th Edition, 2004, BPB.

Facilitating the Achievement of Course Learning Outcomes

Course Learning Outcomes	**Teaching And Learning Activity**	**Assessment Task**
On completion of this course students will be expected to: • Have the basic idea about Computer Systems and the various components of a computer system. • Learn data processing with computers, computer software and computer programming.	Written tests, assignments, quizzes, presentations as announced by the instructor in the class.	(a)Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 markson • Assignments • classtests. • viva-voce or presentation (ii)Mid-term examinations :10 marks (iii)Class attendance -5 marks (c) End-term examinations.-70 marks.

Paper VI/Subject Name: Introduction to Computing	Subject Code: INT052G102/ INT052G306	
L-T-P-C – 3-0-0-3	Credit Units: 03	Scheme of Evaluation: T

Objective:

The objectives of the course are:

- To give the students an introduction to the Computers and Computing environments.
- To give the students exposure to computer programming.
- To give the students exposure to the C programming language and basic and advanced concepts of C programming.
- To make the students capable of using C programming to solve basic as well as advanced computing problems.

Prerequisites: None

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Overview of C**	Importance of C, sample C program, C program structure, executing C program. Variables, Data Types, Constants: integer constant, real constant, character constant, string constant; Character set, C tokens, keywords and identifiers, variables declaration, Assigning values to variables, Assignment statement, declaring a variable as constant, as volatile. Categories of operator- Arithmetic, Relational, logical, assignment, increment, decrement, conditional, bitwise and special operators; arithmetic expressions, precedence and associativity of operators, type conversions, mathematical functions	**9**
II	**Decision Making and Branching Statements**	if statement, if…..else statement, nested if…. else statement , switch….case statement, goto statement. Definition of loop, categories of loops, for loop while loop, do-while loop, break statement, continue statement	**9**
III	**Arrays and Functions**	Arrays Declaration and accessing of one & two-dimensional arrays, initializing two-dimensional arrays, multidimensional arrays.. Functions The form of C functions, Return values and types,return statement, calling a function, categories of functions, Nested functions, Recursion, functions with arrays, call by value, call by reference , storage classes.	**9**
IV	**Structures, Unions and Pointers**	Defining, giving values to members, initialization and comparison of structure variables, array of structure, array within structure, structure within structure, structures and functions, unions. Definition of pointer, declaring and initializing pointers, accessing a variable through address and through pointer, pointer expressions, pointer increments and scale factor, pointers and arrays, pointers and functions, pointers and structures.	**9**
Total			**36**

Text Book:

1. *Computer Fundamentals and Programming in C,* Reema Thareja, 2nd Edition, 2016, Oxford University Press, Delhi.

Reference Books:

1. E Balaguruswamy, *Computing Fundamentals and C Programming*, 1st Edition, 2017, McGraw Hill.
2. Venugopal and Prasad, *Mastering C*, 2nd Edition, 2017, Tata McGraw Hill.
3. Yashawant Kanetkar, *Let us C,* 15th Edition, 2017, BPB Publication.

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching And Learning Activity	Assessment Task
I	Learn about C program, variables, data types, constants, categories of operator, type conversions, mathematical functions.	Written tests, assignments, quizzes, presentations as announced by the instructor in the class.	(a)Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 markson • Assignments • classtests. • viva-voce or presentation (ii)Mid-term examinations :10 marks (iii)Class attendance -5 marks (c) End-term examinations.-70 marks.
II	Understand about if statement, if…..else statement, nested if, Definition of loop, categories of loops.		
III	Understand about Array Declaration, multidimensional arrays, functions Nested functions, Recursion, storage classes		
IV	Learn about pointer, pointers and arrays, pointers and functions, pointers and structures.		

Paper VI/Subject Name: Fundamentals of Web Design		Subject Code: INT052G202
L-T-P-C – 3-0-0-3	Credit Units: 03	Scheme of Evaluation: T

Objective:

The objectives of the course are:

- To explain the basics of internet and www.
- To teach developing HTML pages.
- To explain designing of web pages using HTML and CSS.
- To impart the knowledge of advanced web development to design professional looking web pages.

