MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE
MADANAPALLE
(UGC-AUTONOMOUS)

www.mits.ac.in

COMPUTER SCIENCE AND ENGINEERING (Cyber Security)
Course Structure
&
Detailed Syllabi

For the students admitted to

B. Tech. Regular Four-Year Degree Programme from the academic year 2020-21

and

B. Tech. Lateral Entry Scheme from the academic year 2021-22

B.TECH. COMPUTER SCIENCE AND ENGINEERING (Cyber Security)

Vision and Mission of the Institution

Vision	To become a globally recognized research and academic institution and thereby contribute to technological and socio-economic development of the nation
Mission	To foster a culture of excellence in research, innovation, entrepreneurship, rational thinking and civility by providing necessary resources for generation, dissemination and utilization of knowledge and in the process create an ambience for practice-based learning to the youth for success in their careers.

Vision and Mission of the Department

Vision	To Ignite and Nurture Young Learners to Become Cyber security Professionals Through Qualitative Technical Education & Research and Serve The Nation.
Mission	➢ To Equip The Students With Technical Expertise Through Competent Faculty, State of the Art Infrastructure and Industry Collaboration. ➢ To Develop Technically Competent Professionals Capable of Adapting to New Technologies and Address The Cyber Security Challenges. ➢ To Inculcate Professional, Social and Ethical Values Among Students To Serve The Society.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Graduates shall have the ability to work across various disciplines in emerging areas of Cyber Security for higher studies and research.

PEO2: Graduates shall have good communication skills, possess ethical values, and serve the society with responsibility to protect the network environment.

PEO3: Graduates as entrepreneurs shall contribute to the development and deployment of technologies in Cyber Security.

PROGRAM OUTCOMES (POs)

At the end of the programme, graduate will be able to

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norm of the engineering practice.

PO9: Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with t h e society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: Apply the technical and professional skills related to algorithms, programming, web design and networking.

PSO2: Acquire and demonstrate the ability to use standard tools and techniques for the development and implementation of cybersecurity solutions.

PSO3: Analyze and exhibit professional ethics in the field of Digital Forensic and Cyber Security standards.

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE

B. Tech Four Year Curriculum Structure

Branch: COMPUTER SCIENCE AND ENGINEERING (Cyber Security)

Total Credits	160 Credits for 2020(Regular) & 121 Credits for 2021(Lateral Entry) Admitted Batch
	163 Credits for 2021(Regular) & 124 Credits 2022(Lateral Entry) Admitted Batch onwards

I. Induction Program and Holistic Development Activities

Sl.No.	Title	Duration
1	Induction Program (Mandatory)	Three weeks' duration at the start of First Year (Refer Annexure - I)
2	Holistic Development Activities (Every Student from Semester 2 – 8 should register for at least one activity)	Three hours per week (Activity list is enclosed in Annexure - I)
3	Virtual Laboratory (Students are encouraged to choose and register for any of the Virtual laboratories he /she is interested)	As specified by the Virtual Laboratory

B. Tech Computer Science and Engineering (Cyber Security)

R20 - Curriculum Structure

I Year I Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	BSC	20MAT101	Engineering Calculus	3	1	0	4	4
2	BSC	20PHY102	Applied Physics	3	1	0	4	4
3	ESC	20EEE101	Basic Electrical Engineering	3	1	0	4	4
4	ESC	20CSE101	Programming for Problem Solving (Python)	2	0	3	5	3.5
5	HSMC	20ENG201	English for Professional Purposes Laboratory	0	0	2	2	1
6	BSC	20PHY201	Physics Laboratory	0	0	3	3	1.5
7	ESC	20EEE201	Electrical Engineering Laboratory	0	0	3	3	1.5
Total				**11**	**3**	**11**	**25**	**19.5**

I Year II Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	HSMC	20ENG101	Professional English	3	0	0	3	3
2	BSC	20MAT110	Linear Algebra	3	0	0	3	3
3	BSC	20CHE101	Engineering Chemistry	3	0	0	3	3
4	ESC	20CSE102	C Programming and Data Structures	3	0	0	3	3
5	ESC	20ME101	Engineering Graphics	2	0	2	4	3
6	BSC	20CHE201	Chemistry Laboratory	0	0	3	3	1.5
7	ESC	20CSE201	C Programming and Data Structures Laboratory	0	0	3	3	1.5
8	ESC	20CSE202	Engineering and IT Workshop	0	0	3	3	1.5
Total				**14**	**0**	**11**	**25**	**19.5**

(L = Lecture, T = Tutorial, P = Practical)

B. Tech Computer Science and Engineering (Cyber Security)

II Year I Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	BSC	20MAT111	Probability and Statistics for Computer Science	3	0	0	3	3
2	PCC	20CSC103	Computer System Architecture	3	0	0	3	3
3	PCC	20CSC104	Data Structures using Python	3	0	0	3	3
4	PCC	20CSC105	Object Oriented Programming using C++	2	1	0	3	3
5	PCC	20CSC106	Database Fundamentals for Security	2	1	0	3	3
6	PCC	20CSC203	Data Structures using Python Laboratory	0	0	3	3	1.5
7	PCC	20CSC204	Object Oriented Programming using C++ Laboratory	0	0	3	3	1.5
8	PCC	20CSC205	Database Fundamentals for Security Laboratory	0	0	3	3	1.5
9	SC		Skill Oriented Course-I (Refer ANNEXURE-IV)	1	0	2	3	2
10	MC	20CHE901	Environmental Science	2	0	0	2	0
Total				**16**	**2**	**11**	**29**	**21.5**

II Year II Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	HSMC	20HUM101	Economics and Financial Accounting for Engineers	3	0	0	3	3
2	BSC	20MAT112	Discrete Mathematical Structures	3	0	0	3	3
3	ESC	20CSC107	Operating System Fundamentals for Security	3	0	0	3	3
4	PCC	20CSC108	JAVA Programming	3	0	0	3	3
5	PCC	20CSC109	Design and Analysis of Algorithms	2	1	0	3	3
6	PCC	20CSC206	Operating System Fundamentals for Security Laboratory	0	0	3	3	1.5
7	PCC	20CSC207	JAVA Programming Laboratory	0	0	3	3	1.5
8	PCC	20CSC208	Design and Analysis of Algorithms Laboratory	0	0	3	3	1.5
9	SC		Skill Oriented Course – II (Refer ANNEXURE-IV)	1	0	2	3	2
10	MC	20HUM901	Indian Constitution	2	0	0	2	0
Total				**17**	**1**	**11**	**29**	**21.5**

(L = Lecture, T = Tutorial, P = Practical)

B. Tech Computer Science and Engineering (Cyber Security)

III Year I Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	PCC	20CSC110	Automata Theory and Compiler Design	3	0	0	3	3
2	PCC	20CSC111	Computer Networks	3	0	0	3	3
3	PCC	20CSC112	Software Engineering	3	0	0	3	3
4	OE		Open Elective-I	3	0	0	3	3
5	PE		Professional Elective-I	3	0	0	3	3
6	PCC	20CSC209	Computer Networks Laboratory	0	0	3	3	1.5
7	PCC	20CSC210	Software Engineering Laboratory	0	0	3	3	1.5
8	SC		Skill Oriented Course- III (Refer ANNEXURE-IV)	1	0	2	3	2
9	MC	20CE901	Disaster Management	2	0	0	2	0
10	PROJ	20CSC701	Summer Internship-1*	0	0	3	3	1.5
Total				**18**	**0**	**11**	**29**	**21.5**

* 2 Months' internship during 2nd year summer vacation and to be evaluated in III Year I Semester

III Year II Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	PCC	20CSC113	Cloud Computing	3	0	0	3	3
2	PCC	20CSC114	Foundation of Cryptography	3	0	0	3	3
3	PCC	20CSC115	AI Tools, Techniques and Applications	3	0	0	3	3
4	OE		Open Elective-II	3	0	0	3	3
5	PE		Professional Elective-II	3	0	0	3	3
6	PCC	20CSC211	Cloud Computing Laboratory	0	0	3	3	1.5
7	PCC	20CSC212	Cryptography Laboratory	0	0	3	3	1.5
8	PCC	20CSC213	AI Tools, Techniques and Applications Laboratory	0	0	3	3	1.5
9	SC		Skill Oriented Course- IV (Refer ANNEXURE-IV)	1	0	2	3	2
10	MC	20HUM902** */ 20HUM102#	Universal Human Values	2/3	0	0	2/3	0/3
Total				**18/19**	**0**	**11**	**29/30**	**21.5/24.5**

** 20HUM902 Universal Human Values is offered as non-credit mandatory course for 2020 (Regular) & 2021 (Lateral Entry) Admitted Batch

20HUM102 Universal Human Values is offered as three credit course for 2021 (Regular) & 2022(Lateral Entry) Admitted Batch onwards

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IV Year I Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	PE		Professional Elective-III	3	0	0	3	3
2	PE		Professional Elective-IV	3	0	0	3	3
3	PE		Professional Elective-V	3	0	0	3	3
4	OE		Open Elective-III	3	0	0	3	3
5	OE		Open Elective-IV	3	0	0	3	3
6	OE-HSMC		Open Elective-V (Taken from Humanities & Social Science)	3	0	0	3	3
7	SC		Skill Oriented Course-V (Refer ANNEXURE-IV)	1	0	2	3	2
8	PROJ	20CSC702	Summer Internship-2*	0	0	6	6	3
Total				**19**	**0**	**8**	**27**	**23**

* 2 Months' internship during 3nd year summer vacation and to be evaluated in IV Year I Semester

IV Year II Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	PROJ	20CSC703	Project Work and Internship	0	0	24	24	12
Total				**0**	**0**	**24**	**24**	**12**

(L = Lecture, T = Tutorial, P = Practical)

ANNEXURE - I

THREE WEEK MANDATORY INDUCTION PROGRAMME

- Yoga and Meditation
- Sports and Games
- NSS
- NCC
- MITS Social Responsibility Club
- Management module
- Design Thinking
- Spoken and Written Communication

- **Proficiency modules**
  - Basic Computer Proficiency
  - Interpersonal Skills
  - Computer Graphics
  - Web Programming
  - Mobile Apps
  - Vocabulary Enhancement

HOLISTIC DEVELOPMENT ACTIVITIES

Description of Activities

1. Physical and Health
2. Culture
3. Literature and Media
4. Social Service
5. Self-Development
6. Nature and Environment
7. Innovation

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ANNEXURE - II

OPEN ELECTIVE – I (To be offered under MOOC's Category from SWAYAM – NPTEL)			
Sl. No.	**Course Code**	**Course Title**	**Course Offered by Department of**
1	20HUM3M01	Project Management for Managers	Management Studies
2	20HUM3M02	Ethics in Engineering Practice	Management Studies
3	20HUM3M03	E – Business	Management Studies
4	20CE3M01	Integrated Waste Management for Smart City	Civil
5	20CE3M02	Soil and Water Conservation Engineering	Civil
6	20CE3M03	Plastic Waste Management	Civil
7	20CE3M04	Safety in Construction	Civil
8	20ME3M01	Operations Management	Mechanical
9	20ME3M02	Operations Research	Mechanical
10	20ME3M03	Design Thinking and Innovation	Mechanical
11	20EEE3M01	Non-Conventional Energy Sources	EEE
12	20EEE3M02	Design of Photovoltaic Systems	EEE
13	20ECE3M01	Microprocessors and Interfacing	ECE
14	20ECE3M02	Microprocessors and Microcontrollers	ECE
15	20ECE3M04	System Design Through Verilog	ECE
16	20IE3M01	Intellectual Property Rights and Competition Law	Multidisciplinary
17	20IE3M02	Introduction to Research	Multidisciplinary
18	20IE3M03	Roadmap for Patent Creation	Multidisciplinary
19	20IE3M04	Energy Conversion Technologies (Biomass And Coal)	Multidisciplinary
20	20IE3M05	Research Methodology	Multidisciplinary
Any new Interdisciplinary Course offered by SWAYAM NPTEL can be appended in future.			

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OPEN ELECTIVE – II (To be offered under Conventional Mode)			
Sl. No.	**Course Code**	**Course Title**	**Course Offered by Department of**
1	20MAT301	Advanced Numerical Methods	Mathematics
2	20MAT302	Engineering Optimization	Mathematics
3	20PHY301	Optical Physics and its Applications	Physics
4	20PHY302	LASER Physics and Advanced LASER Technology	Physics
5	20CHE301	Introduction to Petroleum Industry	Chemistry
6	20CHE302	Green Chemistry and Catalysis for Sustainable Environment	Chemistry
7	20CE301	Ground Improvement Techniques	Civil
8	20CE302	Environmental Impact Assessment	Civil
9	20CE303	Watershed Management	Civil
10	20ME301	Material Science for Engineers	Mechanical
11	20ME302	Elements of Mechanical Engineering	Mechanical
12	20EEE301	Industrial Electrical Systems	EEE
13	20EEE302	Introduction to MEMS	EEE
14	20ECE301	Bio-Medical Electronics	ECE
15	20ECE302	VLSI Design	ECE
Any new Interdisciplinary courses can be appended in future.			

