Modern Education Society's

Nowrosjee Wadia College

(AUTONOMOUS)

NAAC Accredited A+ with CGPA 3.51

Affiliated to the

Savitribai Phule Pune University

Four Year B.Sc. Degree Program

B.Sc. (Cyber Security and Digital Forensics)

(Faculty of Science & Technology)

National Education Policy (NEP 2020) Syllabus

To be implemented from Academic Year 2024-2025

Title of the Course: B.Sc. (Cyber Security and Digital Forensics)

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. (Cyber Security and Digital Forensics) at the undergraduate level is framed 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 been awarded 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 subject. While preparing this syllabus the U.G.C. model curriculum (LOCF) is followed.

In an era where Information and Communication technology permeates every aspect of our lives, the need for skilled professionals to safeguard digital assets and investigate cybercrimes has never been more critical. As technology becomes an integral part of our daily lives, the risk of cyber threats and digital crimes continues to escalate. This comprehensive undergraduate program is designed to equip students with the knowledge, skills, and expertise necessary to excel in the dynamic field of cyber security and digital forensics. The knowledge and skills acquired through studying these fields are crucial for safeguarding sensitive information, protecting digital assets, and ensuring the integrity of online systems. Cyber security professionals play a pivotal role in fortifying networks against malicious attacks, preserving user privacy, and maintaining the trustworthiness of digital transactions. Moreover, the study of digital forensics is essential for investigating and mitigating cybercrimes, as it equips individuals with the tools to analyse digital evidence, trace malicious activities, and contribute to the identification and prosecution of cybercriminals.

The curriculum is structured so that it includes both foundational level courses as well as advanced courses; at the same time balancing theory courses with hands on laboratory courses. The syllabus has been prepared with an aim to create more aware, responsive and responsible digital citizens, thereby contributing effectively to an overall healthy cyber security posture and ecosystem. The B.Sc. Cyber Security and Digital Forensics course offers opportunities in various domains such as Banking/Finance/Insurance, Information Technology/Management, Government (Defence /Non-defence), and Consulting/Professional Services.

Objectives:

- Understand the theoretical and practical concepts related to cyber security and digital forensics.
- Understand various threats and attacks on digital Information systems.
- Understand how to collect, examine and analyse digital evidences.
- Familiarize with various tools, techniques and models to implement the security features.
- Understand and develop the security policies and procedures for an effective governance in minimizing the occurrence of risk
- Identify, choose, and apply proper techniques, resources, and protocols to handle attacks in various sectors.

- Study the related legal framework, laws and regulations in the areas of cyber security and digital forensics.
- Develop the ability to come up with risk assessment and vulnerability assessment for securing the information in an organization.
- Diagnose and investigate cyber security events or crimes related to computer systems and digital evidence.
- Apply problem solving principles to analyse and interpret data for planning and decision-making in an information security environment.

PROGRAM OUTCOMES (POs):

The Bachelor of Science (Cyber Security and Digital Forensics) 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	Impart education with domain knowledge effectively and efficiently at par with the expected quality standards for and Cyber Security and Digital Forensics professional.
PO2	Problem Analysis and solution	Ability to apply the technical and critical thinking skills in the discipline of Cyber Security and Digital Forensics to find solutions for complex problems
PO3	Development of various allied skills	Develop skills in the area of Software, Hardware and current developments and the ability to engage in life-long learning and adopt fast changing technology to prepare for professional development.
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, projects, visits, and activities that develop practical knowledge and skills in the field of Cyber Security and Digital Forensics.
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 Cyber security and digital forensics. 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 with Mathematics. All other criteria are same as per Savitribai Phule Pune University rules.

Teaching Scheme:

- The course is a 4 year, 8 semesters full time undergraduate course .
- The course follows the NEP pattern as per Savitribai Phule Pune University.
- 1 credit theory = 15 hours
- 1 credit practical = 30 hours = 4 hrs 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.
(Cyber Security and Digital Forensics)

(Based on NEP 2020 framework)

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

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														

Abbreviations used throughout -

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

EVALUATION PATTERN :

1. Each course shall be evaluated with Continuous Evaluation (CE) and End Semester Examination (ESE) mechanism.
2. Theory courses: Continuous Evaluation shall be of 15 marks and Final Assessment shall be of 35 marks.
3. Practical courses: Continuous Evaluation shall be of 15 marks and Final Assessment shall be of 35 marks.
4. 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.
5. 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.
6. 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)

Structure of Course: w.e.f. Academic Year 2024-25

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	Fundamentals Of Information Security	**2**
				Practical course on Problem solving using 'C'	**2**
			Discipline specific Major II	Discrete Mathematics - I	**2**
				Practical course on Discrete Mathematics - I	**2**
			Discipline specific Major III	Fundamentals of Electronics - I	**2**
				Practical course on Fundamentals of Electronics - I	**2**
		Generic / Open Elective	OE 1	Generic	**2**
		VSC / SEC VSEC	SEC*	Problem Solving Using ' C'	**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.