Prerequisites: None

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Internet and WWW**	What is Internet? : A Network of Networks, Gateway; History of the Internet: Connecting to the Internet, Internet Service Providers, DNS Servers, Connection Types, Modems, Connecting to the Internet using Dialup Networking; Web Browsers; Using Web Browser; How does the Internet Work?; Routers; What you can do with the Internet; Origins and Development of the Internet; How Internet Standards are Developed; Moving Data across the Internet: Internet Addresses Introduction to world wide Web, Web Pages and Contents, Web Clients, Web Servers, Web Applications, Websites – Home Pages: Web Site Development ; How to Builds Web Sites? , Web Content Authoring, Web Graphics Design, Web Programming, Webserver Administration, Protocols, Search Engines & Search Engines, Plug-ins, FTP Applications	**9**
II	**HTML**	History of HTML, Introduction to URI: Fragment Identifier & Relative Uniform Resource indicator, Standard Generalized Markup Language, Structure of HTML document, Switching between your Editor and Browser, Structuring Web Page, Paragraph and Line Break Tags, Adding Comments, Formatting your Text; Creating Lists: Ordered List Tags, Unordered List Tag Creating Hyper Text Links, Linking to a File or Data Object. Inserting Images; Creating Image Links; Horizontal Rules: Changing the Height of a Horizontal Rule, Changing between Shaded and Un-shaded Horizontal Rule, Changing the Width of a Horizontal Rule, Setting the Alignment of a Horizontal Rule; Address Tag; Working with text; Using a Background Image; Marquee Tag Tables, Frames, Forms: What is Form?, Form Tag, Method, Action, Input Tag, Type Attribute: Check box, Hidden, Image, Radio, Reset, Submit, Text; Other <INPUT> attributes: Value, SRC, Checked, Size, Max length, Align, Select tag, Text Area, CGI, Get, Post.	**9**
III	**CSS and XML**	Using the style Attribute, Creating Classes and IDs, Generating External Style Sheets, Typography, Consistency, Types of styles, Specifying class within HTML document, Style placement: Inline style, Span & div tags, header styles, Text and font attributes: Font Vs CSS, changing fonts, text attributes, Advance CSS properties: Backgrounds, Box	**9**

		properties and Positioning. XML: Need for XML, Structured Data and Formatting, Advantages of XML, SGML, XML, and HTML, World Wide Web Consortium (W3C) Specifications and Grammars, XML Applications and Tools, Creating and Viewing XML Documents, Transforming XML Documents, XML Document Syntax, Validating XML Documents with DTDs, XML Namespaces	
IV	**Javascript**	Introduction to JavaScript: Utility of JavaScript, Evolution of the JavaScript Language, JavaScript Versions and Browser Support, Differences Between Client-Side vs. Server-Side JavaScript, Statements and Operators, Variable Declarations, Assignment Operators and Statements, Arithmetic Operators, Logical Operators, Comparison Operators, String Operators, Conditional Operators, Operator Precedence; Implementing Control Constructs: Conditional and Looping Constructs, Implementing Functions: Defining Functions, Calling Functions, Passing Arguments, Local vs. Global Variables, Using the Return Statement, Nested Functions; JavaScript Objects: The JavaScript Object Model and Hierarchy, Form Validation and Testing, Form Validation and Testing	**9**
Total			**36**

Text Books:

1. *Web Technologies- A Computer Science Perspective*, Frey C. Jackson, 1st Edition, 2006, Pearson Education

Reference Books:

1. Robert. W. Sebesta, *Programming the World Wide Web*, 4th Edition, 2007, Pearson Education.
2. Deitel, Deitel, Goldberg, *Internet & World Wide Web How to Program*, 3rd Edition, 2006, Pearson Education.
3. Marty Hall and Larry Brown, *Core Web Programming*, 2nd Edition, Volume I and II, 2001, Pearson Education.

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching And Learning Activity	Assessment Task
I	Learn about Web Browsers, world wide Web, Web Servers, Web Applications, Websites Web Graphics Design, Web Programming, FTP Applications etc.	Written tests, assignments, quizzes, presentations as announced by the instructor in the class.	(a)Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 markson • Assignments • classtests. • viva-voce or presentation (ii)Mid-term examinations :10 marks (iii)Class attendance -5 marks (c) End-term examinations.-70 marks.
II	Understand about different HTML Tags. Web design examples.		
III	Understand about Form Tag, Method, Action, Input Tag, Type Attribute, Check box, Image, Radio, Reset, Submit, CGI, Get, Post etc.		
IV	Learn about CSS advanced topics and XHTML basics.		

Paper VII/Subject Name: Python Programming	Subject Code: INT052G203/INT052G402	
L-T-P-C – 3-0-0-3	Credit Units: 03	Scheme of Evaluation: T

Objective:

The objectives of the course are:

- To know the basics of algorithmic problem solving
- To read and write simple Python programs.
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures –- lists, tuples, dictionaries.