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OPEN ELECTIVE – III (To be offered under MOOC's Category from SWAYAM – NPTEL)			
Sl. No.	**Course Code**	**Course Title**	**Course Offered by Department of**
1	20HUM3M04	Management Information System	Management Studies
2	20HUM3M05	Business Analytics & Text Mining Modeling Using Python	Management Studies
3	20CE3M05	Remote Sensing and GIS	Civil
4	20CE3M06	Wastewater Treatment and Recycling	Civil
5	20CE3M07	Building Materials And Composites	Civil
6	20ME3M04	Power Plant Engineering	Mechanical
7	20ME3M05	Mechatronics and Manufacturing Automation	Mechanical
8	20EEE3M03	Introduction to Smart Grid	EEE
9	20EEE3M04	Transducers For Instrumentation	EEE
10	20IE3M06	Learning Analytics Tools	Multidisciplinary
Any new Interdisciplinary Course offered by SWAYAM NPTEL can be appended in future.			

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OPEN ELECTIVE – IV (To be offered under Conventional Mode)			
Sl. No.	**Course Code**	**Course Title**	**Course Offered by Department of**
1	20PHY303	Thin Film Technology and its Applications	Physics
2	20CHE303	Introduction to Nano Science and Technology	Chemistry
3	20CHE304	Computational Methods in Materials Science and Engineering	Chemistry
4	20CE304	Green Buildings and Energy Conservation	Civil
5	20CE305	Environmental Engineering	Civil
6	20ME303	Total Quality Management	Mechanical
7	20ME304	Entrepreneurship	Mechanical
8	20EEE303	Robotics	EEE
9	20EEE304	Electrical Safety	EEE
10	20ECE303	Embedded Systems	ECE
11	20ECE304	DSP Architecture	ECE
12	20ECE305	Community Radio Technology	ECE
Any new Interdisciplinary courses can be appended in future.			

OPEN ELECTIVE – V (HUMANITIES) (To be offered under Conventional Mode)			
Sl. No.	**Course Code**	**Course Title**	**Course Offered by Department of**
1	20HUM301	Principles of Management	Humanities
2	20HUM302	Human Resource Development	Humanities
3	20HUM303	Soft Skills	Humanities
4	20HUM304	National Cadet Corps	Humanities
Any new Interdisciplinary courses can be appended in future.			

ANNEXURE - III

LIST OF PROFESSIONAL ELECTIVES

Professional Elective – I		
Sl. No.	**Course Code**	**Course Title**
1.	20CSC401	Big Data Analytics
2.	20CSC402	Internet and Web Programming
3.	20CSC403	Database Security and Privacy
4.	20CSC404	Mathematical Models for Internet
5.	20CSC405	Scripting Language for Information Security
Any advanced courses can be appended in future		

Professional Elective – II (To be offered under MOOC's Category from SWAYAM – NPTEL)		
Sl. No.	**Course Code**	**Course Title**
1.	20CSC4M01	Software Testing
2.	20CSC4M02	Introduction to Soft Computing
3.	20CSC4M03	Online Privacy
4.	20CSC4M04	Privacy and Security in Online Social Media
5.	20CSC4M05	Multi-Core Computer Architecture
6.	20CSC4M06	Introduction to Internet of Things
7.	20CSC4M07	Advanced Computer Architecture
8.	20CSC4M08	Social Network Analysis
9.	20CSC4M09	Software Project Management
10.	20CSC4M10	Computational Complexity
Any other new Disciplinary Course which doesn't exist in the Curriculum can be appended in future.		

Professional Elective – III		
Sl. No.	**Course Code**	**Course Title**
1.	20CSC406	Information Security Standards and Policies
2.	20CSC407	Cryptanalysis
3.	20CSC408	Multimedia Security
4.	20CSC409	Introduction to Cyber Physical Systems
5.	20CSC410	Network Security and Secure Coding
Any advanced courses can be appended in future		

Professional Elective – IV		
Sl. No.	**Course Code**	**Course Title**
1.	20CSC411	Introduction to Digital Forensics
2.	20CSC412	Cloud Security
3.	20CSC413	Mobile and Wireless Security
4.	20CSC414	Malware Analysis
5.	20CSC415	IoT Security
Any advanced courses can be appended in future		

Professional Elective – V		
Sl.No	Course Code	Title
1.	20CSC416	Cyber Security Framework
2.	20CSC417	Data Science
3.	20CSC418	Blockchain Technology
4.	20CSC419	Public Key Infrastructure and Trust Management
5.	20CSC420	Information Retrieval and Search Engine
Any advanced courses can be appended in future		

ANNEXURE – IV

SKILL ORIENTED COURSES

Skill Oriented Course - I		
Sl.No	**Course Code**	**Course Title**
1	20CSC601	Web Scripting
2	20CSC602	Android Application Development
Any advanced courses can be appended in future		

Skill Oriented Course – II		
Sl.No	**Course Code**	**Course Title**
1	20ENG601	Corporate Communication
Any advanced courses can be appended in future		

Skill Oriented Course – III		
Sl.No	**Course Code**	**Course Title**
1	20CSC603	Web and Database Security
2	20CSC604	R Programming
3	20CSC605	Selenium with Java
Any advanced courses can be appended in future		

Skill Oriented Course – IV		
Sl.No	**Course Code**	**Course Title**
1	20CSC606	Ethical Hacking
2	20CSC607	Middleware Technologies
3	20CSC608	Security and Network Forensics
Any advanced courses can be appended in future		

Skill Oriented Course – V		
Sl.No	**Course Code**	**Course Title**
1	20CSC609	NoSQL
2	20CSC610	Intrusion Detection Systems
Any advanced courses can be appended in future		

B. Tech Computer Science and Engineering (Cyber Security)

ANNEXURE - V

Honors in Computer Science and Engineering (Cyber Security)

SI.No	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total Contact Hours	
III Year I Semester								
1	**Professional Elective Course (Choose any two from three courses)**	20HDCSC101	Research Methods for the Study of Evolution	3	0	0	3	3
2		20HDCSC102	Natural Language Processing	3	0	0	3	3
3		20HDCSC103	Introduction to Game Theory	3	0	0	3	3
	Sub Total			**6**	**0**	**0**	**6**	**6**
	III Year II Semester							
4	**Professional Elective Course (Choose any two from three courses)**	20HDCSC104	High Performance Computing	3	0	0	3	3
5		20HDCSC105	Advanced Computer Networks and Communications	3	0	0	3	3
6		20HDCSC106	Game Design Studio	3	0	0	3	3
	Sub Total			**6**	**0**	**0**	**6**	**6**
	IV Year I Semester							
7	**Professional Elective Course (Choose any two from three courses)**	20HDCSC107	Evolutionary Computing	3	0	0	3	3
8		20HDCSC108	Advanced Software Engineering	3	0	0	3	3
9		20HDCSC109	Nature Inspired Computing	3	0	0	3	3
10	**SOC**	20HDCSC601	Penetration Testing	1	0	2	3	2
	Sub Total			**7**	**0**	**2**	**9**	**8**
	Total			**19**	**0**	**2**	**21**	**20**

I Year I Semester

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech I Year I Semester

20MAT101 ENGINEERING CALCULUS

L	T	P	C
3	1	**0**	**4**

Pre-requisite: Mathematics at Intermediate or Equivalent Level

Course Description:
Communication takes place in many forms, however the major impact and effectiveness is in its professionalism. This course defines, enlightens and enables learners to engage in Professional Communication by addressing all the areas of communication – Listening, Speaking, Reading and Writing. This course also deals with various types of communication – Verbal, Non-verbal, Storytelling, Crucial Conversations, Written Communication, Vocalics, Eye Contact, Posture, etc.

Course Objectives: This course enables the student to –

1. To introduce the basic concepts of definite integrals, improper integrals, Beta and Gamma functions.
2. To acquire knowledge on mean value theorems in calculus.
3. To illustrate various techniques of testing the convergence of infinite series and introduces the functions of sine and cosine series.
4. To familiarize the knowledge of limit, continuity and the derivatives, extreme values in Multivariable.
5. To emphasize the role of Double and Triple integrals in dealing with area and volume of the regions.

UNIT I INTEGRAL CALCULUS 12 hours

Definite integrals; Applications of definite integrals to evaluate area and length of curves, surface areas and volumes of revolutions; Beta and Gamma functions and their properties.

UNIT II DIFFERENTIAL CALCULUS 12 hours

Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders (without proofs); indeterminate forms, Maxima and minima.

UNIT III SEQUENCE AND SERIES 12 hours

Sequence and Series, their Convergence and tests for convergence; Power series, Taylor's series, Series for exponential, trigonometric and logarithmic functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

UNIT IV MULTIVARIABLE DIFFERENTIAL CALCULUS 12 hours

Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers.

UNIT V MULTIVARIABLE INTEGRAL CALCULUS 12 hours

Multiple Integration: double integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes (double integration), triple integrals, gradient, curl and divergence, Green's, Stokes and Gauss divergence theorems (without proofs).

Course Outcomes:

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

1. Evaluate the definite integrals, Beta and Gamma functions and calculate length of curve and underlying area.
2. Relate the results of mean value theorems in calculus to Engineering problems.
3. Use the Power series and Fourier series for ascertaining the stability and convergence of various techniques.
4. Apply the functions of several variables to evaluate the rates of change with respect to time and space variables in engineering.
5. Compute the area and volume by interlinking them to appropriate double and triple integrals.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 42th Edition, 2012.

2. G. B. Thomas, Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas' Calculus Pearson education 11th Edition, 2004.

Reference Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2 Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3 Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4 Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
5 D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
6 N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech I Year I Semester

20PHY102 APPLIED PHYSICS

L	T	P	C
3	1	0	4

Pre-requisite: Plus two level physics course

Course Description:
Applied Physics for Electrical, Electronics and Computer Engineers is a basic physics course which provides fundamental knowledge to understand the concepts of Waves, Optics, Quantum Mechanics, Semiconductors, Lasers and Fiber Optics.

Course Objectives:

1. Expose students in understanding the basic laws of nature through wave equation using the principles of oscillations and waves.
2. Analyze and understand the concepts of waves and optics to prepare the students for advanced level courses.
3. Expose students to theoretical and mathematical aspects of Interference, Diffraction techniques, Polarization and Lasers for testing of materials.
4. Develop knowledge and understanding the fundamental concepts of Quantum mechanics, Semiconductors and Fiber Optics.
5. Adaptability to new developments in science and technology.

UNIT I WAVES AND OSCILLATIONS 11 hours

Simple harmonic motion, damped harmonic oscillations, forced harmonic oscillations, resonance, and quality factor. Superposition of vibrations along same direction (equal frequency) and in perpendicular directions, Lissajous figures.

Transverse waves, one dimensional wave equation, solution for wave equation, velocity of a transverse wave along a stretched string, modes of vibration of stretched string, reflection and transmission waves at boundary, standing waves, standing wave ratio.

UNIT II OPTICS 13 hours

Superposition of waves, interference of light by division of wavefront - Young's double slit experiment, interference of light by division of amplitude- interference in thin film by reflection, Newton's rings experiment.

Diffraction, Farunhofer diffraction due to single slit, double slit and Diffraction grating (Nslit).

Polarization, Types of polarization, Polarization by reflection, refraction and double refraction, Nicol's prism. Half wave and Quarter wave plates.

UNIT III QUANTUM MECHANICS 12 hours

De Broglie's hypothesis, Uncertainty principle (Qualitative only), Postulates of quantum mechanics, Time-dependent and time-independent Schrodinger equations for wave function, Free-particle wave function and wave-packets (group velocity & phase velocity), Solution of wave equation: Solution of stationary-state, Schrodinger equation for one dimensional problems – particle in a box, Scattering from a potential barrier and principle of tunnelling- operation of scanning tunnelling microscope.

UNIT IV FREE ELECTRON THEORY & SEMICONDUCTORS 12 hours

Free electron theory of metals (drift velocity and electrical conductivity), Fermi energy level, density of states, Kronig-Penney model (Qualitative only) and origin of energy bands, band structure of metals,

semiconductors, and insulators. Direct and indirect bandgap semiconductors, Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier concentration and temperature (equilibrium carrier statistics), Drift and Diffusion Current, Hall effect.

UNIT V LASERS & FIBER OPTICS 12 hours

Introduction to lasers, characteristics of laser, spontaneous and stimulated emission, Einstein's coefficients; population inversion, excitation mechanisms, solid-state lasers – ruby laser, gas Lasers - He-Ne Laser, applications of lasers.

Fiber Optics: Principle, Construction and working of optical fiber, Acceptance angle, Numerical aperture, Types of fiber, Fiber optic communication system.

Course Outcomes:

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

1. Describe a mathematical wave equation using the principles of waves and oscillations
2. Apply the knowledge for materials testing using Interference, Diffraction & Polarization techniques.
3. Understand the idea of wave function and to solve Schrodinger equation for simple potentials.
4. Explain the role of semiconductors in different realms of physics and their applications in both science and technology.
5. Acquire the basic knowledge of lasers and fiber optics.

Text Books:

1. Engineering Physics –Dr. M.N. Avadhanulu & Dr. P.G. Kshirsagar, S. Chand and Company
2. Engineering Physics –K. Thyagarajan, McGraw Hill Publishers.