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	Digital Forensics - I	**2**
				Practical course on Digital Forensics- I	**2**
			Discipline specific Major II	Discrete Mathematics - II	**2**
				Practical course on Discrete Mathematics - II	**2**
			Discipline specific Major III	Fundamentals of Electronics - II	**2**
				Practical course on Fundamentals of Electronics - II	**2**
		Generic / Open Elective	OE 2	Generic	**2**
		VSC / SEC VSEC	SEC*	Scripting Languages	**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.

Year	Semester & Level	Course Type	Choice	Course code and Course Name	Credits
2	3 5.0	Major (Core) Subject	Major core 4T 2P	Digital Forensics -II	2
				Database Management Systems and Security	2
				Practicals course on Digital Forensics II and Database Management Systems and Security	2
		Major Elective	--	--	--
		VSC / SEC VSEC	VSC	Computer Networks and Internet	2
		OJT / FP, CEP	FP*	Field Project	2
		Minor	Minor 2T 2P	Electronics Theory	2
				Electronics Practicals	2
		Generic / Open Elective	OE 3	Generic	2
		AEC/ VEC / IKS	IKS*	(Theory)	2
			AEC	Marathi or Hindi any one	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.

Year	Semester & Level	Course Type	Choice	Course code and Course Name	Credits
2	4 5.0	Major (Core) Subject	Mandatory 4T 2P	Cyber Crime and Cyber Security	2
				Cryptography and Network Security	2
				Practical course on Cryptography and Network Security	2
		Major Elective	--	--	--
		VSC / SEC VSEC	VSC	Data Structures and Algorithms	2
			SEC	Practical on Python Programming	2
		OJT / FP, CEP	CEP*	Community Engagement and Service	2
		Minor	Minor 2T 2P	Electronics Theory	2
				Electronics Practical	2
		Generic / Open Elective	OE 4	Generic	2
		AEC/ VEC / IKS	AEC	Marathi or Hindi any one	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.

Year	Semester & Level	Course Type	Choice	Course code and Course Name	Credits
3	5 5.5	Major (Core) Subject	Mandatory 8T 4P	Network Forensics	**2**
				Cyber Laws and Intellectual Property Rights	**2**
				Reverse Engineering and Malware Analysis	**2**
				Vulnerability Assessment and Penetration Testing	**2**
				Practical course on Network Forensics	**2**
				Practical course on Vulnerability Assessment and Penetration Testing and Malware Analysis	**2**
		Major Elective Subject	Major Elective 2T 2P	Cloud Computing	**2**
				Practical course on Cloud Computing	**2**
				OR	
				Data Analytics with Python	**2**
				Practical course on Data Analytics with Python	**2**

		VSC / SEC VSEC	VSC	Artificial Intelligence	**2**
		OJT / FP, CEP	FP*/CEP	Field Project on Cyber Crime Investigation	**2**
		Minor	Minor	Electronics(Theory)	**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.

Year	**Semester & Level**	**Course Type**	**Choice**	**Course code and Course Name**	**Credits**
3	6 5.5	Major (Core) Subject	Mandatory 8T 4P	Mobile Forensics	**2**
				Incident Response Management	**2**
				Blockchain Technology	**2**
				Information Security Audit and Compliance	**2**
				Practical course on Mobile Forensics	**2**
				Practical course on Blockchain Technology	**2**
		Major Elective Subject	Major Elective	Intrusion Detection	**2**
				Practical course on Intrusion Detection	**2**
				OR	
				Ethical Hacking	**2**

			2T 2P	Practical Course on Ethical Hacking	**2**
		VSC /SEC VSEC	VSC	File System Analysis and Recovery	**2**
		OJT / FP, CEP, CC, RP	OJT*	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.

Year	Semester & Level	Course Type	Choice	Course code and Course Name	Credits
4	7 6.0	Major (Core) Subject	Mandatory 10T 4P	Risk Assessment and Risk Management	**4**
				AI in Cyber Security	**4**
				Security and Privacy in Cloud	**2**
				Practical course on Risk Assessment and Risk Management	**2**
				Practical course On AI in cyber Security	**2**

		Major Elective Subject	Major Elective 2T 2P	IoT and Embedded Systems Security	**2**
				Practical course On IoT and Embedded Systems Security	**2**
				OR	
				Block Chain Security	**2**
				Practical course on Block Chain Security	**2**
		OJT / FP, CEP, CC, RP	RM*	–	**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.

