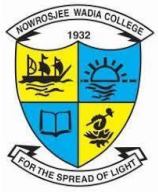


Modern Education Society's

Nowrosjee Wadia College

(AUTONOMOUS)

NAAC Accredited A+ with CGPA 3.51

Affiliated to the
Savitribai Phule Pune University
(Formerly University of Pune)

Four Year B.Sc. (Honors) Degree Program in Information Technology

B.Sc. (Information Technology) (Hons)

(Faculty of Science & Technology)

National Education Policy (NEP) Syllabus
To be implemented from Academic Year 2024-2025

Title of the Course: B.Sc. (Information Technology)

Preamble for the Syllabus:

In compliance with the directives from the University Grants Commission, under the autonomous status of the college, the syllabus for four-year B. Sc. Information Technology at the undergraduate level is revised and reframed as per the National Educational Policy (NEP 2020) curriculum framework. Nowrosjee Wadia College has decided to introduce this programme from AY 2024-25 as the college has already shifted to the autonomous status from the academic year 2022-2023. The present syllabus is prepared by the Board of Studies in Computer Science, Nowrosjee Wadia College, taking into consideration the present relevance and application of the various branches of Computer Science. While preparing this syllabus the U.G.C. model curriculum (LOCF) and existing syllabus given by Savitribai Phule Pune University is followed.

Information Technology (IT) has been evolving as an important branch of science and engineering throughout the world in the last couple of decades and it has carved out a space for itself like any other disciplines of basic science and engineering. Information Technology is a discipline that spans theory and practice and it requires thinking both in abstract terms and in concrete terms. Nowadays, practically everyone is a computer user, and many people are even computer programmers. Information Technology can be seen on a higher level, as a science of problem solving and problem solving requires precision, creativity, and careful reasoning. The ever-evolving discipline of computer science also has strong connections to other disciplines. Many problems in science, engineering, health care, business, and other areas can be solved effectively with computers, but finding a solution requires both computer science expertise and knowledge of the particular application domain.

Information Technology has a wide range of specialties. These include Computer Architecture, Software Systems, Graphics, Artificial Intelligence and Software Engineering. Drawing from a common core of computer science knowledge, each specialty area focuses on specific challenges.

B.Sc. in Information Technology is aimed at undergraduate level training facilitating multiple career paths. Students so graduated, can take up postgraduate programmes in Information Technology leading to research, can be employable at IT industries, or can pursue a teachers" training programme such as B.Ed., in Computer Education, or can adopt a business management career. BSc in Information Technology aims at laying a strong foundation of Information Technology at an early stage of the career along with two other subjects such as Maths and Statistics. There are several employment opportunities and after successful completion of an undergraduate programme in Information Technology, graduating students can fetch employment directly in companies as Web Developer, Software Engineer, Network Administrator, Data Scientist, or AI/ML personnel. The Learning Outcome-based Curriculum Framework in Information.

Objectives:

- To develop an understanding and knowledge of the basic theory of Information Technology with good foundation on theory, systems and applications such as algorithms, data structures, data handling, data communication and computation.
- To develop the ability to use this knowledge to analyse new situations
- To acquire necessary and state-of-the-art skills to take up industry challenges. The objectives and outcomes are carefully designed to suit to the above-mentioned purpose.
- The ability to synthesize the acquired knowledge, understanding and experience for a better and improved comprehension of the real-life problems
- To learn skills and tools like mathematics and statistics to find the solution, interpret the results and make predictions for the future developments.

PROGRAM OUTCOMES (POs):

The Bachelor of Science with Information Technology (BSc with IT) program enables students to attain by the time of graduation following 10 PO's. The course syllabi and the overall curriculum have been designed to achieve these outcomes:

Program Outcome (PO)	Short title	Description A Graduate student in Computer Science will be able to:
PO1	Knowledge outcome	Get fundamental/systematic or coherent knowledge and understanding of Information Technology and its applications.
PO2	Problem Analysis and solution	Procedural knowledge that creates different types of professionals related to Computer Science,
PO3	Development of various allied skills	Develop skills in the area of Software, Hardware and current developments.
PO4	Modern Tool usage	Use knowledge, understanding and skills required for identifying problems and issues, collection of relevant data based on a wide range of sources and their application, analysis and evaluation using methodologies for generating solutions. Undertake hands on lab work and activities that develop practical knowledge and skills in the field of information Technology.
PO5	Environment and Sustainability	Understand, critically analyse and attempt at finding the solutions to various environmental issues and obligate themselves towards sustainable development at the local, national and global context.
PO6	Communication and Leadership	Communicate the results of studies undertaken in an academic field accurately in a range of different contexts using the main concepts, constructs and techniques of the various subjects in Information Technology. Ability to present result using different presentation tools. Communicate proficiently and develop the quality of presentation, good communication, leadership.
PO7	Research skills and Aptitude	Meet one's own learning needs, drawing on a range of current research and development work and professional materials.
PO8	Ethics	Ability to embrace moral/ethical values in conducting one's life, and use/ethical practices in all work. Capable of demonstrating the ability to identify ethical issues related to one's work, void unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights and adopting objective, unbiased and truthful actions in all aspects of work.
PO9	Societal Applications	Ability to formulate, to model, to design solutions, procedure and to use software tools to solve real world problems and evaluate. Attempts at analysing and inspecting varied socio-

		economic issues in computer culture perspective by applying the knowledge to the societal issues.
PO10	Life Skills	Ability to work independently, identify appropriate resources required for a project and manage a project and complete the work.

Eligibility for the Course

XIIth Science or its equivalent examination. All other criteria are same as per Savitribai Phule Pune University rules.

Teaching Scheme:

- The course is a 3 year, 6 semesters full time under graduate course and 1 more year, 2 semester B. Sc. (IT) Honors course.
- The course follows the NEP pattern as per Savitribai Phule Pune University.
- 1 credit theory = 15 hours
- 1 credit practical = 30 hours = 4 hours week per batch

MODERN EDUCATION SOCIETY'S

NOWROSJEE WADIA COLLEGE, PUNE

(An Autonomous College Affiliated to Savitribai Phule Pune University)

Course Structure and other details

For

B. Sc. INFORMATION TECHNOLOGY

(Based on NEP 2020 framework)

(To be implemented from the Academic Year 2024-25)

Structure showing Credits in each semester for a three year Under Graduate programme B. Sc. (Information Technology)

Savitribai Phule Pune University, Pune
Credit Framework for Under Graduate (UG) (2024 – 25) (3 Subject)

Level / Difficulty	Sem	Subject-1				Subject-2	Subject-3	GE/OE	SEC	IKS	AEC	VEC	CC	Total
4.5 / 100	I	2 (T) + 2 (P)				2(T)+2(P)	2(T)+2 (P)	2 (T)	2 (T/P)	2 (T) (Generic)	2 (T)	2	--	22
	II	2 (T) + 2 (P)				2(T)+2(P)	2(T)+2 (P)	2 (P)	2 (T/P)	--	2 (T)	2	2	22
Exit option: Award of UG Certificate in Major with 44 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major and Minor **Continue option**: Student will select one subject among the (subject 1, subject 2 and subject 3) as major and another as minor and third subject will be dropped.														
Level / Difficulty	**Sem**	**Credits Related to Major**				**Minor**		**GE/OE**	**SEC**	**IKS**	**AEC**	**VEC**	**CC**	**Total**
		Major Core	**Major Elective**	**VSC**	**FP / OJT/ CEP**									
5.0 / 200	III	4 (T) + 2 (P)	--	2 (T/P)	2 (FP)	2(T)+2(P)	--	2 (T)	--	2 (T) (Subject Specific)	2 (T)	--	2	22
	IV	4 (T) + 2 (P)	--	2 (T/P)	2 (CEP)	2(T)+2(P)	--	2 (P)	2 (T/P)	--	2 (T)	--	2	22
Exit option: Award of UG Diploma in Major and Minor with 88 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major and Minor														
5.5 /300	V	8(T) + 4(P)	2 (T) + 2 (P)	2 (T/P)	2 (FP/CEP)	2(T)	--	--	--	--	--	--	--	22
	VI	8(T) + 4(P)	2 (T) + 2 (P)	2 (T/P)	4 (OJT)	--	--	--	--	--	--	--	--	22
Total 3 Years		**44**	**8**	**8**	**10**	**18**	**8**	**8**	**6**	**4**	**8**	**4**	**6**	**132**
Exit option: Award of UG Degree in Major with 132 credits OR Continue with Major and Minor														
6.0 /400	VII	6 (T) + 4 (P)	2 (T) + 2 (T/P)	--	--	4 (RP)	4(RM)(T)	--	--	--	--	--	--	22
	VIII	6 (T) + 4 (P)	2 (T) + 2 (T/P)	--	0	8 (RP)	0		0	0	0	0	0	22
Total 4 Years		**68**	**16**	**8**	**2**	**22**	**22**		**12**	**6**	**8**	**4**	**8**	**176**
Four Year UG Honours Degree in Major and Minor with 176 credits **OR**														
6.0 /400	VII	10(T) + 4(P)	2 (T) + 2 (T/P)	0	0	0	4 (RM)		0	0	0	0	0	22
	VIII	10(T) + 4(P)	2 (T) + 2 (T/P)	0	0	4 (OJT)	0		0	0	0	0	0	22
Total 4 Years		**76**	**16**	**8**	**2**	**14**	**22**		**12**	**6**	**8**	**4**	**8**	**176**
Four Year UG Honours with Research Degree in Major and Minor with 160-176 credits														

OE : Open Elective , VSC : Vocational Skill Courses, VEC: Value Education Courses, CC : Co-Curricular Courses, AEC: Ability Enhancement Course, IKS : Indian Knowledge System, OJT : On Job Training, FP : Field Project, CEP : Community Engagement Project

ST : Statistics, EL : Electronics, M : Mathematics

EVALUATION PATTERN :

(i) Each course shall be evaluated with Continuous Evaluation (CE) and Semester-end Examination (SEE) mechanism.