Reference Books:

1. H. J. Pain, "The physics of vibrations and waves", Wiley, 2006.
2. Physics Vol I & II, Halliday/Resnick/Krane 5th Edition, John Wiley, 2003.
3. B.G. Streetman, "Solid State Electronic Devices", Prentice Hall of India, 1995.
4. Concepts of Modern Physics by Arthur Beiser, 7th Edition, 2017.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech I Year I Semester

20EEE101 BASIC ELECTRICAL ENGINEERING

L	T	P	C
3	1	0	4

Pre-requisite Intermediate Physics

Course Description:

This course equips the students with a basic understanding of Electrical circuits and machines for specific applications. In specific, the course covers basic of DC circuit & its analysis, introduction to single-phase and three-phase AC Systems, magnetic materials, transformers, DC & AC electrical machines, basic converters and Components of LT Switchgear.

Course Objectives:

1. To learn the basics of the D.C. circuit analysis.
2. To have an idea about single-phase and three-phase A.C. electrical circuits.
3. To gain knowledge about basic magnetic material and transformers.
4. To learn the construction and operation of D.C. and A.C. machines.
5. To understand the operation of basic rectifiers and various components of LT Switchgear.

UNIT I DC CIRCUIT ANALYSIS 12 hours

Electrical circuit elements, voltage and current sources, Series and parallel resistive circuits, Kirchhoff's current and voltage laws, Nodal and Mesh analysis of simple circuits with dc excitation. Source Transformation, Star-Delta Transformation, Superposition Theorem.

UNIT II AC CIRCUIT ANALYSIS 12 hours

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations. Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT III MAGNETIC MATERIALS AND TRANSFORMERS 12 hours

Magnetic materials, B-H characteristics, ideal and practical transformer, principle of operation, emf equation, equivalent circuit, losses in transformers, regulation and efficiency.

UNIT IV DC AND AC MACHINES 12 hours

Construction, working, emf equation of DC generator, methods of excitation, speed control of dc motor. Introduction to different types of AC motors, Three Phase Induction Motors - Generation of rotating magnetic fields, construction, working and starting methods: D.O.L, Autotransformer starter. Introduction to Alternators.

UNIT V RECTIFIERS AND ELECTRICAL INSTALLATIONS 12 hours

PN junction diode, half wave, full wave and bridge rectifiers. Components of LT Switchgear: switch fuse unit (SFU), MCB, ELCB, MCCB, types of wires and cables – Current carrying capability, Insulation Strength; Earthing.

B. Tech Computer Science and Engineering (Cyber Security)

Course Outcomes:

Upon successful completion of the course, students will be able to

understand and analyze basic DC electric circuits.

1. To measure and analyze various electrical quantities of single phase and three AC electric circuits.
2. To understand magnetic materials and to analyze the transformers.
3. To study the working principles of electrical machines.
4. To create power converters for domestic applications with LT switchgear.

Text Books:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
2. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
3. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
4. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
5. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

Reference Books:

1. Abhijit Chakrabarti, "Circuit Theory : Analysis and Synthesis", Dhanpat Rai & Co., 2014.
2. J.B. Gupta, "Theory & Performance of Electrical Machines", S. K. Kataria & Sons, 2013.
3. John Bird, "Electrical Circuit Theory and Technology", Fourth edition, Elsevier Ltd., 2010.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech I Year I Semester

20CSE101 PROGRAMMING FOR PROBLEM SOLVING (PYTHON)

L	T	P	C
2	0	3	3.5

Pre-requisite: None

Course Description:

Python is a language with a simple syntax, and a powerful set of libraries. It is an interpreted language, with a rich programming environment. While it is easy for beginners to learn, it is widely used in many scientific areas for data exploration. This course is an introduction to the Python programming language for students without prior programming experience.

This course provides knowledge on how to implement programs in python language and to solve computational problems using the various programming constructs including data structures, functions, string handling mechanisms and file handling concepts

Course Objectives:

This course enables students to

1. Learn Python programming constructs.
2. Implement Python programs with conditional structures and loops.
3. Use functions for structuring Python programs.
4. Handle compound data using Python lists, tuples, and dictionaries.
5. Manipulate data using files handling in Python.
6. Getting exposed to the basics of Object Oriented Programming using Python

UNIT I: INTRODUCTION **12 hours**

Algorithms, building blocks of algorithms (flow chart), History of Python, features of Python Programming, Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation. Data Types - Integers, Strings, Boolean.

a) Develop a flowchart for the various arithmetic operations on numbers.
b) Develop a flowchart to check whether the number is positive or negative.
c) Develop a flowchart for finding whether a given number is even or odd.
d) Develop a flowchart for finding biggest number among three numbers.
e) Develop a flowchart for displaying reversal of a number.
f) Develop a flowchart to print factorial of a number using function.
g) Develop a flowchart to generate prime numbers series up to N using function.
h) Develop a flowchart to check given number is palindrome or not using function.
i) Alexa travelled 150 kms by train. How much distance in miles she actually covered?

UNIT II: OPERATORS AND EXPRESSIONS **12 hours**

Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations. Control Flow - if, if-elif else, for, while, break, continue, pass.

a) Swapping of two number with and without using temporary variable.
b) If the age of Ram, Sam, and Khan are input through the keyboard, write a python program to determine the eldest and youngest of the three.
c) Develop a program that performs arithmetic operations (Addition, Subtraction, Multiplication, and Division) on integers. Input the two integer values and operator for performing arithmetic operation through keyboard. The operator codes are as follows:

- For code '+', perform addition.
- For code '-', perform subtraction.
- For code '*', perform multiplication.
- For code '/', perform division.

d) Implement the python program to generate the multiplication table.
e) Implement Python program to find sum of natural numbers
f) If the first name of a student is input through the keyboard, write a program to display the vowels and consonants present in his/her name.
g) The marks obtained by a student in 5 different subjects are input through the keyboard. Find the average and print the student grade as per the MITS examination policy as shown below.

% OBTAINED GRADE
90 - 100 O (Outstanding)
80 - 89 A+ (Excellent)
70 - 79 A (Very Good)
60 - 69 B+ (Good)
50 - 59 B (Above)
45 - 49 C (Average)
40 - 44 P (Pass)
< 40 F (Fail)

h) Implement Python Script to generate prime numbers series up to N.
i) Given a number x, determine whether it is Armstrong number or not. Hint: For example, 371 is an Armstrong number since 3**3 + 7**3 + 1**3 = 371. Write a program to find all Armstrong number in the range of 0 and 999.

UNIT-III: DATA STRUCTURES **12 hours**

Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions. Functions - Defining Functions, Calling Functions, Passing Arguments, variable in python-Global and Local Variables.

a) Write a Python script to
- create a list
- access elements from a list
- slice lists
- change or add elements to a list
- delete or remove elements from a list

b) Write a Python script to read the values from a list and to display largest and smallest numbers from list.
c) Write a Python script to compute the similarity between two lists.
d) Write a Python script to read set of values from a Tuple to perform various operations.
e) Write a Python script to perform basic dictionary operations like insert, delete and display.
f) Write a Python program to count the occurrence of each word in a given sentence.
g) Define a dictionary named population that contains the following data.

Keys	Values
Shanghai	17.8
Istanbul	13.3
Karachi	13.0
Mumbai	12.5

h) Write a Python script to create Telephone Directory using dictionary and list to perform basic functions such as Add entry, Search, Delete entry, Update entry, View and Exit.
i) Implement Python script to display power of given numbers using function.

j) Implement a Python program that takes a list of words and returns the length of the longest one using function.

UNIT-IV:

String Handling -Modules: Creating modules, import statement, from import statement, name spacing

Files and Directories:

a) Implement Python program to perform various operations on string using string libraries.

b) Implement Python program to remove punctuations from a given string.

c) Write a Python program to change the case of the given string (convert the string from lower case to upper case). If the entered string is "computer", your program should output "COMPUTER" without using library functions.

d) Implement Python program to capitalize each word in a string. For example, the entered sentence "god helps only people who work hard" to be converted as "God Helps Only People Who Work Hard"

e) Write a Python script to display file contents.

f) Write a Python script to copy file contents from one file to another.

g) Write a Python script to combine two text files contents and print the number of lines, sentences, words, characters and file size.

h) Write a Python commands to perform the following directory operations.

- List Directories and Files
- Making a New Directory
- Renaming a Directory or a File
- Removing Directory or File

UNIT-V:

Python packages: Predefined Packages and User-defined Packages, Package Creation.

Object Oriented Programming using Python: Introduction to OOP, Creating Classes and Objects in Python, Creating Methods in Python

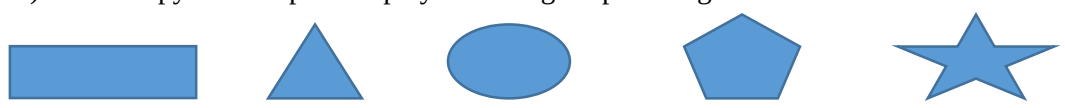
Brief Tour of the Standard Library: Turtle

a) Create a package named Cars and build three modules in it namely, BMW, Audi and Nissan. Illustrate the modules using class. Finally we create the __init__.py file. This file will be placed inside Cars directory and can be left blank or we can put the initialization code into it.

b) Create a class by name Student with instance variables such as roll_no, name, year_of_study, branch, section, and marks in any five subjects. The class should also contain one method for calculating the percentage of marks and the other method for printing a report as follows:

Roll No.	Name	Year	Section	Branch	M1	M2	M3	M4	M5	Percentage
101	abc	I	A	CSE	58	68	95	47	56	64.8

b) Write a python script to display following shapes using turtle.



Course Outcomes:

At the end of the course, students will be able to

1. Understand problem solving techniques and their applications
2. Understand the syntax and semantics of python.
3. Demonstrate the use of Python lists and dictionaries.
4. Demonstrate the use of Python File processing, directories.
5. Describe and apply object-oriented programming methodology and Standard Library.

Text Books:

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016
(http://greenteapress.com/wp/thinkpython/)
2. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

References:

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

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech I Year I Semester

20ENG201 ENGLISH FOR PROFESSIONAL PURPOSES LABORATORY
(Common to all branches)

L	T	P	C
0	0	2	1

Pre-requisite None

Course Description:

English language communication is a social phenomenon and students need to be able to function in the society at large as the communicators before entering the professional world. The present course equips the students with the basic functions of English language communication, which are required not only in their day-to-day lives but also profoundly significant for their future professional, academic training and their careers in the industry. The course mainly focuses on the achievement of communicative proficiency of the students coupled with the necessary linguistic inputs.

Course Objectives:

This course enables the student to –

1. Get aquatinted with the basic communicative functions.
2. Engage effectively in learning various functions of English language communication.
3. Enhance their narration abilities in past experiences and future plans and goals/events.
4. Develop their abilities in expressing opinion.
5. Provide speaking practice in speech.

Course contents:

Greeting and Introductions (L & S)

- Greeting on different occasions and responding to greetings **(L & S)**
- Wishing on various occasions, taking leave and saying goodbye **(L & S)**
- Introducing oneself and others **(L & S)**
- Asking for introduction and responding to introduction **(L & S)**
- Developing a short personal profile **(R &W)**

Describing: (L, S, R & W)

- Using adjectives **(Vocab)**
- Degrees of comparison **(Grammar)**
- Common words, phrases, and expressions used for description **(Vocab)**
- Describing people, places and objects **(L, S, R & W)**
- Reading and writing descriptive paragraphs **(R &W)**

Narrating (L, S, R & W)

- Talking about past experiences and events **(L & S)**
- Talking about memorable incidents or events **(L & S)**
- Techniques of narration and narrative tenses **(Grammar)**
- Composing and narrating a story **(R &W)**

Planning and Predicting (L, S, R & W)

- Talking about future events **(L & S)**
- Making promises and giving assurances **(L & S)**

- Predicting future events **(L & S)**
- Writing and organising a short plan of an event **(R &W)**

Instructions and directions (L, S, R & W)
- Forming imperative sentences (Grammar)
- Reading and writing short instruction manuals **(R &W)**
- Writing a recipe/ procedure **(R &W)**
- Giving directions

Enquiring: (L, S, R & W)
- Open and closed ended questions **(Grammar)**
- Asking for information and giving information **(L & S)**
- Telephonic enquiry **(L & S)**
- Official enquiries through emails and letters **(R &W)**

Requesting: (L, S, R & W)
- Polite expressions
- Modal verbs and key phrases for requesting **(Grammar and vocab)**
- Official requests through emails and letters **(R &W)**

Comparing and contrasting: (L, S, R & W)
- Words and phrases used for comparison and contrast **(Vocab)**
- Comparing qualities/properties/quantities of people, places and objects **(L & S)**
- Composing comparison and contrast paragraphs **(R &W)**

Expressing opinion: (L, S, R & W)
- Language expressions used for expressing opinions **(Vocab)**
- Developing opinion based paragraphs **(R &W)**
- Discourse markers and linkers used in opinion based paragraphs **(R &W)**

Public Speaking: (L, S, R & W)
- Techniques and strategies required for public speaking **(L & S)**
- Developing and organising a short speech **(R &W)**
- Presentation skills required for public speaking **(L & S)**

Course Outcomes:

At the end of the course, students will be able to
1. Develop their confidence while giving introduction, describing a place, & giving directions. (3,4,5)
2. Use various functions of English like asking for & giving information**,** inviting people for events/occasions, & requesting people. (3,4,5)
3. Narrate the past experiences and events in speaking and wring (3,4,5)
4. Express their views and opinions logically and appropriately in spoken and written format. (3,4,5,6)
5. Deliver logically organized speeches and present them without hesitations. (3,4,5, 6)

Text Books:

1. Leo Jones; Functions of English, Published by: Cambridge University Press.
2. Leo Jones; Let's Talk Level 1, 2, 3, Published by: Cambridge University Press.
3. Adrian Doff, Craig Thaine, Herbert Puchta, et al; *Empower: Intermediate (B1+)*; Published by: Cambridge University Press.