Prerequisites: Fundamentals of Computer Programming

Detailed Syllabus:

Modules	Topics	Course content	Hours
I	**Algorithmic Problem Solving**	Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). **Illustrative problems:** find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.	**9**
II	**Data, Expressions, Statements**	Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; **Illustrative programs:** exchange the values of two variables, circulate the values of n variables, distance between two points.	**9**
III	**Control Flow, Functions**	Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. **Illustrative programs:** square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.	**9**
IV	**Lists, Tuples, Dictionaries**	Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing – list comprehension; **Illustrative programs:** selection sort, insertion sort, mergesort, histogram.	**9**
Total			**36**

Text Books:

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

Reference Books:

1. Timothy A. Budd, *Exploring Python*, 2015, Mc-Graw Hill Education (India) Private Ltd.
2. Kenneth A. Lambert, *Fundamentals of Python: First Programs*, 2nd Edition, 2012, CENGAGE Learning.
3. Charles Dierbach, *Introduction to Computer Science using Python: A Computational Problem-Solving Focus*, 1st Edition, 2013, Wiley India Edition.

Paul Gries, Jennifer Campbell and Jason Montojo, *Practical Programming: An Introduction to Computer Science using Python 3*, 2nd edition, 2013, Pragmatic Programmers, LLC.

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching And Learning Activity	Assessment Task
I	Structure simple Python programs for solving problems.	Written tests, assignments, quizzes, presentations as announced by the instructor in the class.	(q) Participation in class discussions (b) Continuous Evaluation(30Marks) (i)15 markson • Assignments • classtests. • viva-voce or presentation (xxxviii) Mid-term examinations :10 marks (xxxix) Class attendance -5 marks (c) End-term examinations.-70 marks.
II	Learn about the various data expressions and statements and the working of the python interpreter.		
III	Learn about the chained control and looping statements along with the working of local and global variables, scoping rules, arrays, slices, lists and to decompose a python program into functions.		
IV	Represent compound data using Python lists, tuples, dictionaries..		

Paper VII/Subject Name:Windows Programming using C#		Subject Code: INT052G301
L-T-P-C – 3-0-0-3	Credit Units: 03	Scheme of Evaluation: T

Objective:

The objectives of the course are:

- Create, compile and run object-oriented C# programs using Visual Studio
- Write and understand C# language constructs, syntax and semantics
- Develop reusable .NET components via interface realization and standard design patterns
- Leverage the major namespaces and classes of the .NET Framework

Prerequisites: None

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Introduction to .Net and C#, Literals, Variables and Data Types, Operators and Expressions:**	The C# Environment: .NET Framework – An Overview, Components of .NET , Common Language Specification (CLS), Common Language Runtime (CLR), Microsoft Intermediate Language ("MSIL" or "IL"), The Common Type System (CTS), .NET Framework Base Classes, Web Services, Web Forms, and Windows Forms, The .Net Languages. Object Oriented Concepts, C# Program – Execution, Sample Programs, Command Line Arguments, Programming Examples, And Multiple Main Methods. Keywords, Identifiers, Literals, Variables, Data Types, Boxing and Unboxing. Operator Precedence and Associativity, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operators, Bitwise Operators, Special Operators, Type Conversions.	**9**
II	**Branching and Looping Structure, Arrays and Strings, Methods in C#, Structures and Enumerations**	Decision Making Statements, The Switch Statement, The? Operator, Decision Making and Looping, Jumps in Loops, Labelled Jumps. Single Dimensional Arrays, Multidimensional Arrays, Jagged Arrays, System. Array Class, Array List Class, Strings, Regular Expressions. Declaring Methods, Main Method, Invoking Methods, Nesting of Methods, Method Parameters. Structures- Defining a Structure, Assigning Values to Members ,Copying Structures , Structures with Methods , Nested Structures , Classes Vs Structures, Guidelines to use Structures; Enumerations- Enumerator Initialization, Enumerator Base Types, Enumerator Type Conversion.	**9**
III	**Classes and Objects, Inheritance and Polymorphism, Exception Handling**	Constructors & Destructors, Member Initialization, 'this' Reference Variable, Nesting of Classes, Members, Properties. Classical Inheritance, Containment Inheritance, Defining a Subclass, Visibility Control, Subclass Constructor, Method Overriding, Hiding Methods, Abstract Classes, Abstract Methods, Sealed Classes, Sealed Methods, Polymorphism. Exceptions – An Overview, Exception Handling Syntax, Multiple Catch Statements, The Exception Hierarchy, General Catch Handler, Using 'Finally', Nested Try Blocks, User Defined Exceptions, Operators – Checked and Unchecked.	**9**
IV	**Interfaces, Delegates and Events, Managing Console I/O Operations, Windows and Web Application Development:**	Defining Interfaces, Extending Interfaces, Implementing Interfaces, Explicit Interface Implementation, Abstract Classes and Interfaces, Delegates, Multicast Delegates, Events. The Console Class, Console Input and Output, Formatted Output, Custom Numeric Format. Developing Windows Applications, Developing Web Applications.	**9**
Total			**36**