(ii) Theory courses: Continuous Evaluation shall be of 15 marks and Final Assessment shall be of 35 marks.

(iii) Practical courses: Continuous Evaluation shall be of 15 marks and Final Assessment shall be of 35 marks.

(iv) To pass a course of 2 credits, a student has to earn minimum 20 marks out of 50, provided that he/she should earn minimum 6 marks in Continuous Evaluation (out of 15) and minimum 14 marks (out of 35) in End-Semester Examination. That is passing criterion is minimum 40% marks in the examination.

(v) For Continuous Evaluation (out of 15 marks), There has to be one written test of 10 marks (Mid-Semester Examination). The remaining 05 marks shall be based on the continuous evaluation consisting of tutorial, viva, seminars, home-assignments, mini project, survey, group discussion etc.(on approval of Head of the Department) and performance and attendance in the lectures and labs.

(vi) There shall be revaluation of the answer scripts of End-Semester Examination (out of 35 marks) of theory papers only, but not of internal assessment papers as per Ordinance No. 134 A and B.

PATTERN OF THE QUESTION PAPER

Continuous Evaluation (Theory papers)

(1) As a part of Internal Evaluation, there shall be written test (Mid-Semester Examination) of 10 marks. Pattern of the question paper is as follows.

(2) Continuous Evaluation (Mid-Semester Examination of 10 marks, Duration: 45 minutes)

Question No.	Total Marks	No. Of questions	Remarks
Q. 1.	05	Solve any 5 out of 7	Short answer / objective type of questions. Each question carry 1 mark.
Q. 2.	05	Solve any 1 out of 2 questions	Each question carry 5 marks

(3) Semester-End Examination for B. Sc. courses, out of 35 marks, shall be of 2 hours duration. The pattern of the question paper will be as decided by the examination section of the college.

AWARD OF GRADES AND GRADE POINTS

The mapping of percentage to letter grade and grade point (for each course) is given in the following Table.

Sr. No.	Grade Letter	Grade Point	Marks
1.	O (Outstanding)	10	45 <= Marks <=50
2.	A+ (Excellent	9	40 <= Marks <= 44
3.	A (Very Good)	8	35<= Marks <= 39
4.	B+ (Good)	7	27.5 <= Marks <= 34
5.	B (Above Average)	6	25 <=Marks <27.5
6.	C (Average)	5	22.5<= Marks <= 24
7.	D (Pass)	4	20 <= Marks<22.5
8.	F (Fail)	0	Marks< 20
9.	Ab (Absent)	0	

CGPA :The CGPA is the weighted average of the grade points obtained in all courses (theory and Practicals) by a student in all the courses in 6 semesters.

Based on the performance of the student in the Semester Examinations, Nowrosjee Wadia College will declare the results and issue the Semester Grade sheets. Also, the College will declare the results and issue the Grade sheets at the end of the course. The class will be awarded to a student on the basis of CGPA. The award of the class shall be as per the following table

Sr. No.	CGPA	Class of the degree awarded
1	9.50 or more than 9.50	OUTSTANDING (O)
2	8.50 or more but less than 9.50	EXCELLENT (A+)
3	7.50 or more but less than 8.50	VERY GOOD (A)
4	6.25 or more but less than 7.50	GOOD (B+)
5	5.25 or more but less than 6.25	ABOVE AVERAGE (B)
6	4.75 or more but less than 5.25	AVERAGE (C)
7	4.00 or more but less than 4.75	PASS (D)

Semester 1 (First Year)

Year	Semester & Level	Course Type	Choice	Course code and Course Name	Credits
1	1 4.5	Major (Core) Subject 2T 2P	Discipline specific Major I	Problem Solving Using 'C'	**2**
				Laboratory on Problem Solving Using 'C'	**2**
			Discipline specific Major II	Basic Electronics	**2**
				Laboratory on Basic Electronics	**2**
			Discipline specific Major III	Basic Statistics for Information Technology- I	**2**
				Practical based on Basic Statistics for Information Technology- I	**2**
		Generic / Open Elective	OE 1	Open Elective I	**2**
		VSC / SEC VSEC	SEC*	Mathematical Techniques for IT	**2**
		AEC/ VEC / IKS	IKS*	Generic	**2**
			AEC	English	**2**
			VEC*	Environmental Education	**2**
		OJT / FP, CEP, CC, RP	CC	--	**-**
Total credits					**22**

IKS*

Indian Knowledge system is the generic subject which will be common for institution or discipline specific choices be provided for Arts and Science students each.

SEC*

Skill Enhancement Course is to be selected by the students as per their choice. Students will select any one subject as SEC from the three major subjects selected by them.

VEC*

Value Education Course will be Environmental Education for all discipline students.

Semester 2 (First Year)

Year	Semester & Level	Course Type	Choice	Course code and Course Name	Credits
1	2 4.5	Major (Core) Subject 2T 2P	Discipline specific Major I	Web Designing using HTML and CSS	**2**
				Laboratory on Web Designing using HTML and CSS	**2**
			Discipline specific Major II	Sensors and IoT	**2**
				Laboratory on Sensors and IoT	**2**
			Discipline specific Major III	Basic Statistics for Information Technology- II	**2**
				Practical based on Basic Statistics for Information Technology- II	**2**
		Generic / Open Elective	OE 2	Open Elective II	**2**
		VSC / SEC VSEC	SEC*	Software Productivity Tools	**2**
		AEC/ VEC / IKS	AEC	English	**2**
			VEC	Environmental Education	**2**
		OJT / FP, CEP, CC, RP	CC	Cultural Activities, NSS/NCC and Fine/ Applied/ Visual/ Performing Arts	**2**
Total credits					**22**

SEC*

Skill Enhancement Course is to be selected by the students as per their choice. Students will select any one subject as SEC from the three major subjects selected by them.

Semester 3 (Second Year)

Year	Semester & Level	Course Type	Choice	Course code and Course Name	Credits
2	3 5.0	Major (Core) Subject	Major core 4T 2P	Fundamentals of Databases	2
				Introduction to JavaScript	2
				Laboratory Course on Fundamentals of Databases and JavaScript	2
		Major Elective	--	--	--
		VSC / SEC VSEC	VSC	Computer Networks and Internet (Theory/Practical)	2
		OJT / FP, CEP	FP*		2
		Minor	Minor 2T 2P	Advanced statistics for Information Technology- I	2
				Practical based on Advanced Statistics for Information Technology- I	2
		Generic / Open Elective	OE 3	Open Elective III	2
		AEC/ VEC / IKS	IKS*		2
			AEC		2
		CC, RP	CC	Cultural Activities, NSS/NCC and Fine/ Applied/ Visual/ Performing Arts	2
Total credits					**22**

Field Project* (FP)

As per the Government Resolution (GR) of Maharashtra dated 20th April 2023, 17th March 2024, a Field Project (FP) worth 2 credits are required in the third semester of undergraduate (UG) courses. This project is related to the core (Major) subject and is to be offered at the departmental level during the third semester. The field project is designed by the guide and students of the specific subject. Research project is to be completed in any recognized institute / laboratory / research laboratory/ academic institution for 120 Hours.

IKS*

Indian Knowledge System in third semester must be based on core subject and framed by concerned Board of studies.