References:

1. AJ Thomson & AV Martinet; A Practical English Grammar; Oxford University Press,2015.
2. Raymond Murphy; English Grammar in Use with CD; Cambridge University Press 2013.
3. K.S. Yadurajan; Modern English Grammar; Oxford University Press, 2014.
4. William Strunk Jr; The Elements of Style; ITHACA, N.Y.; W.P. HUMPHREY, 2006
5. Joseph Devlin; How to Speak and Write Correctly; ITHACA, N.Y.; W.P.HUMPHREY, 2006
6. Anjana Agarwal; Powerful Vocabulary Builder; New Age Publishers, 2011.
7. Writing Tutor; Advanced English Learners' Dictionary; Oxford University Press, 2012
8. www.cambridgeenglish.org/in/
9. https://learnenglish.britishcouncil.org/en/english-grammar
10. https://www.rong-chang.com/

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech I Year I Semester

20PHY201 PHYSICS LABORATORY

L	T	P	C
0	0	3	1.5

Course Description:

Physics Practical course is meant for making the students to gain practical knowledge to co relate with the theoretical studies. It covers experiments on Principles of Mechanics and Optics, Measurement of Magnetic field and studying Resonance using LCR Circuit.

Course Objectives:

1. Elucidate the concepts of Physics through involvement in the experiment by applying theoretical knowledge.
2. Illustrate the basics of mechanics, waves and optics to analyze the behavior and characteristics of various materials for its optimum utilization.
3. Develop an ability to apply the knowledge of physics experiments in the later studies.

LIST OF EXPERIMENTS:

{Out of 17 experiments any 12 experiments (minimum 10) must be performed in a semester}

1. Spring constant - Coupled Pendulums.
2. Study of resonance effect in series and parallel LCR circuit.
3. Determination of radius of curvature of a curved surface - Newton's Rings.
4. Wavelength of a laser - Diffraction Grating
5. Wavelength of the spectral lines - Diffraction Grating.
6. Magnetic field along the axis of a current carrying coil - Stewart Gees' Apparatus
7. Thickness of a given wire - Wedge Method.
8. Dispersive power of prism – Spectrometer.
9. Frequency of the tuning fork - Melde's apparatus.
10. Determination of particle size using Laser.
11. Width of single slit - Diffraction due to Single Slit.
12. Torsional Pendulum.
13. Determination of the numerical aperture of a given optical fiber and hence to find its acceptance angle.
14. Measurement of *e/m* of electron (Thomson's method)
15. Energy gap of a material of p-n junction.
16. Determination of Planck's constant.
17. Ferroelectric hysteresis (B-H Curve).

Course Outcomes:

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

1. Apply the scientific process in the conduct and reporting of experimental investigations.
2. Understand measurement technology, usage of new instruments and real time applications in engineering studies.
3. Verify the theoretical ideas and concepts covered in lecture by doing hands on in the experiments.
4. Know about the characteristics of various materials in a practical manner and gain knowledge about various optical technique methods.
5. Acquire and interpret experimental data to examine the physical laws.

Reference Books:

1. Physics Laboratory Manual
2. Optics, A. Ghatak, 4th Edition, Tata McGraw-Hill, New Delhi 2011.
3. Fundamentals of Optics, F. A. Jenkins and H. E. White, 4th edition, McGraw-Hill Inc., 1981.
4. Engineering Mechanics, 2nd ed. — MK Harbola
5. Introduction to Electrodynamics- David J Griffiths

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech I Year I Semester

20EEE201 ELECTRICAL ENGINEERING LABORATORY

L	T	P	C
0	0	3	1.5

Prerequisite: None

Course Description:

The laboratory facilitates the students to deal with electrical instruments, which further strengthen the concepts & operation of various AC & DC circuits, and machines, and their characteristics. The lab also reinforce the concepts discussed in class with a hands-on approach which enable the students to gain significant experience with electrical instruments such as ammeter, voltmeter, digital multimeter, oscilloscopes, tachometer, switches, fuses and power supplies.

Course Objectives:

1. To provide hands on experience in setting up simple electrical circuits (DC and AC).
2. To get exposure to handle different electrical equipment's.
3. To measure various electrical parameters with different measuring instruments.
4. To get hands on experience in operating DC and AC machines.
5. To understand the operation of basic converters and various components of LT Switchgear..

LIST OF LABORATORY EXPERIMENTS/DEMONSTRATIONS:

DEMONSTRATIONS:

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, wattmeter, multi-meter, oscilloscope. Study of passive components - resistors, capacitors and inductors.
2. Demonstration of voltage and current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents). In star and delta connections.
3. Demonstration of cut-out sections of transformer and DC & AC machines.
4. Demonstration of induction machine. Motor operation and generator operation of an induction machine driven at super-synchronous speed.
5. Wavelength of the spectral lines - Diffraction Grating.
6. Familiarization of (i) different types of cables/wires and switches and their uses, (ii) different types of fuses & fuse carriers; MCB, ELCB, MCCB their ratings and uses (components of LT switchgear).

EXPERIMENTS:

1. Wiring of a simple circuit for controlling (1) a lamp/fan point, (2) Staircase or Corridor Winding.
2. Wiring of a power circuit for controlling an electrical appliance (16A Socket).
3. Verification of Kirchhoff's current and voltage laws (KCL & KVL).
4. Verification of superposition theorem
5. Sinusoidal steady state response of R-L, and R-C circuits (impedance calculation and verification).
6. Measurement of voltage, current and power in a single-phase circuit using voltmeter, ammeter and wattmeter. Also, calculate the power factor of the circuit.
7. Measurement of voltage, current and power in a single-phase circuit using voltmeter, ammeter and wattmeter. Also, calculate the power factor of the circuit.
8. Open-circuit and short-circuit test on a single-phase transformer.
9. Speed control of separately excited DC motor.
10. Wiring of a power distribution arrangement using single-phase MCB distribution board

with ELCB, main switch and energy meter (or residential house wiring).

11. Regulated power supply for generating a constant DC Voltage.

12. Fabrication of a given electronic circuit on a PCB and test the same.

Course Outcomes:

Upon successful completion of the course, the students are expected to

1. Get an exposure to common electrical components and their ratings.

2. Make electrical connections by wires of appropriate ratings.

3. Understand the usage of common electrical measuring instruments.

4. Understand the basic characteristics of transformers and electrical machines.

5. Get an exposure to the working of various power electronic converters.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

I Year II Semester

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech I Year II Semester

20ENG101 PROFESSIONAL ENGLISH

L	T	P	C
3	0	0	3

Pre-requisite None

Course Description:
Communication takes place in many forms, however the major impact and effectiveness is in its professionalism. This course defines, enlightens and enables learners to engage in Professional Communication by addressing all the areas of communication – Listening, Speaking, Reading and Writing. This course also deals with various types of communication – Verbal, Non-verbal, Storytelling, Crucial Conversations, Written Communication, Vocalics, Eye Contact, Posture, etc.

Course Objectives: This course enables the student to –

1. Engage effectively in a professional environment
2. Understand the intricacies and implications of professional communication
3. Use linguistic skills in any given context
4. Conduct self in a learning environment
5. Be better prepared for employment

UNIT I GRAMMAR & VOCABULARY 9 hours

Grammar - Tense, Reported Speech, Modals, Conditionals; Vocabulary development - prefixes, suffixes, compound words, synonyms & antonyms.

UNIT II READING SKILLS & WRITTEN COMMUNICATION 9 hours

Reading - short comprehension passages, practice in skimming, scanning and predicting; Writing- completing sentences, developing hints; Paragraph writing- topic sentence, main ideas, coherence.

UNIT III VERBAL & NON-VERBAL ASPECTS 9 hours

Verbal - Introducing oneself, exchanging personal information, Using 'Wh'- Questions, asking and answering, yes or no questions- asking about routine actions and expressing opinions; Non-Verbal – Use of body language, combating nervousness.

UNIT IV CONVERSATIONS 9 hours

Listening-short texts & conversing, formal and informal conversations, short group conversations, speaking about oneself, sharing information of a personal kind speaking about one's friend.

UNIT V BUSINESS ENVIRONMENT & ETIQUETTES 9 hours

Greeting & taking leave; Writing e-mails, memos, reports, etc.

B. Tech Computer Science and Engineering (Cyber Security)

Course Outcomes:

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

1. Read articles and understand professional communication
2. Participate effectively in informal conversations
3. Introduce themselves and their friends and express opinions in English
4. Comprehend conversations and short talks delivered in English
5. Write short essays of a general kind and personal letters and emails in English.

Text Books:

1. Guy Brook Hart & Norman Whitby; Cambridge English-Business Benchmark: Pre-Intermediate to Intermediate; Published by: Cambridge University Press.

2. Adrian Doff, Craig Thaine, Herbert Puchta, et al; Empower: Intermediate (B1+); Published by: Cambridge University Press.

Reference Books

1. AJ Thomson & AV Martinet; A Practical English Grammar; Oxford University Press, 2015.
2 Raymond Murphy; English Grammar in Use with CD; Cambridge University Press, 2013.
3 K.S. Yadurajan; Modern English Grammar; Oxford University Press, 2014.
4 William Strunk Jr; The Elements of Style; ITHACA, N.Y.; W.P. HUMPHREY, 2006
5 Joseph Devlin; How to Speak and Write Correctly; ITHACA, N.Y.; W.P. HUMPHREY, 2006
6 Anjana Agarwal; Powerful Vocabulary Builder; New Age Publishers, 2011.
7 Writing Tutor; Advanced English Learners' Dictionary; Oxford University Press, 2012.
8 http://www.cambridgeenglish.org/in/
9 https://www.rong-chang.com/
10 https://www.rong-chang.com/

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech I Year II Semester

20MAT110 LINEAR ALGEBRA

L	T	P	C
3	0	0	3

Pre-requisite 20MAT101

Course Description:

Linear algebra has widespread applications in engineering and science. In this course, various methods of solving system of linear equations, as applicable in the information technology and electrical circuits are highlighted. The concept of reduction of number of variables in systems has been introduced and effect of change of basis from the view point of computer graphics has been explained. Finally, basics involved in search engine operations by orthogonalisation and least squares optimization have been explained.

Course Objectives:

1. Understanding basic concepts of linear algebra (systems of linear equations, matrix calculus, vectors and basic vector operations).
2. Learn about vector spaces and subspaces.
3. To become proficient in solving computational problems of linear algebra.
4. To understand the axiomatic structure of modern mathematics and learn to construct simple proof.
5. To gain basic knowledge of search engine operations and optimization path.

UNIT I LINEAR EQUATIONS AND MATRICES 9 hours

System of linear equations, Gaussian elimination, Gauss-Jordan method, LU and LDU factorization, block matrices, inverse of matrices, elementary matrices, permutation matrix, Eigen value and Eigen vectors, Cayley -Hamilton Theorem (without proof), applications to cryptography and electrical network.

UNIT II VECTOR SPACE 9 hours

The n-space $R\ n$ and vector space, subspaces, bases, linear combination, span, linear independence, dimensions, finite dimensional, Row and column spaces, Rank and nullity, Bases for subspace, invertibility, application in interpolation.

UNIT III LINEAR TRANSFORMATIONS 9 hours

Basic Properties of Linear transformations, invertible linear transformation, matrices of linear transformations.

UNIT IV VECTOR SPACE OF LINEAR TRANSFORMATIONS 9 hours

Vector space of linear transformations, change of bases, similarity, application to computer graphics.

UNIT V INNER PRODUCT SPACES 9 hours

Dot Products and Inner products, the lengths and angles of vectors, matrix representations of inner products, Gram-Schmidt orthogonalisation, orthogonal projections, relations of fundamental subspaces, orthogonal matrices and isometrics, singular value decomposition (SVD), applications to least square solutions.

Course Outcomes:

At the end of the course, the students should be able to:

1. Solve systems of linear equations using Gaussian elimination and matrix inversion.
2. Understand the concepts of vector space and subspace, linear independence and use them in network

systems. Apply principles of matrix algebra to linear transformations in solving engineering problems.

3. Use the concepts of similarity of transformations in computer graphics.
4. Demonstrate understanding of inner products, associated norms and interlink to search operations on network.

Text Books:

1. Jin Ho Kwak and Sungpyo Hong, "Linear Algebra", Second edition, Birkhaüser, 2004.

Reference Books:

1. Stephen Andrilli and David Hecher, Elementary Linear Algebra, 3rd Edition, Academic Press (2006)
2. Charles W. Curtis, Linear Algebra, Springer (2004).
3. Howard Anton and Robert C Busby, Contemporary linear algebra, John Wiley (2003).
4. Gilbert Strang, Introduction to Linear Algebra.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech I Year II Semester

20CHE101 ENGINEERING CHEMISTRY

L	T	P	C
3	0	0	3

Pre-requisite: Basic Chemistry at Intermediate or equivalent level.

Course Description:
Deals with the basic principles of various branches of chemistry like physical, organic, inorganic, analytical and nanomaterial chemistry.