Text Book:

1. *Programming in C#*, E Balagurusamy, 3rd Edition, 2010, Tata McGraw Hill , New Delhi

Reference Books:

1. Poul Klausen, *Introduction to programming and C# Language*, Bookbon, 1st 2012, New Delhi.

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching And Learning Activity	Assessment Task
I	Learning basic C# constructs and writing and compiling C# programs using Visual Studio.	Written tests, assignments, quizzes, presentations as announced by the instructor in the class.	(r) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 markson • Assignments • classtests. • viva-voce or presentation (xl) Mid-term examinations :10 marks (xli) Class attendance -5 marks (c) End-term examinations.-70 marks.
II	Learn about looping structures, arrays and structures in C#.		
III	Building C# classes and inheritance hierarchies		
IV	Writing desktop applications with Windows Forms and Web Forms, constructing and deploying custom .NET components, writing multithreaded applications and organizing synchronize access to shared resources and accelerating development with the .NET Framework library		

Paper VI/Subject Name: Intellectual Property Rights and Cyber Law		Subject Code: INT052G302
L-T-P-C – 3-0-0-3	Credit Units: 03	Scheme of Evaluation: T

Objective:

The objectives of the course are:

- To inculcate the significance of Cyber space.
- To enlighten the various legal, social and international issues and the various remedies available under the Information Technology Act for the breach and commission of offence in cyber space.
- To outlines international best practices and the various legal mechanisms to control the various offences in the cyberspace

Prerequisites: None

Detailed Syllabus:

Modules	Topics	Course content	Hours
I	**Introduction to Intellectual Property Rights**	Introduction, History of IPR in India, Overview of Laws related to Intellectual Property Rights in India, Major forms of IPR- Copyright, Patent.	**9**
II	**Advanced issues in IPR**	Other forms of IPR- Trademark, Designs, Geographical Indications of Goods, Semiconductor Integrated Circuits Design, Biological Diversity, Protection of Plant Varieties and Farmer Rights, Undisclosed Information. Indian Intellectual Property- Administrative Machinery. The Agreement of Trade Related Aspects of Intellectual Property Rights (TRIPS). World Intellectual Property Organization (WIPO). Intellectual Property Treaties. Commercialization of Intellectual Property Rights.	**9**
III	**Introduction to the Cyberspace and Cyber Laws**	Introduction- History of Internet and World Wide Web, Need for cyber law, Cyber-crime on the rise, Important terms related to cyber law. Cyber law in India- Need for cyber law in India, History of cyber law in India, Information Technology Act, 2000, Overview of other laws amended by the IT Act, 2000, National Policy on Information Technology 2012. Overview of the Information Technology Act, 2000, Overview of Rules issued under the IT Act, 2000. Electronic commerce, Electronic contracts.	**9**
IV	**Cyber Crimes & Legal Framework**	Cyber-crimes or Cyber Frauds- Definition of cyber crime, First Cyber crime, Types of cyber frauds, Cyber frauds in India, Preventive measures, Cyber crimes, Who commits cyber-crimes, Penalties and offences under the IT Act, 2000, Offences under other legislations, Investigation of cyber-crimes in India. Regulatory Authorities.	**9**
Total			**36**

Text Books:

1. *IPR and Cyber Laws,* Sunil N. Shah, 1st Edition, 2016, Himalaya Publishing House
2. *Intellectual Property,* William Cornish, 1st Edition, 2014, Oxford University Press

Reference Books:

1. Pankaj Sharma, *Information Security and Cyber Laws*, Reprint Edition, 2013, S K Kataria & Sons Publication

Facilitating the Achievement of Course Learning Outcomes

Module	Course Learning Outcomes	Teaching And Learning Activity	Assessment Task
I	Learn about the laws related to Intellectual Property Rights in India	Written tests, assignments, quizzes, presentations as announced by the instructor in the class.	(s) Participation in class discussions (b)Continuous Evaluation(30Marks) (i)15 markson • Assignments • classtests. • viva-voce or presentation (xlii) Mid-term examinations :10 marks (xliii) Class attendance -5 marks (c) End-term examinations.-70 marks.
II	Learn about various aspects of IPR		
III	An overview of cyber space and cyber law with the context of its implementation in India to inculcate the significance of Cyber space.		
IV	Enlighten the various legal, social and international issues and the various remedies available under the Information Technology Act for the breach and commission of offence in cyber space		