Semester 4 (Second Year)

Year	Semester & Level	Course Type	Choice	Course code and Course Name	Credits
2	4 5.0	Major (Core) Subject	Mandatory 4T 2P	Relational Database Management Systems	2
				Web Technologies	2
				Laboratory Course on Relational Database Management Systems and Web Technologies	2
		Major Elective	--	--	--
		VSC / SEC VSEC	VSC	Software Engineering (Theory/ Practical)	2
			SEC	Network Administration (Practical)	2
		OJT / FP, CEP	CEP*		2
		Minor	Minor 2T 2P	Advanced Statistics for Information Technology- II	2
				Practical based on Advanced Statistics for Information Technology- II	2
		Generic / Open Elective	OE 4	Open Elective 4	2
		AEC/ VEC / IKS	AEC		2
		CC, RP	CC	Cultural Activities, NSS/NCC and Fine/ Applied/ Visual/ Performing Arts	2
Total credits					**22**

Community Engagement Service* (CEP)

As per the Government Resolution (GR) of Maharashtra dated 20th April 2023, 17th March 2024, A Community Engagement Program (CEP) worth 2 credits are to be completed in the fourth semester by UG students. As per the GR, the CEP is based on the core subject and aims to convey important aspects of that specific subject, including applicable knowledge, scientific advancements, recent information, etc., for the upliftment of the community or society. Students will choose a nearby rural area/ urban area/ any suitable locality to disseminate such information to the community during the fourth semester. At the end of the

semester, students will prepare a report detailing the information provided to the community, in form of discussions, meetings, talks, programs, etc., conducted in the selected area. After submitting the report, students will receive the credits for this component. For CEP, students must find a suitable rural or urban area for providing information to the community, and the college will provide a letter for their placement.

Semester 5 (Third Year)

Year	Semester & Level	Course Type	Choice	Course code and Course Name	Credits
3	5 5.5	Major (Core) Subject	Mandatory 8T 4P	Core Java programming and Data structures	**2**
				Content Management Systems	**2**
				Python Programming	**2**
				Software Quality Assurance and Testing	**2**
				Laboratory Course on Core Java programming and Data structures	**2**
				Laboratory course on Python Programming	**2**
			Major Elective 2T 2P	UI/UX design / Modern Data Management	**2**
				Laboratory Course on UI/UX design / Laboratory Course on Modern Data Management	**2**
		VSC / SEC VSEC	VSC	Laboratory Course on Software Testing Tools (Theory/ Practical)	**2**
		OJT / FP, CEP	FP*/CEP	FP-II	**2**
		Minor	Minor	Applied Statistics	**2**
Total credits					**22**

Field Project* (FP)

As per the Government Resolution (GR) of Maharashtra dated 20th April 2023, 17th March 2024, a Field Project (FP) worth 2 credits are required in the third semester of undergraduate (UG) courses. This project is related to the core (Major) subject and is to be offered at the departmental level during the third semester. The field project is designed by the guide and students of the specific subject. Research project is to be completed in any recognized institute / laboratory / research laboratory/ academic institution for 120 Hours.

Semester 6 (Third Year)

Year	Semester & Level	Course Type	Choice	Course code and Course Name	Credits
3	6 5.5	Major (Core) Subject	Mandatory 8T 4P	Advanced Java Programming	**2**
				Foundations of Data Science	**2**
				Cloud Computing	**2**
				Mobile Application Development	**2**
				Laboratory Course on Advanced Java Programming	**2**
				Laboratory Course on Foundations of Data Science	**2**
			Major Elective 2T 2P	Operating Systems / Blockchain Technologies	**2**
				Laboratory Course on Operating Systems / Blockchain Technologies	**2**
		VSC / SEC VSEC	VSC	Software Development Frameworks (Theory/Practical)	**2**
		OJT / FP, CEP, CC, RP	OJT*	BOOJT 3610 On Job Training	**4**
Total credits					**22**

On Job Training* (OJT)

As per the Government Resolution (GR) of Maharashtra dated 20th April 2023, 17th March 2024, On Job Training (OJT) is a compulsory component in the sixth semester for UG students, carrying 4 credits (120 clock hours). Students participating in OJT will work in industries/ NGOs/ heritage centres / government agencies/ or other suitable organizations designated by the subject teacher / Course co-ordinator/ mentor or Board of Studies. Upon completion of the OJT program, students must submit a report in a prescribed format provided by the college. After submitting the detailed report, students will receive the allocated credits for this component. Students complete 120 clock hours of work throughout the six-month semester without disrupting their regular academic activities. Students opting for OJT will receive a letter from the college to join the selected institution. Hands on training in any recognised research institute / any production company related with core subject for 120 contact hours.

Semester 7 (Fourth Year)

Year	Semester & Level	Course Type	Choice	Course code and Course Name	Credits
4	7 6.0	Major (Core) Subject	Mandatory 10T 4P	DOT NET Framework	**2**
				Full-Stack Development	**2**
				Advanced Operating System	**2**
				Paradigm of Programming Language	**2**
				Object Oriented Analysis and Design	**2**
				Laboratory Course on DOT NET Framework	**2**
				Laboratory Course on Full-Stack Development	**2**
			Major Elective 2T 2(T/P)	Digital Forensics and Cloud Security / Emerging Technology(Theory) / DIP	**2**
				Laboratory Course on Digital Forensics and Cloud Security / Computer Graphics and Animation (Practical) / Laboratory Course on DIP	**2**
		4(RM)	RP*	BORP 478 Research project	**4**
Total credits					**22**

Research Project* (RP)

As per the Government Resolution (GR) of Maharashtra dated 20th April 2023, 17th March 2024, a Research Project (RP) worth 2 credits are required in the third semester of undergraduate (UG) courses. This project is related to the core (Major) subject and is to be offered at the departmental level during the third semester. The field project is designed by the guide and students of the specific subject. Research project is to be completed in any recognized institute / laboratory / research laboratory/ academic institution for 160 Hours.

Semester 8 (Fourth Year)

Year	Semester & Level	Course Type	Choice	Course code and Course Name	Credits
4	8 6.0	Major (Core) Subject	Mandatory 10T 4P	Software Architecture and Design Pattern	**2**
				AI and ML	**2**
				Cyber Security	**2**
				Network Security	**2**
				IOT / Git and GitHub	**2**
				Laboratory Course on Software Architecture and Design Pattern	**2**
				Laboratory Course on AI and ML	**2**
			Major Elective 2T 2(T/P)	Spring Boot and Hibernate OR Go Programming	**2**
				Laboratory Course on Spring Boot and Hibernate OR Laboratory Course on Go Programming	**2**
		OJT (4)			**4**
Total credits					**22**

Research Project* (RP)

As per the Government Resolution (GR) of Maharashtra dated April 20, 2023, 17 March 2024, a Research Project (RP) worth 2 credits are required in the third semester of undergraduate (UG) courses. This project is related to the core (Major) subject and is to be offered at the departmental level during the third semester. The field project is designed by the guide and students of the specific subject. Research project is to be completed in any recognized institute / laboratory / research laboratory/ academic institution for 320 Hours.

MODERN EDUCATION SOCIETY'S

NOWROSJEE WADIA COLLEGE, PUNE

(An Autonomous College Affiliated to Savitribai Phule Pune University)

Syllabus For First Year of

B. Sc. INFORMATION TECHNOLOGY

(Based on NEP 2020 framework)

(To be implemented from the Academic Year 2023-24)

Course Code: Title : Problem Solving Using 'C' Semester I (Major Paper 1) Theory		
Teaching Scheme 30 hours	No. of Credits 2	Examination Scheme CE : 15 marks ESE: 35 marks

Prerequisites

- Knowledge of Computer fundamentals

Learning Objectives

1. To introduce the foundations of computing, programming and problem-solving using computers.
2. To develop the ability to analyse a problem and devise an algorithm to solve it.
3. To formulate algorithms, pseudo-codes and flowcharts for arithmetic and logical problems
4. To understand the structured programming approach.
5. To develop the basic concepts and terminology of programming in general.
6. To understand the concept of data, its storage and manipulation.
7. To learn control structures and their uses.
8. To implement algorithms, test, debug using 'C'.

Course Contents

Unit 1	Problem Solving Aspects	6

1.1 Introduction to problem solving using computers.
1.2 Problem solving steps.
1.3 Algorithms-definition, characteristics, examples, advantages and limitations.
1.4 Flowcharts - definition, notations, examples, advantages and limitations, Comparison with algorithms.
1.5 Pseudo codes - notations, examples, advantages and limitations.
1.6 Programming Languages as tools, programming paradigms, types of languages .
1.7 Converting pseudo-code to programs.
1.8 Compilation process (compilers, interpreters), linking and loading, syntax and semantic errors, testing a program .
1.9 Good Programming Practices (naming conventions, documentation, indentation).