Course Objectives:
Students will

1. Understand, analyse and determine the impurities present in the water.
2. Appreciate the synthetic organic reactions used in daily life
3. Learn the principles of spectroscopies to analyse them.
4. Value the basic concepts of thermodynamics and electrochemistry.
5. Be exposed to the importance of nano and engineering materials used in their daily life and industry

UNIT I IMPURITIES PRESENT IN WATER AND WATER TREATMENT **9 hours**

Impurities present in Water: Impurities in water (BIS and WHO standards), Hardness of water-determination of hardness - EDTA Method (numerical problems), Alkalinity of water (numerical problems), Estimation of Dissolved Oxygen by Winkler's method and its importance and Chlorides. Disadvantages (industry level) of using hard water (Boiler corrosion, Caustic embrittlement, Scale and Sludges). Softening of water (Ion exchange method), Treatment of brackish water by Reverse Osmosis method. Water treatment for civic applications: coagulation, sedimentation, filtration, sterilization - chlorination and ozonation. Concept of break point chlorination.

UNIT II PERIODIC PROPERTIES AND ORGANIC REACTIONS **7 hours**

Periodic properties: Electronic configurations, atomic and ionic sizes, ionization energies, oxidation states, molecular geometries. Organic Reactions: Introduction to substitution (SN^1 and SN^2), elimination (E_1 and E_2) - Addition, Condensation and Free Radical Polymerization Reaction (only the mechanism).

UNIT III SPECTROSCOPY **8 hours**

Basic Principle and Applications of UV-Visible, FT-IR, Raman, Microwave and Nuclear Magnetic Resonance (NMR) Spectroscopy

UNIT IV THERMODYNAMICS AND ELECTROCHEMISTRY **11 hours**

Thermodynamics: Systems, State Functions, Thermodynamic Functions: Work, Energy, Entropy and Free energy. Estimations of Entropy in Isothermal, Isobaric and Isochoric processes. Electrochemistry: Free energy and EMF. Cell potentials, the Nernst equation and applications. Batteries (Lead-Acid and Lithium ion) and Fuel-Cells (H_2-O_2).

UNIT V ENGINEERING MATERIALS, NANOSCIENCE & NANOTECHNOLOGY **10 hours**

Engineering Materials: Cement Materials and Manufacturing Process. Reactions in setting and hardening of Cement. Lubricants – definition, Properties of lubricants – Viscosity, Viscosity Index,

Flash Point and Pour Point. Nanomaterials: Introduction, Classes/Types, Chemical synthesis of Nanomaterials: Chemical Vapor Deposition method (Carbon Nanotubes), Characterization by powder XRD (Scherrer's equation). Applications of Nanomaterials: Solar Energy and Photocatalytic Dye Degradation (TiO_2).

Course Outcomes:

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

1. Analyse and determine the impurities in water such as hardness, alkalinity for sustainable development.
2. Prepare organic compounds/polymers for environmental, safety and society need.
3. Comprehend the principles and applications of spectroscopies.
4. Apply the concept of free energy in thermodynamics, electrochemistry for solving the problems evolve in the engineering processes.
5. Acquire spotlight to the nanomaterials and basic engineering materials used in academics, industry, and daily life.

Text Books:

1. P. W. Atkins & Julio de Paula, 'The Elements of Physical Chemistry', Ninth edition (Oxford University Press, Oxford 2010)
2. C. N. Banwell, Fundamentals of Molecular Spectroscopy, Fourth Edition, (Tata McGraw Hill, 2008).
3. C. N. Banwell, Fundamentals of Molecular Spectroscopy, Fourth Edition, (Tata McGraw Hill, 2008).
4. Dr. S. S. Dara and Dr. S. S. Umare, A Textbook of Engineering Chemistry,1 st Edition., (S. Chand & Company Ltd, 2000).
5. T. Pradeep, Nano: The Essentials, 1 st Edition, (Tata McGraw-Hill Publishing Company Limited, 2017).

Reference Books:

1. 'Physical Chemistry', D. W. Ball, First Edition, India Edition (Thomson, 2007).
2. Perry's Chemical Engineers' Handbook, Don W. Green and Marylee Z. Southard, 9th Edition (McGraw Hill, 2018).
3. Engineering Chemistry, Dr. Suba Ramesh and others, 1st Edition (Wiley India, 2011).
4. Jain and Jain, Engineering Chemistry,16th Edition (Dhanpat Rai Publishing Company (P) Ltd, 2016).
5. Amretashis Sengupta, Chandan Kumar Sarkar (eds.), Introduction to Nano Basics to Nanoscience and Nanotechnology (Springer-Verlag, Berlin, Heidelberg, 2015)

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech I Year II Semester

20CSE102 C PROGRAMMING AND DATA STRUCTURES

L	T	P	C
3	0	0	3

Pre-requisite: 20CSE101

Course Description:
This course includes C program basics, control structures, arrays, files, pointers and data structures.

Course Objectives:
1. To make the student understand fundamentals of C programming language and problem solving.
2. To understand the syntax and semantics of C programming language.
3. To develop algorithms for sorting, searching techniques.
4. To design and implement operations on stack, queue, and linked list.

UNIT I INTRODUCTION TO C PROGRAMMING 9 hours

Structure of C Program, C Tokens: Variables, Data types, Constants, Identifiers, key words and Operators, Expressions.
Control Structures: Conditional Statements (Simple if, if-else, Nested -if-else, Switch). Iterative Statements (for, While, Do-While), Jump Statements (break, Continue).

UNIT II FUNCTIONS & ARRAY 9 hours

Functions Introduction, User defined function, Function prototype, Function Definition and Function Call, Storage classes, Recursion **Arrays**: Defining an array, processing an array, one dimensional arrays, two dimensional arrays. Passing array as an argument to function. **Sorting:** Bubble Sort, Insertion Sort, selection sort. **Searching:** Linear and binary search.

UNIT III STRINGS & POINTERS 9 hours

Strings: Declaring and defining a string, Initialization of strings, Strings Library functions.
Pointers: Fundamentals of pointer, Pointer Declarations, Parameter passing: Pass by value, Pass by reference, Dynamic memory allocation.

UNIT IV STRUCTURES & FILES 9 hours

Structures: Defining a structure, processing a structure, Pointer to Structure, Unions.
Files: Opening and closing a data file, Reading and Writing a data file, File I/O Functions.

UNIT V DATA STRUCTURES 12 hours

Stack: stack operations, stack implementations using arrays.
Queue: queue operations, queue implementations using array, Applications of stack and queue.
Linked List: Single linked list operations.

Course Outcomes:

Upon successful completion of the course, students will be able to
1. Understand fundamentals of C programming language and its constructs.
2. Design and implement applications using functions, arrays, sorting and searching techniques.
3. Design and implement applications using strings and pointers.
4. Design and implement applications using structures and File processing.
5. Choose appropriate linear data structure depending on the problem to be solved.

Text Books:

1. The C Programming Language, Brian W. Kernighan and Dennis M. Ritchie, 2nd Edition, Prentice Hall, India 1988.
2. Alfred V. Aho, John E. Hopcroft and Jeffry D. Ullman, Data Structures and Algorithms, Pearson Education, New Delhi, 2006.

Reference Books:

1. Let us C, Yashavant Kanetkar, 15th Edition, BPB Publications, 2016.
2. Problem Solving & Program Design in C, Hanly, Jeri R and Elliot. B Koffman, Pearson Education, 5th edition, 2007.
3. K. N. King ,"C Programming ": A Modern Approach, 2nd Edition 2nd Edition.
4. Byron Gottfried , Jitender Chhabra , Programming with C (Schaum's Outlines Series)

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech I Year II Semester

20ME101 ENGINEERING GRAPHICS

L	T	P	C
2	0	2	3

Pre-requisite: None

Course Description:
Introduction to AutoCAD commands, simple drawings, orthographic projections, projection of points, lines, planes; auxiliary projections; projections and sections of solids; development and intersection of surfaces; isometric projections.

Course Objectives:
1. Engineering Graphics is the primary medium for development and communicating design concepts.
2. Through this course the students are trained in Engineering Graphics concepts with the use of AutoCAD.
3. The latest ISI code of practice is followed while preparing the drawings using AutoCAD.
4. Computerized drawing is an upcoming technology and provides accurate and easily modifiable graphics entities.
5. Storage and Retrieval of Drawings is also very easy and it takes very less time to prepare the drawings. Also enhances the creativity.

UNIT I INTRODUCTION TO AUTO CAD 12 hours

Introduction to AutoCAD commands, simple drawings using AutoCAD, Introduction to orthographic Projections – Theory, techniques, first angle projections and third angle projections.

UNIT II PROJECTIONS OF POINTS & LINES 12 hours

Projections of points: Positions, notation system and projections. Projections of lines: Positions, terms used, different cases, traces of lines and finding true length.

UNIT III PROJECTIONS OF PLANES & SOLIDS 12 hours

Projections of planes: Positions, terms used, different cases and projections procedure.
Projections of Solids: Projections of Regular Solids inclined to one plane (resting only on HP).

UNIT IV SECTIONS AND DEVELOPMENTS OF SOLIDS 12 hours

Section of solids: Sectional view of right regular solids (Prism and cylinder), true shapes of the sections.
Development of Surfaces: Development of surfaces of right regular solids (Prism, Cylinder and their Sectional Parts).

UNIT V INTERSECTIONS & ISOMETRIC PROJECTIONS 12 hours

Intersections of surfaces of solids: Intersection between prism Vs prism, prism Vs cylinder, cylinder Vs cylinder.
Isometric Projections: Theory of isometric drawing and orthographic views, Conversion of isometric view into orthographic views.

Course Outcomes:

Student will be able to

1. Identify various commands in AutoCAD software and apply AutoCAD skills to develop the new designs.
2. Draw the projections of points, straight lines using AutoCAD.
3. Draw the projections of the planes, solids using AutoCAD
4. Sketch the developments of solids, sections of solids using AutoCAD.
5. Draw the conversion of the isometric views to orthographic views and intersections of surfaces using AutoCAD.

Text Books:

1. D.M. Kulkarni, A.P. Rastogi and A.M. Sarkar., Engineering Graphics with AutoCAD, PHI Learning Private Limited, New Delhi 2009.
2. N D Bhat, Engineering Drawing, Charotar Publishing House, Gujarath,15th Edition, 2010.
3. K.L. Narayana, P. Kanniah, Engineering Drawing, Scitech Publishers, 2nd Edition, 2010.

Reference Books:

1. Dhananjay A Jolhe, Engineering Drawing: with an introduction to AutoCAD, Tata McGraw Hill, 2008.
2. Warren J. Luzadder & Jon M. Duff Fundamentals of Engineering Drawing, 11th edition, Prentice Hall of India, New Delhi.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech I Year II Semester

20CHE201 CHEMISTRY LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite: Basic Chemistry at Intermediate or equivalent level.

Course Description:

It deals with basic principles of volumetric and instrumental analytical methods.

Course Objectives:

This Engineering Chemistry Laboratory is common to all branches of I Year B Tech. At the end of the course the student is expected to Students will

1. Learn to estimate the chemical impurities present in water such as hardness, alkalinity, chlorine, etc.
2. Understand and experience the formation of inorganic complex and analytical technique for trace metal determination.
3. Be trained to use the instruments to practically understand the concepts of electrochemistry.
4. Bridge theoretical concepts and their practical engineering applications, thus
5. highlighting the role of chemistry in engineering.

LIST OF EXPERIMENTS

1. Estimation of total, permanent and temporary hardness of water by EDTA method.
2. Estimation of alkalinity of water sample.
3. Estimation of dissolved oxygen by Winkler's method.
4. Determination of molecular weight of a polymer by using Ostwald's viscometer.
5. Determination of rate constant of an ester hydrolysis (Pseudo First Order reaction).
6. Determination of strength of a Strong acid (conc. H_2SO_4) by conductometric titration (Neutralisation Titration).
7. Conductometric titration of $BaCl_2$ Vs Na_2SO_4 (Precipitation Titration).
8. Dissociation constant of weak electrolyte by Conductometry.
9. Determination of percentage of Iron in Cement sample by colorimetry.
10. Estimation of ferrous ion by Potentiometric titration (Redox Titration).
11. Saponification value of oil.
12. Formation of Iron-1,10-phenanthroline complex and determination of iron by colorimetry.

Course Outcomes:

After the completion of the Engineering Chemistry Laboratory experiments, students will be able to

1. Develop and perform analytical chemistry techniques to address the water related problems (for e.g., hardness, alkalinity present in water) technically.
2. Handle electro-analytical instruments like digital conductivity meter and potentiometer to perform neutralization, precipitation, and redox titrations, respectively.
3. Acquire practical skills to handle spectro-photochemical methods to verify Beer Lambert's Law.
4. Operate various instruments for the analysis of materials and produce accurate results in a given time frame.
5. Think innovatively and improve the creative skills that are essential for solving engineering problems.