Year	Semester & Level	Course Type	Choice	Course code and Course Name	Credits
4	8 6.0	Major (Core) Subject	Mandatory 10T 4P	Security in Wireless Ad Hoc Networks	**4**
				Web and Mobile Application Security	**4**
				Foundational Security Operations and Defensive Analysis	**2**
				Practical course on Security in Wireless Ad Hoc Networks	**2**

				Practical course on Web and Mobile Application Security	**2**
		Major Elective Subject	Major Elective 2T 2P	E-Commerce, Digital Payments and Security	**2**
				Practical course on E-Commerce, Digital Payments and Security	**2**
				OR	
				Social Media Forensics	**2**
				Practical course on Social Media Forensics	**2**
		OJT / FP, CEP, CC, RP	OJT*	—	**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.

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(An Autonomous College Affiliated to Savitribai Phule Pune University)

Syllabus for

First Year

B.Sc. (Cyber Security and Digital Forensics)

(Based on NEP 2020 framework)

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

Semester- I

Course Code: Title: Fundamentals of Information Security Semester I (Discipline Specific Major Paper 1) Theory		
Teaching Scheme **30 hours**	**No. Of Credits** **2**	**Examination Scheme** **CE:15 marks** **ESE: 35 marks**

Learning Objectives:

1. To understand the basic information security concepts.
2. To identify the common threats and attacks on assets.
3. To interpret the risk analysis and management process.
4. To understand the types of access control.

Course Contents

Unit 1	**The Need for Information Security**	**8**

1.1 What is security?
1.2 Key information security concepts / Tenets of Information Systems Security: authenticity, availability, integrity, confidentiality, accuracy, utility, possession
1.3 Components of an Information system
1.4 The Seven Domains of a Typical IT Infrastructure: User Domain, Workstation Domain, LAN Domain, LAN-to-WAN Domain, WAN Domain, Remote Access Domain, System/Application Domain: Domain Roles, Responsibilities, and Accountability, Risks, Threats, and Vulnerabilities in each domain.
1.5 Weakest Link in the Security of an IT Infrastructure

Unit 2	**Malicious Attacks, Threats, and Vulnerabilities**	**10**

2.1 What Are You Trying to Protect?
2.2 Types of Assets: Customer data, IT assets, intellectual property, finances and financial data, service availability, reputation
2.3 Whom Are You Trying to Catch?
2.4 hackers and attack tools: Protocol analyzers, Port scanners, OS fingerprint scanners, Vulnerability scanners, Exploit software, Wardialers, Password crackers, Keystroke loggers
2.5 What Is a Security Breach?
2.6 Attacks: Denial of service (DoS) attacks, Distributed denial of service (DDoS) attacks, Unacceptable web-browsing behavior, Wiretapping, Use of a backdoor to access resources, Accidental data modifications
2.7 Risks, Threats, and Vulnerabilities
2.8 Malicious Attacks: Fabrication, Interception, Interruption, Modification, Birthday attacks,
Brute-force password attacks. Dictionary password attacks, IP address spoofing, Hijacking, Replay attacks, Man-in-the-middle attacks, Masquerading
2.9 Social engineering attacks: Phishing, Phreaking, Pharming
2.10 Wireless network attacks
2.11 Web Application Attacks
2.12 Malicious Software: malware, viruses, worms, trojan horses, rootkits, spyware

Unit 3	**Risk Management**	**4**

3.1 Defining risk
3.2 The relationship among risks, threats, and vulnerabilities.
3.3 Risk methodology
3.4 Disaster recovery plan
3.5 Threat analysis
3.6 Assessing Risks, Threats, and Vulnerabilities
3.7 Information Security Gap analysis

Unit 4	Access Control	8

4.1 Parts of access control: Identification, Authorization, Accountability, Authentication
4.2 Physical and Logical access controls
4.3 Security kernel
4.4 Access control policies
4.5 Authorization policies
4.6 Methods and Guidelines for Identification
4.7 Processes and Requirements for Authentication
4.8 Policies and Procedures for Accountability
4.9 Formal Models of Access Control: Discretionary, mandatory, non-discretionary, role-based.

Learning Outcomes:

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

1. Apply fundamental security concepts while designing secure systems
2. Assess the threats, risks and vulnerabilities of systems

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Learning Resources:

1. Fundamentals of Information Systems Security, 3rd Edition by David Kim, Michael G. Solomon, O'Reilly media, 2016
2. Principles Of Information Security, Whitman M E, Herbert J. Mattord , 5th Edition, Cengage Learning, 2014
3. Fundamentals of Information Security, Nadkarni, Sanil , BPB Publications, 2020

Course Code: Title: Practical Course on Problem solving using 'C' Semester I (Discipline Specific Major Paper 1) Practical		
Teaching Scheme 4 hours/week (60 Hours)	**No. of Credits** **2**	**Examination Scheme** CE: 15 marks SEE: 35 marks

Learning 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 consisting of small real life problems requiring logical thinking, to generate solutions. (Solution should be Identification of input / processing needed / output generated, generation of a pseudo-code/algorithm)
Practical 2	Assignment on data types, operators in C.
Practical 3	Assignment on decision making Conditional statements, Loops in 'C'.
Practical 4	Assignment on Writing Menu driven programs, in 'C'.
Practical 5	Assignment on writing modular programs (Functions / Recursive functions) in 'C'.