Unit 2	'C' Fundamentals	8

2.1 History of 'C' language.
2.2 Application areas.
2.3 Structure of a 'C' program.
2.4 'C' Program development life cycle.
2.5 Function as building blocks.
2.6 'C' tokens .
2.7 Character set, Keywords , Identifiers .
2.8 Variables, Constants (character, integer, float, string, escape sequences, enumeration constant).
2.9 Data Types (Built-in and user defined data types).
2.10 Operators, Expressions, types of operators, Operator precedence and Order of evaluation, typecasting – implicit and explicit .
2.11 Character, String, Formatted input and output.

Unit 3	Control Structures and Functions	8

3.1 Introduction and Types of control structures, single and nested structures
3.2 Decision making structures: if, if-else, switch and conditional operator, nested

decision making structures.
3.3 Loop control structures: while, do while, for, nested loops.
3.4 Use of break and continue.
3.5 Unconditional branching (goto statement).
3.6 Concept of function, Advantages of Modular design.
3.7 Standard library functions.
3.8 User defined functions: declaration, definition, function call, paramete passing (by value), return statement.
3.9 Recursive functions.
3.10 Scope of variables and Storage classes.

Unit 4	Arrays , Strings and Structures	8

4.1 Concept of array.
4.2 Types of Arrays – One, Two and Multidimensional array, memory representation and address calculation.
4.3 Array Operations - declaration, initialization, accessing array elements.
4.4 Concept of Function.
4.5 Types of Functions- Standard library functions, User defined functions.
4.6 Concept of structure, Definition and initialization, Accessing structure members.

Learning Outcomes

On completion of this course, students will be able to :
1. Explore algorithmic approaches to problem-solving.
2. Develop structured and modular programs in 'C'.

Learning Resources:

1. How to Solve it by Computer, R.G. Dromey, Pearson Education.
2. Problem Solving and Programming Concept, Maureen Sprankle, 7th Edition, Pearson Publication.
3. C: the Complete Reference, Schildt Herbert, 4th edition, McGraw Hill
4. A Structured Programming Approach Using C, Behrouz A. Forouzan, Richard F. Gilberg, Cengage Learning India
5. The 'C' programming language, Brian Kernighan, Dennis Ritchie, PHI

Course Code: Title: Laboratory Course on Problem solving using 'C' Semester I (Major Paper 3) Practical		
Teaching Scheme 4 hours/week (60 Hours)	**No. of Credits** **2**	**Examination Scheme** CE: 15 marks SEE: 35 marks

Course Objectives

1. To provide practical knowledge on how to apply procedural approach to real life problems
2. To provide hands-on experience on Designing algorithmic techniques to solve a given problem.
3. To provide expertise in thinking logically, through implementation of solutions in 'C' Programming.
4. To provide hands on experience in designing E-R model, creating and querying databases.

Course Contents

	Problem Solving using 'C' Assignments	
Practical 1	Assignment on Algorithm, Flowchart and Pseudo code.	
Practical 2	Assignment on data types, simple operators and expressions.	
Practical 3	Assignment on decision making structures (if, if-else, nested structures).	
Practical 4	Assignment on Writing Menu driven programs, in 'C'.	
Practical 5	Assignment on loop control structures.	
Practical 6	Assignment on writing modular programs (Functions / Recursive functions) in 'C'.	
Practical 7	Assignment on Array	
Practical 8	Assignment on structures	

Learning Outcomes :

1. Students would have understood the programming concepts and its application for problem solving using 'C'.

Learning Resources:

1. How to Solve it by Computer, R.G. Dromey, Pearson Education.
2. Problem Solving and Programming Concept, Maureen Sprankle, 7th Edition, Pearson Publication.
3. C: the Complete Reference, Schildt Herbert, 4th edition, McGraw Hill
4. A Structured Programming Approach Using C, Behrouz A. Forouzan, Richard F. Gilberg,

Cengage Learning India
5. The ‘C’ programming language, Brian Kernighan, Dennis Ritchie, PHI.

Subject Code:
Subject Title: Basic Electronics
Semester I Theory

Teaching Scheme	No. of Credits	Examination Scheme
30 Hours	2	CE: 15 marks ESE: 35 marks

Learning Objectives:

1. Study of semiconductor devices and their applications.
2. To understand basic concepts of digital electronics.
3. Study different types of Logic gates.
4. Study types of Digital Circuit.
5. Learn to connect and perform experiments with simple circuits.

Course Contents

Unit 1	**Semiconductors and Diodes**	**5**

1.1 Brief introduction to band theory and classification of Conductors, Insulators, and Semiconductors based on band theory.
1.2 Intrinsic and Extrinsic semiconductors.
1.3 PN Diode, Forward and Reverse I-V Characteristics.
1.4 Zener diode-reverse bias characteristics.
1.5 Working principle of LED, Optocoupler, LDR and photodiode.
1.6 Bridge rectifier.
1.7 Regulated power supply-block diagram and applications.

Unit 2	**Bipolar Junction Transistor and Applications**	**5**

2.1 Transistors and Applications- definition, terminals, types, symbols.
2.2 Working of NPN transistor, CE transistor input and output characteristics.
2.3 Concept of cut off, saturation, and active region.
2.4 Amplifier- definition, Single Stage Amplifier, concept of Gain and Bandwidth.
2.5 Transistor as switch.

Unit 3	**Number Systems and Digital Codes**	**4**

3.1 Number Systems: Binary and Hexadecimal number systems and their inter conversions.
3.2 Representation of Data: Signed Magnitude, one's complement and two's complement.
3.3 Binary addition and binary subtraction using 2's complement method.
3.4 Codes: BCD, Gray code.

Unit 4	**Logic Gates and Boolean Identities**	**4**

4.1 Basic gates: AND, OR and NOT.
4.2 Derived gates: NAND, NOR, XOR and XNOR gates.
4.3 Universal gates, Boolean identities, De Morgan Laws.

Unit 5	**Combinational Circuits**	**4**

5.1 Half adder, full adder, full Subtractor.
5.2 4 bit binary adder, 2 to 1 Multiplexers and 1 to 2 demultiplexers.

5.3 Encoders: Definition, 4 to 2 encoder. 5.4 Decoders: Definition, 2 to 4 decoder.		
Unit 6	**Sequential Circuits**	**6**
6.1Introduction to sequential circuits. Difference between combinational circuits and sequential circuits. 6.2 Flip Flops (Clocked RS circuit and truth table), JK, D, T block diagram and truth tables. 6.3 Shift register: Types and applications. 6.4 Counters: Synchronous and Asynchronous counters. 3-bit Asynchronous UP and DOWN counter.		
Unit 7	**Memory Devices**	**2**
7.1 Classification of memory. 7.2 Memory hierarchy. 7.3 Concept of cache memory. 7.4 Concept of associative memory and virtual memory.		

Learning Outcomes:

On completion of this course, students will be able to:

1. Understand semiconductor devices and their applications.
2. Solve problems on Number systems and their representations.
3. Be familiar with logic gate, its use in combinational and sequential circuits.

Learning Resources:

1. Electronics Principles: A.P. Malvino David J. Bates, McGraw Hill Higher Education publication, 7th Edition.
2. Principles of Analog Electronics: V.K. Mehta, S. Chand and Company publication.
3. Electronics Devices: Thomas .L.Floyd, Pearson PHI, 7th Edition.
4. Digital Electronics: R.P. Jain, Tata McGraw Hill.
5. Digital Principles and Applications: Malvino Leach, Tata Mc Graw Hill.
6. Digital Fundamentals: Floyd, Jain R.P., Pearson Education.

Subject Code: Subject Title : Laboratory course on Basic Electronics		
Teaching Scheme 4 hours/week	**No. of Credits** 2	**Examination Scheme** CE: 15 marks ESE: 35 marks

Learning Objectives:

1. To design simple digital circuits and learn how to connect them
2. Understand the difference between sequential and combinational circuits.
3. Understand the working of various analog devices and how they are used.

Course Contents

Group A	**Digital Electronics Experiments** **Any 4 experiments out of the following:**	**4 hours each experiment**

1. Study of Logic Gates (Verification of Truth tables).
2. Study of Half Adder and Full Adder using Logic Gates.
3. Study of Decimal to BCD/ (Binary) Converter.
4. Study of Multiplexer and Demultiplexer (4:1 & 1:4).
5. BCD to 7 segment conversion using IC 7447.
6. Study of asynchronous/synchronous Up/Down Counter.
7. Study of Diode Matrix ROM.
8. Binary to Gray and Gray to Binary code converters.

Group B	**Analog Electronics Experiments** **Any 4 experiments out of the following:**	**4 hours each experiment**

1. Study of Zener regulator.
2. Study of Half Wave and Bridge Rectifier.
3. PN junction diode characteristics.
4. Zener diode characteristics.
5. Bipolar junction transistor as an amplifier.
6. Bipolar junction transistor as a switch.
7. Verification of KVL and KCL.