Textbooks:

1. Engineering Chemistry Lab Manual (2017-18), Dept. of Chemistry, Madanapalle Institute of Technology and Science, Madanapalle – 517325, Chittoor Dist., Andhra Pradesh, India.
2. "Vogel's Textbook of Qualitative Chemical Analysis", Arthur Israel Vogel, Prentice Hall, 2000.
3. Laboratory Manual on Engineering Chemistry, by Dr Sudha Rani, Dhanpat Rai Publishing house, 2009.
4. A Textbook on Experiments and calculations in Engineering Chemistry, by SS Dara, S Chand publications, 2015.
5. Laboratory Manual of Organic Chemistry, by Raj K Bansal, Wiley Eastern Limited, New age international limited, 2009.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech I Year II Semester

20CSE201 C PROGRAMMING AND DATA STRUCTURES LABORATORY

L	T	P	C
0	0	3	1.5

Prerequisite: 20CSE101

Course Description:

This course includes C program basics, control structures, arrays, files, pointers and data structures.

Course Objectives:

1. To make the student understand fundamentals of C programming language and problem solving.
2. To get hands-on practices with the syntax and semantics of C programming language.
3. To develop algorithms for sorting, searching techniques.
4. To design and implement operations on stacks, queues, and linked lists.

LIST OF EXPERIMENTS

1. a) Write a C program to swap the two numbers.
b) Write a C Program to find the eligibility of admission for a Professional course based on the following criteria:

i. Marks in Maths >=65
ii. Marks in Physics >=55
iii. Marks in Chemistry>=50
OR
iv. Total in all three subject >=180

2. a) Write a C program to compute the factorial of a given number.
b) Write a program that reads numbers which are in the range 0 to 100, till it encounters -1. Print the sum of all the integers that you have read before you encountered -1.

3. a) Write a C program to accept a coordinate point in a XY coordinate system and determine in which quadrant the coordinate point lies.
b) The digital root (also called repeated digital sum) of a number is a single digit value obtained by an iterative process of summing digits. Digital sum of 65536 is 7, because 6+5+5+3+6=25 and 2+5 = 7.Write a program that takes an integer as input and prints its digital root.

4. a) Write a C program to find the series of prime numbers in the given range.
b) Write a C program to generate Tribonacci numbers in the given range.

5. a) Write a C program to find sum of digits, Decimal to Binary conversion, reversal of numbers using functions.
b) Write a C program to find Factorial, Greatest Common Divisor, and Fibonacci using recursion.

6. Your program should take as input: dimension of a square matrix N, two matrices of size N x N with integer values, and one operator symbol (+, - ,*). It must perform the corresponding operation given below;
a) Matrix Addition b) Matrix Subtraction c) Matrix Multiplication

7. Implement the following sorting techniques.
a) Bubble sort b) Insertion sort c) Selection sort.

8. Implement the following searching techniques.
a) Linear Search b) Binary Search

9. a) Write a program in C to find the frequency of characters in a string.
b) Write a C program to implement all string operations (string length, string copy, string compare, string concatenation and string reverse) without using string library functions.

10. a) Write a C program to get *N* elements in an array and sort it using Pointer.
b) Write a C program to swap two integers using pass by reference.
c) Write a C program to find the largest element using Dynamic Memory Allocation.

11. a) Write a program in C to count the number of vowels, consonants, digits, special symbols, words in a string using a pointer.
b) Write a C program to print all permutations of a given string using pointers.

12. a) Write a C program to add two distances in the inch-feet system using structures.
b) Write a C program to calculate difference between Two Time Periods (in *Hours*, *Minutes*, *Seconds* format) using structures.

13. Develop an application to match parenthesis of a given expression using Stack.

14. Develop an application to identify Palindrome string using Stack and Queue.

15. Develop an application to add two Polynomial equations using Linked List.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Understand fundamentals of C programming language and its constructs.
2. Design applications using functions, arrays, sorting and searching techniques.
3. Design and implement solutions using strings and pointers.
4. Design and develop solutions using structures and File processing.
5. Design and develop applications on stack, queue, and linked list depending on the problems to be solved.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech I Year II Semester

20CSE202 ENGINEERING AND IT WORKSHOP

L	T	P	C
0	0	3	1.5

Prerequisite: None

Course Description:
This course will provide students with a hands-on experience on various basic engineering practices CSE and presenting the final product design.

Course Objectives:

1. Introduction to the use of Tools and Machinery in foundry, forging, tinsmith, carpentry, welding, fitting, working, fabrication of plastic components, fabrication of polymer composite materials, simple machine turning and wood turning, basic electrical connections.
2. Introduction of basic electrical engineering.
3. Fabrication of final product design at end of the semester.

LIST OF EXPERIMENTS

1. Carpentry (Cross half lap Joint and Miter Joint)
2. Fitting (Square and 'V' fit)
3. Sheet Metal - Tin smithy (Square tray)
4. Foundry (Solid and Split pattern)
5. Welding (Arc and Gas welding) – SingleV Butt Joint, T-fillet Joint
6. Plastic fabrication (Pen Stand)
7. Metrology (Internal and External dimension)
8. Introduction of Power Tools and CNC (Demo Only)
9. Introduction to 3D Printing (Demo Only)

Course Outcomes:
On successful completion of this course, the student will be able to

1. Fabricate carpentry components with suitable joint and pipe connections including plumbing works.
2. Practice the welding equipment to join the structures
3. Effective the basic machining operations
4. Create the models using sheet metal and plastic works.
5. Illustrate the operations of foundry, fitting and smithy
6. Fabrication product in composite material and product in plastic material
7. Conduct experiment basic electrical wire connection
8. Design and fabrication of final product design

Suggested Text/Reference Books:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.

3. Gowri P. Hariharan and A. Suresh Babu, "Manufacturing Technology – 1" Pearson Education, 2008.
4. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998. (v) Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGraw Hill House, 2017.

IT WORKSHOP

Prerequisite: None

Course Description:
This course helps the students to understand the basic components of a computer, installation of operating systems, working on office productivity tools word-processor, spreadsheet and presentation slides. Also it gives a basic understanding of using Google tools and various email settings in Gmail.

Course Objectives:
1. The course focuses on enhancing student knowledge in computer peripherals and assembling.
2. To install operating system on computers and create new email account.
3. To understand basic software utilities like compression tools, PDF readers and web browser.
4. To provide technical training to the students on software tools like online forms, calendar applications, online drive, online translation tools and image processing applications.
5. To make the students to install software like Integrated Development Environments (IDE),and compliers for different programming languages.

LIST OF EXPERIMENTS

1. Components of Computer & Assembling a Computer: Learning about the different parts of the computer and its advancement
   - Processor
   - Memory – Types
   - Motherboard
   - Peripheral interfaces – I/O devices
   - Learn about the proper connectivity among the devices inside the PC
   - Assembling the different parts of the computer inside the cabinet
2. Install Operating System
   - Partition the disk drive based on the capacity and the OS to be installed.
   - Install ReactOS/Windows
   - Install Ubuntu or any other GNU/Linux
   - Install VirtualBox or VMWare or QEMU
3. Basic PC Troubleshooting
   - Awareness on the possible issues in a computer
   - Troubleshooting the problems using the available tools
   - Removal and repair of existing software
   - Identification of suitable Device driver for Hardware Devices.
4. Learning Basic Software:
   - Installation of simple Productivity tools like file and folder compression utilities and PDF readers.
   - Installation of Image Editor and Web browsers.

- Basic Software installation in GNU Linux based system.
- Connect the Printer and Scanner Devices perform printing and scanning operation.

5. Office Productivity Tools:
   - Generate, manipulate, search, aligning content using word processing applications.
   - Creation of spreadsheet with various column and rows applying various formulas on cells.
   - Create Presentation and Visualization – graphs, charts, 2D, 3D.
   - Create a database template using Libreoffice Base, OpenOffice Base or MS Access.
   - Draw flowchart using the Drawing tools – Google Quick draw, sketch up,
6. Introduction to Google Tools
   - Design a Google form and collect a response date among students using Google Form.
   - Schedule One day of your activities using Google Calendar.
   - Store and Retrieve Date from cloud storage using Google Drive.
   - Translate the English language sentence to Telugu sentence using Google Translate
   - Organizing photo and editing photo using Google Photos.
7. Exploring Email
   - Creation, Composing and Sending the E-mail.
   - Use High Priority setting to categories the mail.
   - Create a Folder in different Categories and move the received mail to Folder.
   - Unsubscribing unwanted emails
   - Enable settings for automatic reply

Add_on content:

- Networking Commands: ping, ssh, ifconfig, scp, ipconfig, traceroute, nslookup, getmac

Technical Stack: GNU Linux, Windows/ReactOS-Compression Utilities, PDF reader, Office Package.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Attain complete knowledge of a computer hardware
2. Install Operating Systems and troubleshooting using Utility software.
3. Able to do document task through office productivity software.
4. Attain technically strong usage of Google Tools and Email handling.
5. Able to install basic computer engineering software.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

II Year I Semester

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech II Year I Semester

20MAT111 PROBABILITY AND STATISTICS FOR COMPUTER SCIENCE

L	T	P	C
3	0	0	3

Pre-requisite 20MAT101

Course Description:
This course provides an introduction to probability, distributions and statistics with applications. Topics include: Conditional probability, Random variables, Probability distributions, Joint densities, Bayesian inference, descriptive statistics, Correlation and Regression, Estimation, Confidence intervals, Hypothesis testing.

Course Objectives:

1. To extend and formalize knowledge of the theory of probability and random variables.
2. To solve real time problems in engineering and science by using discrete and continuous distributions
3. To analyze and interpret basic summary and modeling techniques for Multi-variate data
4. To analyze the data by using descriptive statistics for decision making
5. To apply the statistical inference involving confidence interval and hypothesis testing in data analysis.

UNIT I Probability **9 hours**

Introduction to Probability, Sample space and events, axioms of probability, theorems on probability, conditional probability, multiplication theorem and independence of events, Baye's theorem. Random variables (discrete and continuous), probability density functions, distribution function, mathematical expectation, properties. moment generating function.

UNIT II Probability Distributions **9 hours**

Discrete probability distributions - Binomial, Poisson, Geometric and their properties Continuous probability distributions - Uniform, Exponential, Gamma, Normal distributions and their properties, Chebychev's inequality.

UNIT III Joint Distributions **9 hours**

Joint densities and Independence - Marginal distributions (discrete & continuous)- Expectation and Covariance, Correlation, Conditional densities and Regression, Curves of regression, Transformation of random variables.

UNIT IV Statistics for Data Analysis **9 hours**

Data Visualization, Moments, skewness, kurtosis, correlation, correlation coefficient, rank correlation, principle of least squares, lines of regression, regression coefficients and their properties.

UNIT V Statistical Inference 9 hours

Population, sampling, formulation of null hypothesis, alternative hypothesis, level of significance, types of errors and power of the test. Large Sample Tests: Test for single mean, single proportion, difference of means, difference of proportions, Confidence interval for parameters in one sample and two sample problems, t test for single mean, difference of means, test for ratio of variances.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Understand the probability concepts and their importance in engineering.
2. Apply discrete and continuous probability distributions to solve various engineering problems.
3. Get an idea about joint density functions, distribution functions to the random variables and analyse the multivariate problems in engineering
4. Apply the method of least squares to estimate the parameters of a regression model.
5. Perform Test of Hypothesis as well as calculate confidence interval for a population parameter for single sample and two sample cases.

Text Book(s):

1 Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th Edition, 2007.

2 Dr.B.S.Grewal, " Higher Engineering Mathematics", Khanna Publications, 42nd Edition.

Reference Books:

1 Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 2004.

2 Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2012

3 Dean G. Duffy., "Advanced Engineering Mathematics with MATLAB", CRC Press, Third Edition 2013.

E BOOKS:

1 http://nptel.ac.in/courses/IIT-MADRAS/Principles_of_Communication1/Pdfs/1_5.pdf

2 https://www.khanacademy.org

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech II Year I Semester

20CSC103 COMPUTER SYSTEM ARCHITECTURE

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

Course Description:

This course deals with basics of digital logic design and computer organization. It provides knowledge to design digital circuits for computer components. Computer arithmetic, Pipelining and Parallel processing are studied in this course. It also emphasizes on CPU, Memory and I/O organization.

Course Objectives:

1. To provide knowledge for designing digital circuits.
2. To understand various data representation methods and arithmetic operations.
3. To learn about Processor, Memory and I/O organization.
4. To learn the basics of pipelined execution and parallel processing

UNIT I DIGITAL LOGIC CIRCUITS AND COMPONENTS 9 hours

Logic Gates – Boolean Algebra – Simplification of Boolean Expression using K – Map, Combinational Circuit - Binary Codes - Error Detection Codes. Encoders – Decoders – Multiplexers & Demultiplexers – Sequential Circuit - Flip Flops – Registers – Shift Registers.

UNIT II DATA REPRESENTATION AND COMPUTER ARITHMETIC 9 hours

Data Representation: Fixed Point, Floating point Representations –. **Computer Arithmetic**: Addition, Subtraction, Multiplication & Division Algorithms - Floating point Arithmetic Operations.

UNIT III CPU AND CONTROL UNIT 9 hours

Processor Structure and Function: - Processor Organization - Register Organization – Instruction Cycle – CISC – RISC Processors – x86 and ARM Addressing Modes – x86 and ARM Instruction Formats. **Control Unit Operation**:– Hardwired Control – Microprogrammed Control – Basic Concepts.

UNIT IV PIPELINE AND PARALLEL PROCESSING 9 hours

Instruction Pipelining: Pipelining Strategy – Pipeline performance – Pipeline Hazards – Dealing with branches – **Parallel processing**: Multi-Processor Organizations – Symmetric Multiprocessors – Multithreading and Chip Multiprocessors – Clusters.