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: Discrete Mathematics-I Semester I ((Discipline Specific Major Paper 1I)) Theory		
Teaching Scheme 30 Hours	No. of Credits 2	Examination Scheme CE: 15 marks SEE: 35 marks

Course Objectives

1. To build the necessary skill and analytical abilities for developing computer based solutions using mathematical concepts.
2. To get the relational understanding of mathematical concepts.
3. To develop a positive attitude towards mathematics as an interesting subjects in study of Computer Science.

Course Contents

Unit 1	Set and Relation	12

1. 1. Introduction, Sets and Definition, Examples
2. Types of Sets : Empty set, Singleton set
3. Operations On Set (Union, Intersection, Complement)
4. Cardinality Of Set, Finite and Infinite Set
5. Power Set
6. Subsets
7. Ordered Pairs, Cartesian product of sets.
8. Relations, types of relations, equivalence relations, partial ordering, poset, Lattice (Definition only).
9. Equivalence class, properties and partition of a set.
10. Diagraph of relations, matrix representation and Hasse Diagram.

Unit 2	Binary Operations	8

2.1 Functions (Definition and Examples)
2.2 One-to-one Function, Onto Function.
2.3 Inverse Functions and Composition Function.
2.4 Some important Functions.
2.5 Binary operations
2.6 Properties of Binary Operations
2.7 Algebraic Structure
2.8 Groups (Definition only), Examples.

Unit 3	Counting Principle	10

3.1 Introduction
3.2 Basic Rule:
3.2.1 The Multiplication Rule.
3.2.2 The Addition Rule.

3.3 Principle of Inclusion and Exclusion.
3.4 Pigeon Hole Principle
3.5 Permutation and Combination (definition, Examples and basic properties)
3.6 Binomial Theorem (Statements only and Examples)

Learning Outcomes:

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

1. Students will understand basic concepts of Set theory.
2. Learn some fundamental concepts and terminology.
3. They will be able to solve problems based on permutation, Combinations.
4. Able to understand the general concept of a function, such as domain, range, function type etc.

Learning Resources:

1.Discrete Mathematics and its applications (Tata McGraw Hill) by Kenneth Rosen, 7th edition.

Unit-I : Text Book 1: Chapter 2: section 2.1, 2.2 Chapter 5 : section 5.1

Unit-II: Text Book 1: Chapter 5 : section 5.1

Unit-III: Text Book 1: Chapter 6 : section 6.1, 6.2, 6.3, 6.4

Subject Code:
Subject Title : Practical Course on Discrete Mathematics-I
Semester I (Discipline Specific Major Paper 2) Practical

Teaching Scheme	No. of Credits	Examination Scheme
4 hours/week	2	CE: 15 marks SEE: 35 marks

Course Objectives:

1. Student should be able to solve problems depending on contents in Discrete Mathematics-I

Course Contents

List of practical:

1. Operations on set.
2. Subset, Power set and cardinality of set.
3. Equivalence Relation
4. Poset and Hasse Diagram
5. Functions
6. Binary Operations
7. Algebraic Structure and Groups
8. Multiplication Rule, Addition Rule and Inclusion and Exclusion Principle
9. Permutation, Combination and Binomial theorem
10. Miscellaneous

Learning Outcomes

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

1. The exercises develop basic techniques and tests understanding of concepts and enhance mathematical ability.
2. It promotes abstract and analytical thinking of the students.

Subject Code:
Subject Title: Fundamentals of Electronics I
Semester I (Discipline Specific Major Paper III) 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**	**6**

1.1 Intrinsic and Extrinsic semiconductors.
1.2 PN Diode, Forward and Reverse I-V Characteristics.
1.3 Zener diode- reverse bias characteristics.
1.4 Working principle of LED, Optocoupler and photodiode.
1.5 Rectifier: concept and types, working of bridge rectifier.
1.6 Regulated power supply- block diagram and applications.

Unit 2	**Bipolar Junction Transistor and Applications**	**6**

2.1 Transistors- definition, terminals, types, symbols.
2.2 Working of NPN transistor, CE output characteristics, alpha, beta and relationship between them in transistor.
2.3 Concept of loadline and 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**	**6**

3.1 Number Systems: Binary and Hexadecimal number systems and their inter conversions.
3.1 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, ASCII code.