Learning Outcomes:

On the completion of the course student will be able to:

1. Identify basic digital circuits/gates.
2. Learn how to read circuit diagrams and make circuit connections.
3. Learn how to use measuring instruments and correlate observations with theory.
4. Get to know various circuit simulating soft wares and use them to design simple circuits.

Subject Code:
Subject Title: Basic Statistics for Information Technology -I
Semester I (Minor) Theory

Teaching Scheme	No. of Credits	Examination Scheme
30 hours	2	CE: 15 marks ESE: 35 marks

Prerequisites
Knowledge of Counting Principles.

Learning Objectives

1. To study basic statistical concepts & procedures required for Information Technology
2. To solve problems which later on can be applied in data analysis
3. To apply these statistical tools in CS applications
4. To understand and apply various probability techniques

Course Contents

Unit 1	**Data Condensation and Presentation of Data**	**04**

1.1 Definition, importance, scope (especially in Computer Science and Information Technology) and limitations of statistics.
1.2 Data Condensation: Types of data (Primary and secondary), Attributes and variables, discrete and Continuous variables.
1.3 Graphical Representation: Histogram, Steam and leaf chart. [Note: Theory paper will contain only procedures. Problems to be included in practical]
1.4 Numerical problems related to real life situations.

Unit 2	**Descriptive Statistics**	**11**

2.1 Measures of central tendency: Concept of central tendency.
2.2 Arithmetic mean: Definition, computation for raw data, properties of arithmetic mean (without proof), combined mean, weighted mean, merits and demerits.
2.3 Median and Mode: Definition, formula for computation for raw data, merits and demerits. Empirical relation between mean, median and mode (without proof)
2.4 Partition Values: Quartiles, Box Plot.
2.5 Concept of dispersion, absolute and relative measures of dispersion.
2.6 Measures of dispersion : Range and Quartile Deviation for raw data and their coefficients, merits and demerits
2.7 Variance and Standard deviation: definitions for raw data, coefficient of variation, merits and demerits.
2.11Numerical problems related to real life situations

Unit 3	**Moments, Skewness and Kurtosis**	**09**

3.1 Concept of Raw and central moments: Formulae for ungrouped and grouped data (only first four moments),
3.2 Relation between central and raw moments upto fourth order. (Without proof)
3.3 Measures of Skewness: Types of skewness, Pearson's and Bowley's coefficient of skewness,
3.4Measure of skewness based on moments.
3.5 Measure of Kurtosis: Types of kurtosis, Measure of kurtosis based on moments.
3.6Numerical problems related to real life situations

Unit 4	Basic Probability tools	06

4.1 Review of counting principles
4.2 Deterministic and non-determination models
4.3 Random Experiment, Sample Spaces (Discrete and continuous)
4.4 Events: Types of events, Operations on events
4.5 Probability - classical definition, probability models, axioms of probability
4.6 Theorems of probability (without proof) i) $0 \leq P(A) \leq 1$ ii) $P(A) + P(A') = 1$ iii) $P(\Phi) = 0$ iv)$P(A) \leq P(B)$ when $A \subset B$ v) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

Learning/Course Outcomes

On completion of this course, students will be able to :
CO1 – get knowledge of basic statistical concepts
CO2 – get basic knowledge of statistical procedures
CO3 – get basic information about methods of data representation and summarization
CO4 - Apply probability techniques in a specific problem
CO4 – apply these tools in solving problems
CO5 – apply these tools in simple analytical situations in computer science
CO6 - strengthen themselves both computationally and analytically

Learning Resources

1. Fundamentals of Applied Statistics, Gupta and Kapoor, (3rd Edition) S. Chand and Sons, New Delhi, 1987.
2. Fundamentals of Statistics, Vol. 1, Goon, A. M., Gupta, M. K. and Dasgupta, B. (1983). Sixth Revised Edition. The World Press Pvt. Ltd., Calcutta
3. Basic Statistics, B.L. Agarwal, Fifth Edition New Age International Publishers.
4. Fundamentals of Mathematical Statistics (3rd Edition), Gupta S. C. and Kapoor V. K.1987.S. Chand and Sons, New Delhi.
5. Mathematical Statistics, Mukhopadhyay P. 2015, (3rd Edition) Books and Allied (P), Ltd.

Subject Code: Subject Title: Practical based Basic Statistics for Information technology -I		
Teaching Scheme 30 hours	No. of Credits 2	Examination Scheme CE: 15 marks ESE: 35 marks

Prerequisites

Knowledge of Descriptive Statistics and Probability (as studied in semester I)
Knowledge of Statistics for corresponding Lab course

Learning Objectives

1. To study basic statistical concepts & procedures required for Information Technology
2. To solve problems which later on can be applied in data analysis
3. To apply these statistical tools in CS applications
4. To understand and apply various probability techniques

Based on theory paper Practical will be conducted (Using Manual as well as Ms-Excel/R-Software)

Title of Practical

1.	Diagrammatic representation of Data
2.	Measures of central tendency and Dispersion
3.	Measure of Skewness and kurtosis Part I
4.	Measure of Skewness and kurtosis Part II
5.	Problems on Elementary techniques of probability
6.	Study of statistical tools in Computer Science and preparation of a report on it (individual activity
7.	Analysis of real-life data collected in practical number 9 and preparation of a report of findings.

Learning/Course Outcomes

On completion of this course, students will be able to :
CO1 – get knowledge of basic statistical concepts
CO2 – get basic knowledge of statistical procedures
CO3 – get basic information about methods of data representation and summarization
CO4 - Apply probability techniques in a specific problem
CO4 – apply these tools in solving problems
CO5 – apply these tools in simple analytical situations in computer science
CO6 - strengthen themselves both computationally and analytically

Learning Resources

1. Introduction to linear regression analysis (fifth edition) Douglas C. Montgomery.
2. Fundamentals of Applied Statistics (3rd Edition), Gupta and Kapoor, S. Chand and Sons, New Delhi, 1987.
3. Fundamentals of Mathematical Statistics (3rd Edition), Gupta S. C. and Kapoor V. K.1987 S. Chand and Sons, New Delhi.
4. Fundamentals of Statistics, Vol. 1, Sixth Revised Edition, Goon, A. M., Gupta, M. K. and Dasgupta, B. (1983). The World Press Pvt. Ltd., Calcutta

5. Mathematical Statistics (3rd Edition), Mukhopadhyay P. 2015, Books And Allied (P), Ltd.
6. Programmed Statistics, B.L. Agarwal, New Age International Publishers.

Course Code:
Title: Mathematical Techniques for IT
Semester II (Minor 1) Theory

Teaching Scheme	No. of Credits	Examination Scheme
30 hours	2	CE: 15 marks ESE: 35 marks

Course Objectives

1. Introduce concepts of mathematical logic for analyzing propositions, proving theorems, solving a variety of problems and its applications.
1. Evaluate elementary mathematical arguments and identify fallacious reasoning.
2. Understand and apply mathematical foundations, computing, and domain knowledge for the conceptualization of computing models from defined problems.

Course Contents

Unit 1	**Matrices**	**8L**

1.1 Elementary matrices, Matrix operations
1.2 Echelon form of matrix, System of linear equations
1.3 Gaussian Elimination Method, Gauss–Jordan Elimination Method

Unit 2	**Logic**	**7L**

2.1 Propositional logic
2.2 Propositional Equivalences
2.3 Predicates and Quantifiers

Unit 3	**Divisibility in Integers**	**8L**

3.1 Division Algorithm, Divisibility and its properties
3.2 Prime numbers, G.C.D. and L.C.M.
3.3 Euclidean Algorithm
3.4 Relatively prime integers

Unit 4	**Graphs and Trees**	**7L**

4.1 Graph Terminology and Special Types of Graphs
4.2 Representing Graphs and Graph Isomorphism
4.3 Define Walk ,Path, Circuit, Connectivity
4.4 Introduction to Trees, Applications of Trees

Learning Outcomes

1. Express mathematical properties via the formal language of propositional logic.
2. Acquire ability to describe computer programs in a formal mathematical manner.
3. Apply variety of methods for explaining, summarizing, and printing data and interpreting results clearly; and Apply concepts of graphs and trees to tackle real situations such as connectivity and constraint satisfaction, e.g., scheduling.