UNIT V MEMORY AND I/O ORGANIZATIONS 9 hours

Memory Hierarchy: Main memory – ROM - RAM– Cache memory: Computer Memory System Overview – Cache memory principles – Elements of Cache design – **Data Transfer Schemes**: - Programmed I/O – Interrupt Driven I/O – Direct Memory Access – Redundant Array of Independent Disks.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Design digital circuits for computer components.
2. Implement fixed-point and floating point arithmetic unit.
3. Understand the basics structure of computers, operations and instructions.
4. Understand pipelined execution and parallel processing architectures.
5. Analyze the various memory systems and I/O communication

Text Book(s):

1. William Stallings, "Computer Organization and Architecture Designing for Performance", Tenth Edition, Pearson Publications.
2. M.Morris Mano, "Computer System Architecture", Third edition, Pearson Publications.

Reference Books:

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization", Fifth Edition, Tata McGraw Hill Publications.
2. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Fifth Edition, Morgan Kaufmann / Elsevier, 2014.
3. John P. Hayes, "Computer Architecture and Organization", Third Edition, Tata McGraw Hill, 2012.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech II Year I Semester

20CSC104 DATA STRUCTURES USING PYTHON

L	T	P	C
3	0	0	3

Pre-requisite NIL

Course Description:

The typical data structures course, which introduces a collection of fundamental data structures. The basic concepts related to abstract data types, data structures, and algorithms. Arrays, Sets and Maps, Searching and Sorting, Linked Structures, Stacks, Queues, Advanced Linked Lists, Recursion, Hash Tables, Advanced Sorting, Binary Trees, Search Trees.

Course Objectives:

1. To develop skills to design and analyze linear and nonlinear data structures.
2. Develop algorithms for manipulating linked lists, stacks, queues, trees and graphs.
3. Develop recursive algorithms as they apply to trees and graphs.
4. To develop skill in advanced linked list.
5. To develop skill in advanced sorting.

UNIT I ABSTRACT DATA TYPES, ARRAYS, SETS AND MAPS 9 hours

Abstract Data Types: Introduction, The Date Abstract Data Type, Bags, Iterators. **Arrays:** The Array Structure, The Python List, Two-Dimensional Arrays, The Matrix Abstract Data Type. **Sets and Maps:** Sets, Maps, Multi-Dimensional Arrays.

UNIT II ALGORITHM ANALYSIS, SEARCHING AND SORTING 9 hours

Algorithm Analysis: Complexity Analysis, Evaluating the Python List, Amortized Cost, Evaluating the Set ADT. **Searching and Sorting:** Searching, Sorting, Working with Sorted Lists, The Set ADT Revisited.

UNIT III LINKED STRUCTURES, QUEUES 9 hours

Linked Structures: The Singly Linked List, The Bag ADT Revisited, The Sparse Matrix Revisited. **Stacks:** The Stack ADT, Implementing the Stack, Stack Applications. **Queues:** The Queue ADT, Implementing the Queue, Priority Queues.

UNIT IV ADVANCED LINKED LISTS, RECURSION, HASH TABLES 9 hours

Advanced Linked Lists: The Doubly Linked List, The Circular Linked List, Multi-Linked Lists, Complex Iterators. **Recursion:** Recursive Functions, Properties of Recursion, How Recursion Works, Recursive Applications. **Hash Tables:** Hashing, Separate Chaining, Hash Functions, The HashMap Abstract Data Type.

UNIT V ADVANCED SORTING, BINARY TREES, SEARCH TREES 9 hours

Advanced Sorting: Merge Sort**,** Quick Sort, Radix Sort, Sorting Linked Lists. **Binary Trees:** The Tree Structure, The Binary Tree, Expression Trees, Heaps, Heapsort. **Search Trees:** The Binary Search Tree, Search Tree Iterators, AVL Trees, The 2-3 Tree.

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Course Outcomes:

Upon successful completion of the course, students will be able to

1. Describe the Abstract Data Types, Arrays, Sets and Maps
2. Explain the Algorithm Analysis, Searching and Sorting
3. Understand the Linked Structures, Stacks, and Queues
4. Examine the Advanced Linked Lists, Recursion, and Hash Tables
5. Construct of Advanced Sorting, Binary Trees, and Search Trees

Text Books:

1. Data Structures and Algorithms Using Python, Rance D. Necaise

Reference Books:

1. Fundamentals of Data Structures, Ellis Horowitz, SartajSahni, Dinesh Mehta, Silicon Press, Second Edition. 2007.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech II Year I Semester

20CSC105 OBJECT ORIENTED PROGRAMMING USING C++

L	T	P	C
2	1	0	3

Pre-requisite 20CSE102

Course Description:

Object Oriented Programming (OOP) using the C++ language. Topics covered will be C++ classes/objects, input/output streams, overloading, inheritance, templates and exception handling. This is a second semester course in C/C++; students entering the course should already be familiar with the C programming language.

Course Objectives:

- To provide basic characteristics of OOP through C++.
- To impart skills on various kinds of overloading and inheritance.
- To introduce the principles of virtual functions and polymorphism
- To introduce pointers and file handling in C++ together with exception handling mechanism

UNIT I OVERVIEW OF C++ 9 hours

Getting started with C++ syntax, data-type, variables, expressions, operators, statements, arrays, strings, pointers and functions. Introduction to object oriented programming, user defined types, structures, unions, polymorphism, and encapsulation.

UNIT II CLASSES AND DATA ABSTRACTION 9 hours

Introduction, classes, Friend functions, Friend classes, Inline functions, Constructors, Arrays of objects, This pointers, Pointers to class members, Reference parameters, Dynamic allocation operators, Function overloading, Copy constructors, Operator overloading.

UNIT III INHERITANCE, VIRTUAL FUNCTION & POLYMORPHISM 9 hours

Concept of inheritance. Derived class and based class. Derived class constructors, Member function, Class hierarchies, public and private inheritance, aggregation: Classes within classes, inheritance and program development, static and dynamic binding, Virtual functions, Dynamic binding through virtual functions, Virtual function call mechanism, Pure virtual functions, Abstract classes, Implications of polymorphic use of classes, Virtual destructors.

UNIT IV FILE STREAMS 9 hours

C++ I/O: I/O using C functions, Stream classes hierarchy, Stream I/O, File streams and String streams, Error handling during file operations.

UNIT V GENERIC PROGRAMMING AND EXCEPTIONS 9 hours

Function templates, Overloading template functions, Class templates, Exception handling techniques.

B. Tech Computer Science and Engineering (Cyber Security)

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Realize the need and features of OOP and idealize how C++ differs from C.
2. Infer knowledge on various types of overloading.
3. Choose suitable inheritance while proposing solution for the given problem and write the applications of virtual functions.
4. Demonstrate about file handling functions
5. Illustrate the exception handling mechanism

Text Books:

1. The Complete Reference C++, 4th Edition, Herbert Schildt, Tata McGraw Hill.

Reference Books:

1. The C++ Programming Language, 3rd Edition, B. Stroutstrup, Pearson Education.
2. Object Oriented Programming in C++, 3rd Edition, R. Lafore, Galigotia Publications Pvt Ltd
3. Teach Yourself C++, 3rd Edition, Herbert Schildt

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech II Year I Semester

20CSC106 DATABASE FUNDAMENTALS FOR SECURITY

L	T	P	C
2	1	0	3

Pre-requisite NIL

Course Description:

Database security has a great impact on the design of today's information systems.This course will provide an overview of database security concepts and techniques and discuss new directions of database security in the context of Internet information management. The topics will cover database application security models, database and data auditing, access control, trust management and privacy protection.

Course Objectives:

1. To understand the components of DBMS and to study the database design.
2. To study the retrieval of data using relational algebra and calculus and the concept ofnormal forms in the design of database.
3. To comprehend the structure of SQL Queries to query,update, and manage a database.
4. To master the security architecture, access control, and Understand administration of users and its application to database security.
5. To Understand the databases security models.

UNIT I DATABASE SYSTEM ARCHITECTURE AND RELATIONAL MODEL **9 hours**

Overview of Database Systems, Introduction to Database Design, Introduction to Relational Model and Relational Algebra. RELATIONAL CALCULUS AND SQL: Expressive power of Algebra and Calculus, Simple Queries in SQL, Embedded SQL, Dynamic SQL, Stored Procedures.

UNIT II DATABASE DESIGN **9 hours**

Functional Dependencies-Rules about Functional Dependencies, Keys, Design of Relational Database Schemas, Multivalued Dependencies. Storage strategies- B-trees, hashing.

UNIT III TRANSACTION PROCESSING, DATABASE SECURITY **9 hours**

Transaction Processing: Concurrency control, Locking and timestamp-based schedulers, optimistic Concurrency Control schemes. **Database Security-**Database recovery Authentication, DAC, MAC and RBAC Models.

UNIT IV SECURITY ARCHITECTURE **9 hours**

Administration of Users, Access Control, Privileges, passwords, roles, Access Control Models, Discretionary Access Control and Role-based Access Control, Mandatory Access Control, Database Application Security Models, SQL injection.

UNIT V DATABASE ENCRYPTION AND MASKING **9 hours**

Virtual Private Databases, Database Auditing Models, Application Data Auditing, Multilevel Secure Relational Model, Watermarking.

B. Tech Computer Science and Engineering (Cyber Security)

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Design database structure, Construct relational algebra expressions and write SQL queries.
2. Design database and access data.
3. Explain about transaction processing
4. Apply security features in database server
5. Explain Database application security model and SQL injection.

Text Books:

1. Database Management Systems, Raghu Rama Krishnan, Johannes Gehrke, 3rd Edition, 2003, McGraw Hill.
2. Sam Afyouni, Database Security and Auditing: Protecting Data Integrity and Accessibility. Thomson. ISBN: 0-619-21559-3, 2005.
3. Ron Ben Natan, "Implementing Database Security and Auditing", Elsevier Digital Press, 2005

Reference Books:

1. Database Systems, The Complete Book, Hector Garcia-Molina, Jeffrey D. Ullman and Jennifer Widom, 3rd impression, 2009, Pearson.

2. Ron Ben-Natan, Implementing Database Security and Auditing, Elsevier digital press. ISBN: 1-55558-334-2. 2005.

3. Oracle 10g Programming: A Primer by RajshekharSunderraman, Addison Wesley Marshall D.Abrams, SushilJajodia, and Harold J. Podell, eds.

4. Information Security: An Integrated Collection of Essays, IEEE Computer Society Press, 1995.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech II Year I Semester

20CSC203 DATA STRUCTURES USING PYTHON LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite -NIL-

Course Description:

The typical data structures course, which introduces a collection of fundamental data structures. The basic concepts related to abstract data types, data structures, and algorithms. Arrays, Sets and Maps, Searching and Sorting, Linked Structures, Stacks, Queues, Advanced Linked Lists, Recursion, Hash Tables, Advanced Sorting, Binary Trees, Search Trees.

Course Objectives:

1. To develop skills to design and analyze linear and nonlinear data structures.
2. To develop algorithms for manipulating linked lists, stacks, queues, trees and graphs.
3. To develop recursive algorithms as they apply to trees and graphs.
4. To develop skill in advanced linked list.
5. To develop skill in advanced sorting.

List of Programs:

1. Write a Python program that uses functions to perform the following:
   a) Create a singly linked list of integers.
   b) Delete a given integer from the above linked list.
   c) Display the contents of the above list after deletion.

2. Write a Python program that uses functions to perform the following:
   a) Create a doubly linked list of integers.
   b) Delete a given integer from the above doubly linked list.
   c) Display the contents of the above list after deletion.

3. Write a Python program that uses stack operations to convert a given infix expression into its postfix Equivalent, Implement the stack using an array.

4. Write Python programs to implement a double ended queue ADT using i) array and ii) doubly linked list respectively.

5. Write a Python program that uses functions to perform the following:
   a) Create a binary search tree of characters.
   b) Traverse the above Binary search tree recursively in Postorder.

6. Write a Python program that uses functions to perform the following:
   a) Create a binary search tree of integers.
   b) Traverse the above Binary search tree non recursively in inorder.
7. Write Python programs for implementing the following sorting methods to arrange alist of integers in ascending order:
   a) Insertion sort b) Merge sort

8. Write Python programs for implementing the following sorting methods to arrange alist of integers in ascending order:
   a) Quick sort b) Selection sort

9. i) Write a Python program to perform the following operation:
   A) Insertion into a B-tree
   ii) Write a Python program for implementing Heap sort algorithm for sorting a given list of integers in ascending order.
10. Write a Python program to implement all the functions of a dictionary (ADT) using hashing.

11. Write a Python program for implementing Knuth-Morris- Pratt pattern matching algorithm.

12. Write Python programs for implementing the following graph traversal algorithms:
    a) Depth first traversal b) Breadth first traversal

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Execute the programs related to Abstract Data Types, Arrays, Sets and Maps
2. Apply searching and sorting techniques
3. Implement the Linked Structures, Stacks, and Queues
4. Examine the Advanced Linked Lists, Recursion, and Hash Tables
5. Implement Binary Trees, and AVL Trees

Text Books:

1. Data Structures and Algorithms Using Python, Rance D. Necaise

Reference Books:

1. Fundamentals of Data Structures, Ellis Horowitz, SartajSahni, Dinesh Mehta, Silicon Press, Second Edition. 2007.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech II Year I Semester

20CSC204 OBJECT ORIENTED PROGRAMMING USING C++ LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite 20CSE202

Course Description:

This lab course provides in-depth coverage of object oriented programming principles and techniques using C++. Topics include classes, overloading, data abstraction, information hiding, encapsulation, inheritance, polymorphism, file processing, templates, exceptions, container classes, and low-level language features.