Unit 4	**Logic Gates and Boolean Identities**	**3**

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

Unit 5	Combinational Circuits	4
5.1 Definition of multiplexer and need. 5.2 2 to 1 Multiplexer. 5.3 1 to 2 Demultiplexer. 5.4 Encoder: Definition, 4 to 2 encoder working. 5.5 Decoder: Definition, 2 to 4 decoder working.		
Unit 6	**Sequential Circuits**	**5**
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. 6.5 Three bit asynchronous Up and down counter (connections, truth table and timing diagram).		
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. 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 : Practical course on Fundamentals of Electronics I
Semester I (Discipline Specific Major Paper III) Practical

Teaching Scheme	**No. of Credits**	**Examination Scheme**
4 hours/week	2	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 Decimal to BCD/ (Binary) Converter.
3. 4-bit binary parallel adder and subtractor using IC7483.
4. BCD to 7 segment conversion using IC 7447.
5. Verification of De Morgans theorems.
6. Study of read and write action of RAM (using IC 2112/4 or equivalent).
7. Inter conversion of gates using universal gates.

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. To understand semiconductor devices and their applications.
2. Be familiar with logic gates and its use in combinational and sequential circuits.
3. To learn to work with simple digital circuits.
4. To understand how to read circuits and make circuit connections.

Course Code: Title : Problem Solving Using 'C' Semester I (SEC 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**	**10**

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	Decision Making and Iteration	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.		
Unit 4	**Functions**	**6**
4.1 Concept of function, Advantages of Modular design. 4.2 Standard library functions. 4.3 User defined functions: declaration, definition, function call, parameter passing (by value), return statement. 4.4 Recursive functions. 4.5 Scope of variables and Storage classes.		
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		

Semester-II

Subject Code: Subject Title : Digital Forensics - I Semester II (Discipline Specific Major Paper 1) Theory		
Teaching Scheme 30 hours	No. of Credits 2	Examination Scheme CE: 15 marks ESE: 35 marks

Learning Objectives:

1. To understand underlying principles and techniques associated with the digital forensic practices
2. To explore practical knowledge about digital forensic methodology.
3. To learn the importance of evidence handling and storage for various devices
4. To apply digital forensic knowledge to use computer forensic tools and investigation report writing

Course Contents

Unit 1	Introduction to Digital Forensics	8

1.1 What Is Digital Forensics?
1.2. Digital Forensics Goals
1.3. Cybercrime
- 1.3.1 Cybercrime Attack Mode How Are Computers Used in Cybercrimes?
- 1.3.2 Example of Cybercrime

1.4. Types of Digital Forensics
- 1.4.1 Computer Forensics
- 1.4.2 Mobile Forensics Network Forensics
- 1.4.3 Database Forensics
- 1.4.4 Forensics Data Analysis

1.5. Digital Forensics Users
- 1.5.1 Law Enforcement
- 1.5.2 Civil Ligation
- 1.5.3 Intelligence and Counterintelligence

1.6. Types of Digital Forensics Investigation
1.7. Forensics Readiness
- 1.7.1 The Importance of Forensic Readiness for Organizations

Unit 2	Essential Technical Concepts	6

2.1 Data Representation: Decimal (Base-10), Binary , Hexadecimal (Base-16), Computer Character Encoding Schema
2.2 File Structure
2.3 Digital File Metadata
2.4 Timestamps Decoder (Tool)
2.5 Hash Analysis
2.6 How to Calculate File Hash
2.7 Memory Types: Volatile Memory, Nonvolatile Memory
2.8 Types of Computer Storage: Primary Storage, Secondary Storage
2.9 HPA and DCO

2.10 Data Recovery Considerations 2.11 File Systems: NTFS, FAT		
Unit 3	**Initial Response and First Responder Tasks**	**8**
3.1 Digital Evidence 3.1.1 Digital Evidence Types 3.1.2 Locations of Electronic Evidence 3.1.3 Challenge of Acquiring Digital Evidence 3.1.4 Who Should Collect Digital Evidence? 3.1.5 Chain of Custody 3.1.6 Cloning, and Live vs Dead System 3.1.7 Hashing, and Final Report 3.2 Digital Forensics Examination Process 3.2.1 Seizure 3.2.2 Acquisition 3.2.3 Analysis 3.2.4 Reporting 3.3 Digital Forensics vs. Other Computing Domain 3.4 Search and Seizure 3.4.1 Consent to Search 3.4.2 Subpoena 3.4.3 Search Warrant 3.5 First Responder Toolkit 3.6 First Responder Tasks 3.7 Order of Volatility 3.8 Documenting the Digital Crime Scene 3.9 Packaging and Transporting Electronic Devices 3.10 Conducting Interview 3.10.1 First Responder Questions When Contacted by a Client 3.10.2 Witness Interview Questions 3.10.3 Witness Signature		
Unit 4	**Digital Forensics Tools**	**8**
5.1 Evaluating Digital Forensics Tool Needs 5.1.1 Types of Digital Forensics Tools 5.1.2 Tasks Performed by Digital Forensics Tools 5.1.3 Tool Comparisons 5.1.4 Other Considerations for Tools 5.2 Digital Forensics Software Tools 5.2.1 Command-Line Forensics Tools 5.2.2 Linux Forensics Tools 5.2.3 Other GUI Forensics Tools 5.3 Digital Forensics Hardware Tools 5.3.1 Forensic Workstations 5.3.2 Using a Write-Blocker 5.3.3 Recommendations for a Forensic Workstation 5.4 Validating and Testing Forensics Software		