Learning Resources

1. Kenneth Rosen, Discrete Mathematics and It's Applications (Tata McGraw Hill).
2. C. L. Liu, Elements of Discrete Mathematics, (Tata McGraw Hill).
3. John Clark and Derek Holton, A First Look at Graph Theory (World Scientific).
4. Narsingh Deo, Graph Theory with Applications to Information Technology and Engineering, (Prentice Hall).
5. H. Anton and C. Rorres, Elementary Linear Algebra with Applications, Seventh Ed., Wiley, (1994).
6. B. Kolman, R. Busby, S. C. Ross, Nadeem-ur-Rehman, Discrete Mathematics

Structure, PearsonEducation, 5th Edition.
7. N. Biggs, Discrete Mathematics, 3rd edition, Oxford University Press.
8. A Foundation Course in Mathematics, Ajit Kumar, S. Kumeresan and Bhaba Kumar

SEMESTER II

Course Code: **Title: Web Designing using HTML and CSS** **Semester II (Discipline specific Major I) Theory**		
Teaching Scheme 30 hours	No. of Credits 2	Examination Scheme CE: 15 marks ESE: 35 marks

Course Objectives: -

1. To explain different components and technologies of World Wide Web as a platform.
2. To develop a static website using client-side programming like HTML and CSS.
3. To enable students to understand web page site planning, management and maintenance.
4. To explain the concepts of developing advanced HTML pages with the help of frames, scripting language.

Learning Outcomes: -

5. Understand the fundamentals of Internet and how the web function.
6. Design a static webpage by applying HTML elements.
7. Apply CSS concepts for designing HTML web pages.
8. To acquire knowledge and skills for creation of web site considering client-side programming.
9. Understand need and purpose of Web Hosting.

Course Contents

Unit 1	**Basic Terminology of Web and Web Design Principles**	**4**

1.1 What is Internet
1.2 Brief History of Internet
1.3 What is World Wide Web
1.4 Client Server Architecture
1.5 Web Server Vs Web browser
1.6 Webpages
1.7 Website
1.8 How website works?
1.9 Types of Websites
1.10 Domain Name Server and Uniform Resource locator
1.11 Basic principles involved in developing a web site
1.12 Five Golden rules of web designing
1.13 Web Standards and W3C recommendations

Unit 2	**Introduction to HTML5**	**10**

2.1 What is HTML
2.2 Features of HTML
2.3 What is difference between HTML and HTML5
2.4 Basic structure of an HTML document
2.5 Basic Building blocks of HTML
2.6 Block level Tags and Inline Tags
2.7 Core Attributes of HTML- id, style, class, title

2.8 Working with Lists, Tables and Frames
2.9 Working with Text and Image Hyperlinks, Images and Multimedia
2.10 Working with Forms and Controls
2.11 Advanced Tags in HTML5

Unit 3	**Introduction to Cascading Style Sheets**	**12**

3.1 Concept of CSS
3.2 Need of CSS
3.3 Creating Style Sheet -Inline, External, Embedded CSS.
3.4 CSS Selectors
3.5 Types of Selectors
3.6 CSS Properties -Position, Float, clear, visibility
3.7 CSS3 Flexbox Layout
3.8 CSS3 Grid Layout
3.8 CSS Styling Properties (Background, Text Format, Controlling Fonts)
3.9 Working with Lists and Tables
3.10 Box Model (Border properties, Padding Properties, Margin properties, Display properties)
3.11 CSS Advanced (Grouping, Dimension, Display, Positioning, Floating, Align, Navigation Bar, Image)
3.12 CSS3 Advanced properties: Z-index, Opacity Property, Transition effect, Transform effect, Animation effect.

Unit 4	**Introduction to Web Publishing or Hosting**	**4**

4.1 What is Web Hosting?
4.2 Need of Web Hosting
4.3 Types of Hosting packages
4.4 Registering Domains
4.5 Defining Name Servers
4.6 Steps to host the website

Learning Resources

1. HTML5 and CSS3- WAN BAYROSS -BPB Publications
2.HTML and CSS, 5th Edition –Thomas A Powell
3. Head First HTML and CSS,2nd Edition-Elisabeth Robson and Eric Freeman – O'Reilly
4. An introduction to Web Design + Programming- Paul S Wang, Sanda S. Katila

Web References

1. http://www.w3schools.com
2. https://html5andcss3.org/

Course Code:
Title: Laboratory on Web Designing using HTML and CSS
Semester II (Discipline specific Major I) Practical

Teaching Scheme	No. of Credits	Examination Scheme
60 hours (4 hours/week)	2	CE:15 marks ESE: 35 marks

Prerequisites:

- HTML and CSS basics

Course Objectives: -

- To understand basic web designing concepts.
- To create web pages using HTML
- To apply CSS to web pages

Course Outcomes: - Student will be able to: -

On completion of the course, student will be able to–

- Design simple websites using HTML.
- Apply styles to the web pages.

Assignments

Web Designing Using HTML and CSS

1. Designing Pages using Block, Inline, Hyper Link and Image tags.
   Sample Question: Create an html5 page with the following specifications
   i. Title should be about MYCOLLEGE
   ii. Put the windows Logo image in the background
   iii. Place your college name at the top of the page in the large text followed by the address in a smaller size
   iv. Add names of courses offered each in a different color, style, and typeface.
   v. Add scrolling text with a message of your choice
   vi. Add a college image at the bottom
2. Designing Pages using Un-Ordered, Ordered and Nested List tags.
   Sample Question: Write an HTML code to generate the following output
   a. Flowering Plant
      - Rose
      - Lily
      - Jasmin

   b. Non-Flowering Plant
      - Fern
      - Spore

3. Designing Pages using Table and Form Tag.
   Sample Question: Write an HTML code to design the following form.

Personal information:

First name:

Last name:

Male Female

Select Your Favorite Color

Red Green Blue

Submit

4. Designing Pages using Basic CSS.
Sample Question:
   - Write an HTML Code to set the background image of a web page using CSS.

   - Write a program using HTML and CSS to set the image as a border around an HTML element.
   - Write an HTML code to implement the Flex Box Layout as given below

Flexible Boxes

1 2 3 4 5 6 7 8

Try to resize the browser window.

A container with "flex-wrap: nowrap;" will never wrap its items.

Note: Flexbox is not supported in Internet Explorer 10 or earlier versions.

5. Designing Pages using Advanced CSS.
Sample Question:

- Write a program using HTML and CSS which changes the color of the div element from red to yellow, when animation is finished, it goes back to its original style.
-

E-Books and Online Learning Material

1. https://www.tutorialspoint.com/plsql/plsql_triggers.htm
2. www.w3schools.com

Subject Code:
Subject Title: Sensors and IoT
Semester II (Discipline specific Major II) Theory

Teaching Scheme	No. of Credits	Examination Scheme
30 Hours	2	CE: 15 marks ESE: 35 marks

Learning Objectives:

6. Study basic principles and types of different sensors.
7. Understand the basics of Operational Amplifier.
8. Know the basic circuit applications using OPAMP.
9. To understand the Data converters and their performance parameters.
10. Understanding of Internet of Things.

Course Contents

Unit 1	**Sensors and Transducers**	**10**

1.1 Definition of Sensors and Transducer.
1.2 Sensor parameters.
1.3 Types of Sensors (Working principle and specifications).
1.3.1 Temperature Sensor: RTD, Thermocouple, LM35.
1.3.2 Displacement Sensor: LVDT.
1.3.3 Motion Sensor: PIR.
1.3.4 Proximity sensor.
1.3.5 Tilt sensor.
1.3.6 Humidity sensor.
1.4 Transducers: Working Principle of DC Motors and Stepper Motors.

Unit 2	**Introduction to Operational Amplifier (OPAMP)**	**7**

2.1 Block diagram, Symbol and Parameters of OPAMP IC741.
2.2 Signal Conditioning circuits using OPAMP.
2.2.1 Inverting and Non inverting Amplifier.
2.2.2 Buffer.
2.2.3 Adder.
2.2.4 Subtractor.
2.2.5 Instrumentation Amplifier.
2.2.6 Current to Voltage and Voltage to Current converter.

Unit 3	**Data Converters**	**6**

3.1 Need of Data converters.
3.1 DAC types, R-2R DAC, Parameters.
3.3 ADC: Flash ADC, Successive approximation ADC, DUAL slope ADC, Parameters.

Unit 4	**Introduction to Internet of Things (IoT)**	**7**

4.2 Fundamentals of IoT: Introduction, Block diagram of Data acquisition system (DAS), definition and characteristics of IoT.
4.2 IoT Architecture.
4.3 Physical and Logical design of IoT.

4.4 Enabling Technologies in IoT.
4.5 Things in IoT, Identifiers in IoT, Internet in IoT.
4.6 IoT frameworks.
4.7 IoT and M2M.

Learning Outcomes:

On completion of this course, students will be able to:

1. Know the working principles of various types of sensors.
2. Understand the working principle of OPAMP and its circuit application.
3. Use the knowledge of Data converters and their performance parameters.
4. Have the knowledge of basics of IoT.

Learning Resources:

6. Sensors and Transducers, D. Patranbis, Prentice Hall Publication, 2nd Edition, 1st January 2008.
7. Sensors and Transducers, Dr. A. D. Shaligram, Chintan Publication, 2013.
8. Electric and Electronic Measurements and Instrumentation, A. K. Sawhney, Dhanpat Rai and Co., 2nd edition, 1976.
9. Internet of Things: Principles and Paradigms, Rajkumar Buyya and Dastjerdi, MK publishers, 1st Edition, 11th May 2016.
10. Internet of Things, Mayur Ramgir, Pearson publication CBCS: 2020-21 S.Y.B.Sc.(Computer Science).
6. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013.
7. Op-Amps and Linear Integrated Circuits, Fourth Edition, Pearson Publications, Ramakant .A. Gayakwad, 29th May 2015.

Subject Code: **Subject Title : Laboratory course on Sensors and IoT** **Semester II (Discipline specific Major II) Laboratory**		
Teaching Scheme 4 hours/week	**No. of Credits** 2	**Examination Scheme** CE: 15 marks ESE: 35 marks

Learning Objectives:

4. To design build and test circuits using OPAMP.
5. Study of converters.
6. Study of different types of Sensors.

Course Contents	
Any eight from the following:	**4 hours each experiment**

1. Study of LVDT.
2. Study of LM 35.
3. OPAMP IC 741 as Adder and Subtractor.
4. Inverting and Non Inverting Amplifier Using IC 741.
5. Study of Instrumentation Amplifier.
6. Study of R-2R DAC.
7. Study of 3-bit Flash ADC.
8. Study of RAM IC 7489.
9. Inter-Conversions of Gates.
10. Study of Shift Register IC 7495.
11. Study of Electronics Components.
12. Sample and Hold Circuit.
13. Study of Analog Multiplexer using IC 4051.
14. Study of Voltage to Frequency Convertor.

Subject Code:
Subject Title : Basic Statistics for Information Technology-II
Semester II (Discipline specific Major III) Theory

Teaching Scheme	No. of Credits	Examination Scheme
30 hours	2	CE: 15 marks ESE: 35 marks

Prerequisites
Knowledge of Descriptive Statistics and Probability (as studied in semester I)
Knowledge of Statistics for corresponding Lab course

Learning Objectives

1. To study more involved statistical concepts & procedures required for Information Technology
2. To solve problems which later on can be applied in data analysis
3. To apply tools in IT applications
4. To understand basic terminology and techniques of correlation and regression analysis for bivariate data
5. To apply these to some real life data model

Course Contents

Unit 1	**Correlation**	**08**

1.1 Concept of bivariate data, scatter diagram, its interpretation, concept of Correlation, Positive correlation, negative correlation, zero correlation
1.2 Karl Pearson's coefficient of correlation, properties of correlation coefficient, Interpretation of correlation coefficient, coefficient of determination with Interpretation.
1.3 Spearman's rank correlation coefficient (formula with and without ties).
1.4 Numerical problems

Unit 2	**Regression**	**08**

2.1 Concept of linear regression.
2.2 Illustrations, appropriate situations for regression and correlation
2.3 Linear regression : Fitting of both lines of regression using least square method. Concept of regression coefficients.
2.4 Properties of regression coefficients : $bxy \cdot byx = r2$, $bxy * byx \leq 1$, $bxy = r(\sigma x / \sigma y)$ and $byx = r(\sigma y / \sigma x)$.
2.5 Concept of coefficient of determination.
2.6 Numerical problems related to real life situations

Unit 3	**Non -Linear Regression**	**08**

3.1 Concept of nonlinear regression.
3.2 Illustrations, appropriate situations for nonlinear regression
3.3 Nonlinear regression models: Second degree curve,
3.4 exponential curves of the type $Y=ab^x$ and $Y=ax^{b.}$
3.5 Numerical problems related to real life situations

Unit 2	**Advanced Probability Tools**	**06**

4.7 Concepts and definitions of conditional probability, multiplication theorem

$P(A \cap B)=P(A).P(B\|A)$ 4.8 Bayes' theorem (without proof). Application of Bayes theorem. 4.9 Concept of Posterior probability, problems on posterior probability 4.10 Concept and definition of independence of two events Numerical problems related to real life situations
Learning/Course Outcomes On completion of this course, students will be able to : **CO1** – get deeper knowledge of basic and advanced statistical concepts **CO2** – get deeper knowledge of statistical procedures **CO3** - Apply a specific discrete probability distribution as model in a particular data situation **CO4** - examine various hypotheses involved in a situation and apply tests of hypothesis **CO5** – apply these tools in solving problems **CO6** – apply these tools in simple analytical situations in computer science **CO7** – apply all procedures independently for a real life data set **CO8** – apply these tools in simple analytical situations in computer science **CO9** - strengthen themselves both computationally and analytically
Learning Resources
1. Introduction to linear regression analysis (fifth edition) Douglas C. Montgomery. 2. Fundamentals of Applied Statistics (3rd Edition), Gupta and Kapoor, S. Chand and Sons, New Delhi, 1987. 3. Fundamentals of Mathematical Statistics (3rd Edition), Gupta S. C. and Kapoor V. K.1987 S. Chand and Sons, New Delhi. 4. Fundamentals of Statistics, Vol. 1, Sixth Revised Edition, Goon, A. M., Gupta, M. K. and Dasgupta, B. (1983). The World Press Pvt. Ltd., Calcutta 5. Mathematical Statistics (3rd Edition), Mukhopadhyay P. 2015, Books And Allied (P), Ltd. 6. Programmed Statistics, B.L. Agarwal, New Age International Publishers.

Subject Code:
Subject Title: Laboratory on Basic Statistics for Information technology
Semester II (Discipline specific Major III) Laboratory

Teaching Scheme	No. of Credits	Examination Scheme
30 hours	2	CE: 15 marks ESE: 35 marks

Prerequisites

Knowledge of Descriptive Statistics and Probability (as studied in semester I)
Knowledge of Statistics for corresponding Lab course

Learning Objectives

1. To study more involved statistical concepts & procedures required IT
2. To solve problems which later on can be applied in data analysis
3. To apply tools in IT applications
4. To understand basic terminology and techniques of correlation and regression analysis for bivariate data
5. To apply these to some real-life data model

Based on theory paper Practical will be conducted (Using Manual as well as Ms-Excel/R-Software)

Title of Practical

1.	Correlation for bivariate data.
2.	Linear regression analysis for bivariate data.
3.	Non-Linear regression analysis for bivariate data
4.	Problems on Conditional Probability, Multiplication Theorem and independence of events -I
5.	Problems on Conditional Probability, Multiplication Theorem and independence of events-II
6.	Study of Application of IT in any three areas and preparation of a report on it(individual activity)
7.	Real Life Data Collection of Bivariate data and Data analysis using Statistics– the activity to be done in a group of 2 to 4 students

Learning/Course Outcomes

On completion of this course, students will be able to :
CO1 – get deeper knowledge of basic and advanced statistical concepts
CO2 – get deeper knowledge of statistical procedures
CO3 - Apply a specific discrete probability distribution as model in a particular data situation
CO4 - examine various hypotheses involved in a situation and apply tests of hypothesis
CO5 – apply these tools in solving problems
CO6 – apply these tools in simple analytical situations in computer science
CO7 – apply all procedures independently for a real life data set
CO8 – apply these tools in simple analytical situations in computer science
CO9 - strengthen themselves both computationally and analytically

Learning Resources

7. Introduction to linear regression analysis (fifth edition) Douglas C. Montgomery.
8. Fundamentals of Applied Statistics (3rd Edition), Gupta and Kapoor, S. Chand and Sons, New Delhi, 1987.
9. Fundamentals of Mathematical Statistics (3rd Edition), Gupta S. C. and Kapoor V. K.1987 S. Chand and Sons, New Delhi.
10. Fundamentals of Statistics, Vol. 1, Sixth Revised Edition, Goon, A. M., Gupta, M. K.

and Dasgupta, B. (1983). The World Press Pvt. Ltd., Calcutta
11. Mathematical Statistics (3rd Edition), Mukhopadhyay P. 2015, Books And Allied (P), Ltd.
12. Programmed Statistics, B.L. Agarwal, New Age International Publishers.