5.4.1 Using National Institute of Standards and Technology Tools 5.4.2 Using Validation Protocols
Learning Outcomes On completion of this course, students will be able to : 1. Describe Forensic science and Digital Forensic concepts 2. Interpret the cyber pieces of evidence, Digital forensic process model and their legal perspective. 3. Demonstrate various forensic tools to investigate the cybercrime and to identify the digital pieces of evidence 4. Analyze the digital evidence used to commit cyber offences.
Learning Resources:
1. John Sammons, "The Basics of Digital Forensics - The Primer for Getting Started in Digital Forensics" Syngress is an imprint of Elsevier 2. Nihad A. Hassan, "Digital Forensics Basics - A Practical Guide Using Windows OS" Apress 3. Clint P Garrison "Digital Forensics for Network, Internet, and Cloud Computing A forensic evidence guide for moving targets and data , Syngress Publishing, Inc. 2010 4. Bill Nelson Amelia Phillips Christopher Steuart , Guide to Computer Forensics and Investigations: Processing Digital Evidence, Cengage Learning 5. Nilakshi Jain, Dhananjay Kalbande, "Digital Forensic : The fascinating world of Digital Evidences " Wiley India Pvt Ltd 2017. 6. Cory Altheide, Harlan Carvey "Digital forensics with open source tools "Syngress Publishing, Inc. 2011.

Course Code: **Title: Practical Course on Advanced 'C' Programming and Digital Forensics - I** **Semester II (Discipline Specific Major Paper 1) Practical**		
Teaching Scheme 4 hours / week 60 hours	No. of Credits 2	Examination Scheme CA:15 marks UA: 35 marks

Prerequisites
Problem Solving using 'C'
Fundamentals of Digital Forensics

Learning Objectives:

- To apply advanced concepts of 'C' Programming to solve problems
- To Apply digital forensics

Advanced 'C' Programming Assignments

1. Assignment on 1-d and 2-d Arrays
2. Assignment on Simple pointers and dynamic memory allocation
3. Assignment on String handling
4. Assignment on Structures and Unions
5. Assignment on File Handling
6. Assignment on Command line arguments

Digital Forensics – I Assignments

Apply digital forensics concepts using any free and open source tool (detailed assignments to be given in Lab manual)

Learning Outcomes: -

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

1. Apply advanced 'C' programming concepts
2. Get hands-on experience on digital forensics tools

Subject Code Subject Title: Discrete Mathematics-II Semester II (Discipline Specific Major Paper 1I) Theory		
Teaching Scheme 30 Hours	No. of Credits 2	Examination Scheme CE: 15 marks SEE: 35 marks

Course Objectives

1. To build the necessary skills and analytical abilities for developing computer based solutions using mathematical concepts.
2. To develop logical thinking and its applications to computer Science.

Course Contents

Unit 1	Recurrence Relations	8

1.1 Recurrence Relations: Introduction, Formation.
1.2 Linear Recurrence Relations with constant coefficients.
1.3 Homogeneous Solutions.
1.4 Particular Solutions.
1.5 Total Solutions.

Unit 2	Graphs	10

2.1 Definition, Elementary terminologies and results, Graphs as Models
2.2 Special types of graphs
2.3 Isomorphism
2.4 Adjacency and Incidence Matrix of a Graph
2.5 Subgraphs, induced subgraphs, vertex deletion, edge deletion
2.6 Complement of a graph and self-complementary graphs
2.7 Union, intersection and product of graphs
2.8 Fusion of vertices
2.9 Walk, Trail, Path, Cycle: definitions and elementary properties
2.10 Connected Graphs: definitions and properties
2.11 Distance between two vertices, eccentricity, center, radius and diameter of a graph
2.12 Isthmus, Cutvertex ; definition and properties
2.13 Cutset, edge-connectivity, vertex connectivity
2.14 Weighted Graph and Dijkstra's Algorithm.

Unit 3	Eulerian and Hamiltonian Graphs	4

3.1 Seven Bridge Problem, Eulerian Graph : Definition and Examples, Necessary and Sufficient condition.

3.2 Fleury's algorithm 3.3 Hamiltonian Graphs : Definition and Examples, Necessary Condition. 3.4 Introduction of Chinese Postman Problem and Travelling Salesman Problem		
Unit 4	**Trees**	**4**
4.1 Definition, Properties of trees 4.2 Center of a tree 4.3 Binary Tree : Definition and properties 4.4 Tree Traversal : Ordered rooted Tree, Preorder traversal, inorder traversal and postorder traversal, Prefix Notation. 4.5 Spanning Tree : Definition, Properties, Shortest Spanning Tree, Kruskal's Algorithm.		
Unit 5	**Directed Graphs**	**4**
5.1 Definition, Examples Elementary Terminologies and properties. 5.2 Special types of digraphs 5.3 Connectedness of digraphs 5.4 Network and Flows: definition and examples.		