Course Code:
Title: Software Productivity Tools
Semester II (SEC 2) Theory

Teaching Scheme: 30 hours	No. of Credits 2	Examination Scheme CE: 15 marks ESE: 35 marks

Prerequisites
Fundamental concepts of computers
Accessing and using the internet

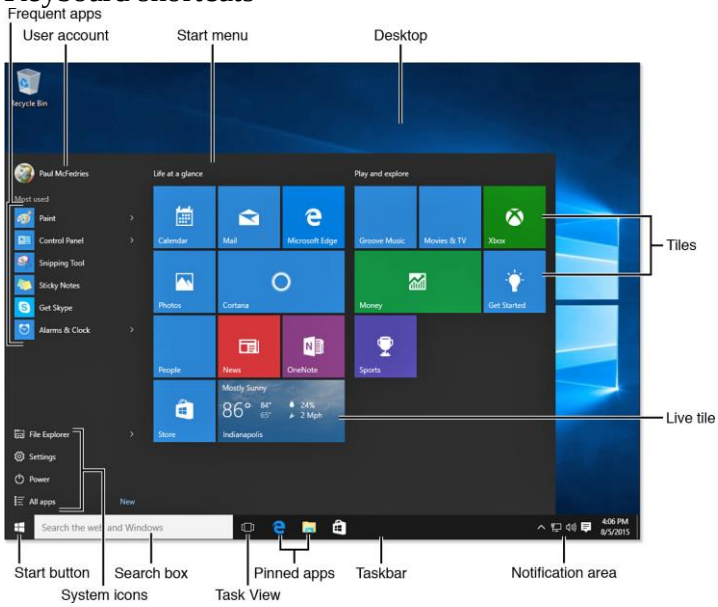
Course Objectives

1. To get Familiar with the operating system.
2. To understand the concept and use of document processing.
3. To understand the concept and use of spreadsheets.
4. To learn how to make effective presentations.
5. To be aware of the latest tools and their application to organizations.

Course Contents

Unit 1	**Using the Operating System (Windows / Linux)**	**6**

- Starting the Machine, shutdown, login and logoff
- Desktop GUI Components: Cursors/Pointers, Icons, GUI Menus, icons and their functions
- Parts of Desktop: Start menu, Task Bar, System Tray, Quick launch toolbar, Start button, Help
- Parts of a Window: Title bar, Menu bar, Scroll bar, Status bar, Maximize, Minimize, Close, Resize and Moving a Window
- Computer Hardware and System configuration
- File System: Files and Folders, Navigating the file system, Opening and Saving files, Creating, Renaming, Deleting and Moving folders.
- Keyboard shortcuts

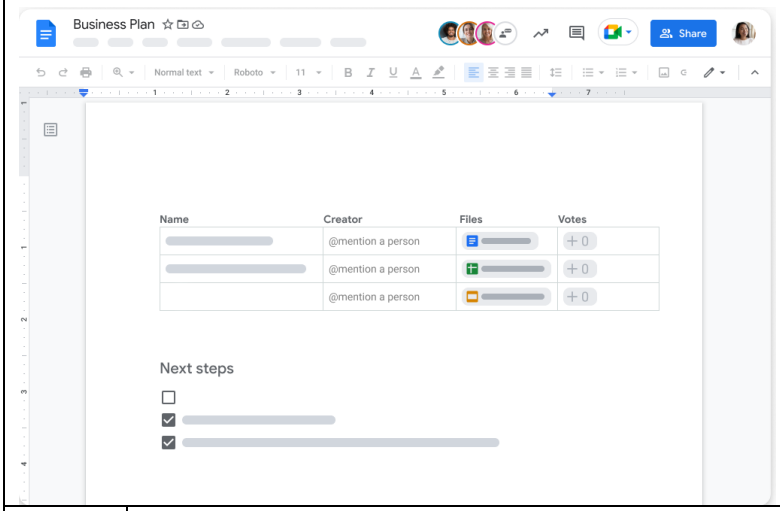


Unit 2	**Document Editing Software**	**8**

- Editing Content: Open, Save, Edit,, Cut, Copy, Paste, Undo, Redo, Find, Search,

Replace

- Page settings: Converting files to different formats, Importing and Exporting documents, Sending files to others, Using Toolbars, Ruler, Using Icons, using help
- Formatting Documents - Setting Font styles, Font selection- style, size, color etc, Typeface - Bold, Italic, Underline, Case settings, Highlighting, Special symbols, Setting Paragraph style, Alignments, Indents, Line Space, Margins, Bullets & Numbering.
- Page style - Formatting Page, Page tab, Margins, Layout settings, Border, Shading, Header and footer, Page numbers, Inserting page break, Column break and line break, Creating sections & frames, Anchoring, Wrapping, Table of Contents, Index, Page Numbering, Date and Time
- Creating Tables- Table settings, Borders, Alignments, Insertion, deletion, Merging, Splitting, Sorting, Formula, Drawing - Inserting ClipArts, Pictures/Files etc.,
- Tools – Word Completion, Spell Checks, Mail merge, Templates, Creating contents for books, Creating Letter/Faxes, Creating Web pages, Using Wizards, Tracking Changes, Security, Digital Signature. Printing Documents, Shortcut keys.
- Free Open Source Software: Introduction to Open Office Suite - Selecting the application package, Working with Documents, Formatting Documents, Setting Page style, Creating Tables, Drawing, Tools, Printing Documents
- Online tools: Google docs

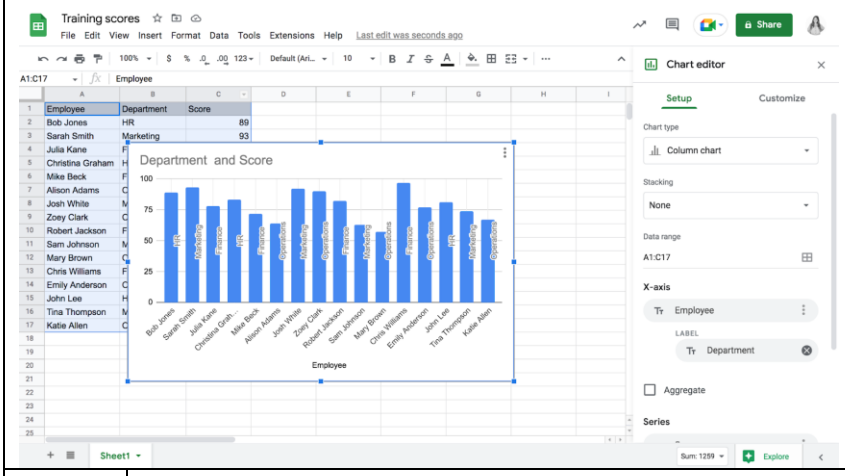


Unit 3	Spreadsheets	8

- Opening Spreadsheet, Menus - main menu, Formula Editing, Formatting, Toolbars, Spreadsheet types
- Importing and exporting spreadsheets
- Spreadsheet addressing - Rows, Columns, Cells, Referring Cells, Selecting Cells – Shortcut Keys.
- Entering and Deleting Data- Entering data, Cut, Copy, Paste, Undo, Redo, Filling Continuous rows, columns, highlighting values, Find, Search and replace,
- Inserting Data: Insert Cells, Column, rows and sheets, Symbols, Data from external files, Frames, Clipart, Pictures, Files etc
- Inserting Functions, Manual breaks, Setting Formula, finding total in a column

or row Mathematical operations (Addition, Subtraction, Multiplication, Division, Exponentiation), Using other Formulae.

- Formatting Spreadsheets: Labeling columns and rows, Font, Border and Shading, Hiding/ Locking Cells, Worksheet Row and Column Headers, Sheet Name, Row height, Column width, Visibility of Row, Column and Sheet, Security, Sheet Formatting and style, Sheet background, Color, Borders & Shading, Shortcut keys.
- Working with sheets: Sorting, Filtering, Validation, Consolidation, Subtotal, Creating Charts, Drawing. Printing.
- OpenOffice Calc: Introduction to Spreadsheets, Overview of a Worksheet, Creating Worksheet and Workbooks, Organizing files, Managing files and workbooks, Functions and Formulas, Working with Multiple sheets, Creating Charts and Printing Charts
- **Online tools: Google sheets**



Unit 4	Creating presentations	8

- Introduction, Opening new Presentation, Different presentation templates, Setting backgrounds, Selecting presentation layouts
- Creating a presentation, Setting presentation style, Adding Text to the presentation
- Formatting a presentation - Adding style, Color, gradient fills, Arranging objects, Adding Header and Footer, Slide background, Slide layout
- Adding Graphics to the presentation - Inserting pictures, movies, tables, Drawing Pictures using Draw
- Adding effects to the presentation - Setting Animation and transition effect,
- Adding audio and video, Printing Handouts and Generating standalone presentation viewer

Learning Outcomes

On completion of this course, students will be able to :

1. Apply various skills in preparing and editing effective documents, spreadsheets and presentations.
2. Choose the most appropriate tool for a specific task.
3. Improve efficiency in daily computer-related activities.

Learning Resources

1. Laboratory manual
2. https://support.microsoft.com/en-us/training
3. https://edu.gcfglobal.org/en/subjects/office/
4. Open Office: https://www.openoffice.org/documentation/manuals/OOo1.x.x/user_guide.p df
5. Google docs training: https://support.google.com/a/users/answer/9282664?hl=en
6. https://edu.gcfglobal.org/en/googledocuments/