Learning Outcomes

On the completion of the course student will be able to

1. Learn some fundamental concepts and terminology.
2. Acquire ability to describe computer programs in a formal mathematical manner.
3. Able to differentiate between valid and invalid mathematical reasoning.
4. Learn techniques for constructing mathematical proofs illustrated by Discrete Mathematical examples.

Learning Resources

1.Discrete Mathematics and its Applications, (Tata McGraw Hill), Seventh Edition by Kenneth Rosen.
2.A First Look at Graph Theory (Allied Publishers) by John Clark and Derek Holton.
3. Elements of Discrete Mathematics, (Tata McGraw Hill), by C.L.Liu.
Unit 1: Text Book 3: Chapter 10: Sec. 10.1, 10.2, 10.3, 10.4, 10.5, 10.6
Unit 2: Text Book 1: Chapter 8: Sec. 8.1, 8.2, 8.3
Unit 2: Text Book 2: Chapter 1: Sec. 1.5, 1.6, 1.7, 1.8
Unit 2: Text Book 1: Chapter 8: Sec. 8.4
Unit 3: Text Book 1: Chapter 8: Sec. 8.5, 8.6
Unit 4: Text Book 1: Chapter 9: Sec. 9.1, 9.2, 9.3, 9.4, 9.5.
Unit 5: Text Book 2: Chapter 7: Sec. 7.1, 7.2.,
Chapter 8: Sec. 8.1, 8.2.

Subject Code:
Subject Title : Practical Course on Discrete Mathematics-II
Semester II (Discipline Specific Major Paper 1I) Practical

Teaching Scheme	No. of Credits	Examination Scheme
4 hours/week	2	CE: 15 marks SEE: 35 marks

Course Objectives

1. Student should be able to solve problems depending on contents in Discrete Mathematics

Course Contents

List of practical:

1. Homogeneous Recurrence Relations
2. Non-homogeneous Recurrence Relations
3. Operations on Graphs and Connected Graphs
4. Isomorphism of Graphs.
5. Eulerian and Hamiltonian Graphs.
6. Algorithms in Graphs
7. Tree
8. Spanning Tree
9. Directed Graphs.
10. Miscellaneous.

Learning Outcomes

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

1. The exercises develop basic techniques and tests understanding of concepts and enhance mathematical ability.
2. It promotes abstract and analytical thinking of the students

Subject Code:
Subject Title: Fundamentals of Electronics II
Semester II (Discipline Specific Major Paper 1II) Theory

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

Learning Objectives:

1. Understand digital circuit designing concept.
2. Study basics of Computer organization and Architecture.

Course Contents

Unit 1	**Digital circuit design**	**10**

1.1 Introduction to Boolean algebra and rules of Boolean algebra.
1.2 Simplification of expressions using rules of Boolean algebra, Concept of SOP and POS, Maxterm and Minterm.
1.3 Introduction to K maps: Concept of Cells, Pairs, Quads, Octets.
1.4 Combinational circuit design.
1.4.1 Half adder and Full adder.
1.4.2 Designing 4 bit Binary to Gray and Gray to Binary converter.
1.5 Sequential circuit Design.
1.5.1 Definition and Truth tables of JK flipflop, D flipflop and T flipflop.
1.5.2 Excitation table for JK flipflop, and T flipflop.
1.5.3 Designing of 3 bit synchronous Up counter.
1.5.4 Designing of 3 bit Synchronous Down counter.

Unit 2	**Introduction to Computer Organization**	**7**

2.1 Block diagram and function of each block of Computer system.
2.2 Block diagram of a CPU and function of its blocks.
2.3 Concept of Buses and registers.
2.4 Stack: Need and its organization.
2.5 I/O organization.
2.5.1 Block diagram and need of I/O interface.
2.5.2 Types of I/O data transfer: (only to be explained conceptually).
2.5.3 Programmed I/O.
2.5.4 Concept of polling.
2.5.5 Interrupt initiated I/O (concepts of interrupts and priority of interrupts).
2.5.6 DMA (Definition, Types of DMA transfer and DMA controller).

Unit 3	**Basics of MOSFET**	**3**

3.2 Types of MOSFET and Symbols.
3.3 Working principle of MOSFET and I/O characteristics.
3.4 Concept of CMOSFET.
3.5 MOSFET as switch.

Unit 4	Operational Amplifier (OPAMP) and applications	6
4.2 Block diagram of OPAMP. 4.3 Ideal and practical (for IC 741) Parameters of OPAMP and symbol of IC 741. OPAMP as comparator. 4.4 Concept of Virtual ground and OPAMP as inverting amplifier. 4.5 OPAMP as non inverting amplifier and OPAMP as unity gain amplifier/buffer. 4.5 OPAMP as Adder and Subtractor.		
Unit 5	**Oscillators and clock**	**4**
5.1 Concept of feedback and types of feedback, concept of oscillator. 5.2 Conditions for sustained oscillations. Types of oscillators (RC and LC oscillators.) Wein bridge oscillator. 5.3 Concept of clock. Block diagram of IC 555 and its working. 5.4 IC 555 as clock generating circuit.		
Learning Outcomes: **On the completion of the course student will be able to:** 1. Understand the basics of digital circuit design. 2. Design digital circuits.		
Learning Resources: 6. Modern Digital Electronics by R.P Jain 5th edition McGraw Hill publications. 7. Digital fundamentals by Floyd 11th edition Pearson publications. 8. Microprocessor and interfacing, Douglas Hall 3rd edition Mc Graw Hill publication. 9. Computer architecture by Morris Mano.		

Subject Code:
Subject Title : Practical course on Fundamentals of Electronics II
Semester II (Discipline Specific Major Paper 1II) Practical

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

Learning Objectives:

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

Course Contents

Any eight from the following:

1. Astable multivibrator IC 555.
2. Wein bridge oscillator.
3. OPAMP as adder/Subtractor.
4. MOSFET as a switch.
5. Study of MOSFET characteristics.
6. OPAMP as inverting and non inverting amplifier.
7. Design of Half and Full adder circuit using K map.
8. Design of 4 bit binary to gray and Gray to binary convertor using K map.
9. Design of 3 bit Synchronous Up/Down/Updown counter using K map.
10. Study of Flipflops.
11. Study of Shift register (SISO and Ring counter).
12. Study of diode matrix ROM.

Learning Outcomes:

On the completion of the course student will be able to

1. Design and build common combinational and sequential digital circuits.
2. Understand working of analog devices by using circuits.
3. Learn to use measuring instruments like CRO, Signal generator and Multimeter.

Course Code:
Title : Scripting Languages
Semester I (SEC Paper) Theory

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

Prerequisites

Knowledge of Computer fundamentals

Learning Objectives:

This course will enable students to

1. To study the basics of scripting languages like Shell Script , JavaScript and Perl.
2. To understand the requirements of Scripting Languages.
3. To identify the uses of Scripting Languages.
4. To introduce in-depth knowledge of programming features of Shell Script , JavaScript and Perl.
5. To state the implementation and applications of Scripting.

Course Contents

Unit 1	Shell Scripting	10

1.1 Overview of shell scripting and its significance in Unix/Linux environments
1.2 Introduction to Unix/Linux command-line interface
1.3 Basics of shell scripting: script structure, shebang line, execution permissions ,Variables and data types in shell scripts
1.4 Control Structures and Functions, Conditional statements: if, else, elif ,Looping constructs: for loops, while loops
1.5 Functions in shell scripts: defining, calling, parameters, return values
1.6 File Handling and Text Processing
1.7 File manipulation: reading, writing, and appending files
1.8 Working with file permissions and ownership
1.10 Introduction to text processing utilities: grep , sed, awk
1.11 Regular expressions for pattern matching and text manipulation

Unit 2	JavaScript programming	6

2.1 Scripts and Programs, Uses for Scripting Languages, Web Scripting.
2.2 JavaScript:Variables,DataTypes,Operators,Conditionalstatements,Loops,Arrays,Functions
2.3 Objects-Predefined objects, Accessing objects, Object Methods.

Unit 3	JavaScript programming of reactive web pages elements	6

3.1 JavaScriptEvents-Mouseevents,Keyboardevents,Formevents,windowevents,
3.2 Event handlers, Frames, Form object, JavaScript Form Validation.

Unit 4	Perl Programming	8

4.1 PERL- Names and Values, Variables, Scalar Expressions, Control Structures
4.2 Arrays, list, hashes, strings, pattern and regular expressions, subroutines.
4.3 Advanced Perl - Finer points of looping, pack and unpack, file system, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

Learning Outcomes:

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

1.Comprehend the differences between typical scripting languages and typical system and application programming languages.

2. Develop structured and modular programs in 'C'.

Learning Resources:

1. Open Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP, J. Lee and B. Ware (Addison Wesley) Pearson Education.

2. Perl by Example, E. Quigley, Pearson Education.

3. Beginning JavaScript with Dom scripting and AJAX, Russ Ferguson, Christian Heilmann ,Apress.

4. Programming Perl, Larry Wall, T. Christiansen and J. Orwant, O'Reilly, SPD.

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