Course Objectives:

The objectives of the course are to have students identify and practice the object-oriented programming concepts and techniques, practice the use of C++ classes and class libraries, arrays, vectors, inheritance, and file I/O stream concepts.

List of Programs:

1. a. Create a class named 'Student' with a string variable 'name' and an integer variable 'roll_no'. Assign the value of roll_no as '2' and that of name as "John" by creating an object of the class Student.
   b. Write a class having two private variables and one member function which will return the area of the rectangle.
   c. Perform addition operation on complex data using class and object. The program should ask for real and imaginary part of two complex numbers, and display the real and imaginary parts of their sum.

2. a. Write a program that asks a name say hello. Use your own function, that receives a string of characters (name) and prints on screen the hello message. (Doesn't returns anything- `void` type)
   b. Write a program that ask for two numbers, compare them and show the maximum. Declare a function called max_twothat compares the numbers and returns the maximum.
   c. Write a C++ program that uses functions.
   i) to swap two integers ii) to swap characters iii) to swap two reals

3. a.Create a class 'Student' with three data members which are name, age and address. The constructor of the class assigns default values to name as "unknown", age as '0' and address as "not available". It has two functions with the same name 'setInfo'. First function has two parameters for name and age and assigns the same whereas the second function takes has three

parameters which are assigned to name, age and address respectively. Print the name, age and address of 10 students. Hint - Use array of objects

b. Create a class named 'Rectangle' with two data members- length and breadth and a function to calculate the area which is 'length*breadth'. The class has three constructors which are :

1 -having no parameter - values of both length and breadth are assigned zero.
2 - having two numbers as parameters - the two numbers are assigned as length and breadth respectively.

3 - having one number as parameter - both length and breadth are assigned that number. Now, create objects of the 'Rectangle' class having none, one and two parameters and print their areas.

4. a.Using function overloading write C++program to find the volume of cube, cylinder, cone and sphere.

b. Write a C++ program illustrating an interactive program for swapping integer, real, and character type variables without using function overloading .Write the same program by using function overloading features and compare the same with its C counterpart.

5. a. Write a C++ program to perform different arithmetic operation such as addition, subtraction, division, modulus and multiplication using inline function.

b. Write a program to swap private data members of classes named class_1, class_2 using friend function.

6. a. Using operator overloading write a C++ program for class STRING and overload the operator + and == to concatenate two strings length.

7. a. Write a C++ program illustrating Constructor overloading (Both parameterized and default).

b. Write a C++ program illustrating for overloading ++ operator to increment data.

8. a.Write a C++ program illustrating overloading of new and delete operator.

b.Write a C++ program illustrating Abstract classes.

9. Write a C++ program illustrating Inheritance (Multiple, Multilevel, Hybrid).

10. a. Create a class 'Degree' having a function 'getDegree' that prints "I got a degree". It has two subclasses namely 'Undergraduate' and 'Postgraduate' each having a function with the same name that prints "I am an Undergraduate" and "I am a Postgraduate" respectively. Call the function by creating an object of each of the three classes.

b. A class has an integer data member 'i' and a function named 'printNum' to print the value of 'i'. Its subclass also has an integer data member 'j' and a function named 'printNum' to

print the value of 'j'. Make an object of the subclass and use it to assign a value to 'i' and to 'j'. Now call the function 'printNum' by this object.

11. a. Design a virtual base class for the employee information system.
    b. Implement a program using pure virtual function for calculating area and volume for the circle and cylinder
12. a. Write a C++ program using Copy constructor to copy data of an object to another object
13. a. Write a C++ program illustrating access data members & member functions using 'THIS' pointer.
    b. Write a program to illustrate the use of pointers to objects which are related by inheritance
14. a.Write a C++ program to read and print employee details using Files.
    b. Write a C++ program to copy the contents of one text file to another file.
15. a. Write a C++ program that uses function template to determine the square of an integer, a float and a double
    b. Write a Template Based Program to Sort the Given List of Element
16. a. Write a Program Containing a Possible Exception. Use a Try Block to Throw it and a Catch Block to Handle it Properly.

b. Write a Program to Demonstrate the Catching of All Exceptions

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Understand the features of C++ supporting object oriented programming.
2. Apply the concepts of class, method, constructor, instance, overriding, overloading
3. Choose suitable inheritance while proposing solution for the given problem.
4. Apply virtual and pure virtual function & complex programming situations.
5. Implement Object Oriented Programs using templates and file handling concepts.

Text Books:

1. The Complete Reference C++, 4th Edition, Herbert Schildt, Tata McGraw Hill

Reference Books:

1. The C++ Programming Language, 3rd Edition, B. Stroutstrup, Pearson Education.
2. Object Oriented Programming in C++, 3rd Edition, R. Lafore, Galigotia Publications Pvt Ltd.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech II Year I Semester

20CSC205 DATABASE FUNDAMENTALS FOR SECURITY LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite -NIL-

Course Description:

This course is designed to provide basic understanding on database systems and its design. Database security has a great impact on the design of today's information systems. It provides an overview of database security concepts and techniques and discusses new directions of database security in the context of Internet information management. The topics will cover database application security models, database and data auditing, access control, trust management and privacy protection.

Course Objectives:

1. To understand the components of DBMS and to study the database design.
2. To study the retrieval of data using relational algebra and calculus and the concept ofnormal forms in the design of database.
3. To comprehend the structure of SQL Queries to query,update, and manage a database.
4. To master the security architecture, access control, and Understand administration of users and its application to database security.
5. To Understand the databases security models.

List of Programs:

1.To study DDL-create and DML-insert commands.

a) Create tables according to the following definition.

b) Insert the data as shown below.

c) From the above given tables perform the following queries:

i. Describe deposit, branch.
ii. Describe borrow, customers.
iii. List all data from table DEPOSIT.
iv. List all data from table BORROW.
v. List all data from table CUSTOMERS.
vi. List all data from table BRANCH.
vii. Give account no and amount of depositors.
viii. Give name of depositors having amount greater than 4000.
ix. Give name of customers who opened account after date '1-12-96'.

2.Create the below given table and insert the data accordingly.

Perform following queries

i. Retrieve all data from employee, jobs and deposit.
ii. Give details of account no. and deposited rupees of customers having account opened between dates 01-01-06 and 25-07-06.
iii. Display all jobs with minimum salary is greater than 4000.
iv. Display name and salary of employee whose department no is 20. Give alias name toname of employee.

v. Display employee no, name and department details of those employee whose department lies in(10,20)

To study various options of LIKE predicate

i. Display all employee whose name start with 'A' and third character is ' 'a'.
ii. Display name, number and salary of those employees whose name is 5 characters long and first three characters are 'Ani'.
iii. Display the non-null values of employees and also employee name second character should be 'n' and string should be 5 character long.
iv. Display the null values of employee and also employee name's third character should be 'a'.
v. What will be output if you are giving LIKE predicate as '%_%' ESCAPE '\'

3.To Perform various data manipulation commands, aggregate functions and sorting concept on all created tables.

i. List total deposit from deposit.
ii. List total loan from karolbagh branch
iii. Give maximum loan from branch vice.
iv. Count total number of customers
v. Count total number of customer's cities.
vi. Create table supplier from employee with all the columns.
vii. Create table sup1 from employee with first two columns.
viii. Create table sup2 from employee with no data
ix. Insert the data into sup2 from employee whose second character should be 'n' andstring should be 5 characters long in employee name field.
x. Delete all the rows from sup1.
xi. Delete the detail of supplier whose sup_no is 103.
xii. Rename the table sup2.
xiii. Destroy table sup1 with all the data.
xiv. Update the value dept_no to 10 where second character of emp. name is 'm'.
xv. Update the value of employee name whose employee number is 103.

4.To study Single-row functions.

i. Write a query to display the current date.
ii. For each employee, display the employee number, job, salary, and salary increased by 15% and expressed as a whole number. Label the column New Salary
iii. Modify your query no 4.(2) to add a column that subtracts the old salary from the new salary. Label the column Increase
iv. Write a query that displays the employee's names with the first letter capitalized and all other letters lowercase, and the length of the names, for all employees whose name starts with J, A, or M. Give each column an appropriate label. Sort the results by the employees' last names.
v. Write a query that produces the following for each employee: <employee last name> earns <salary> monthly
vi. Display the name, hire date, number of months employed and day of the week starting with Monday.
vii. Display the hire date of emp in a format that appears as Seventh of June 199412:00:00 AM.
viii. Write a query to calculate the annual compensation of all employees (sal+comm)

5.Displaying data from Multiple Tables (join)

i. Give details of customers ANIL.
ii. Give name of customer who are borrowers and depositors and having living city Nagpur
iii. Give city as their city name of customers having same living branch.
iv. Write a query to display the last name, department number, and department name for all employees.
v. Create a unique listing of all jobs that are in department 30. Include the location of the department in the output
vi. Write a query to display the employee name, department number, and department name for all employees who work in NEW YORK.
vii. Display the employee last name and employee number along with their manager's last name and manager number. Label the columns Employee, Emp#, Manager, and Mgr#, respectively.
viii. Create a query to display the name and hire date of any employee hired after employee SCOTT.

6.To apply the concept of Aggregating Data using Group functions.

i. List total deposit of customer having account date after 1-jan-96.
ii. List total deposit of customers living in city Nagpur.
iii. List maximum deposit of customers living in bombay.
iv. Display the highest, lowest, sum, and average salary of all employees. Label the columns Maximum, Minimum, Sum, and Average, respectively. Round your results to the nearest whole number.
v. Write a query that displays the difference between the highest and lowest salaries. Label the column DIFFERENCE.
vi. Create a query that will display the total number of employees and, of that total, the number of employees hired in 1995, 1996, 1997, and 1998
vii. Find the average salaries for each department without displaying the respective department numbers.
viii. Write a query to display the total salary being paid to each job title, within each department.
ix. Find the average salaries > 2000 for each department without displaying the respective department numbers.
x. Display the job and total salary for each job with a total salary amount exceeding 3000, in which excludes president and sorts the list by the total salary.
xi. List the branches having sum of deposit more than 5000 and located in city bombay.

7.To study various administration of Users Profiles, password policies, privileges, and roles.
8.To apply access Control Models: MAC, DAC, RBAC
9.To study the Stored Procedures and Functions: PL/SQL I, PL/SQL II
10.To apply and monitor auditing of Database Activities

Project Based Learning:

Design and implement a Personal Information System model with security features

B. Tech Computer Science and Engineering (Cyber Security)

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Design database structure, Construct relational algebra expressions for the query.
2. Design database and access data.
3. Transaction processing techniques, SQL queries.
4. Apply security features in database, data server and data warehouse design.
5. Database application security model and SQL injection.

Text Books:

1. Database Management Systems, Raghu Rama Krishnan, Johannes Gehrke, 3rd Edition, 2003, McGraw Hill.
2. Sam Afyouni, Database Security and Auditing: Protecting Data Integrity and Accessibility. Thomson. ISBN: 0-619-21559-3, 2005.
3. Ron Ben Natan, "Implementing Database Security and Auditing", Elsevier Digital Press, 2005

Reference Books:

1. Database Systems, The Complete Book, Hector Garcia-Molina, Jeffrey D. Ullman and Jennifer Widom, 3rd impression, 2009, Pearson.

2. Ron Ben-Natan, Implementing Database Security and Auditing, Elsevier digital press. ISBN: 1-55558-334-2. 2005.

3. Oracle 10g Programming: A Primer by RajshekharSunderraman, Addison Wesley Marshall D.Abrams, SushilJajodia, and Harold J. Podell, eds.

4. Information Security: An Integrated Collection of Essays, IEEE Computer Society Press, 1995.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

Mandatory Course
B. Tech. II Year I Semester

20CHE901 ENVIRONMENTAL SCIENCE

L	T	P	C
2	0	0	0

Pre-requisite Basic knowledge about sciences up to intermediate or equivalent level.

Course Description:
The course deals with basic concepts of environment, its impact on human, universe, consumption of energy sources, effects, controlling methods for pollution and the environmental ethics to be followed by human beings.

Course Objectives:
1. To make the students aware about the environment and its inter-disciplinary nature and to emphasize the importance of the renewable energy sources.
2. To familiarize the concept of Ecosystem and their importance.
3. To bring the awareness among students about the importance of biodiversity and the need for its conservation.
4. To make the students understand the adverse effects of environmental pollution, its causes and measures to control it.
5. To introduce the environmental ethics and emphasize the urgency of rain water harvesting along with water shed management.

UNIT I MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES **6 hours**

Definition, Scope and Importance – Need for Public Awareness. Renewable energy Resources: Solar energy - solar cells, wind energy, tidal energy. Non-renewable energy resources: LPG, water gas, producer gas. Overgrazing, effects of modern agriculture – fertilizer and pesticides.

UNIT II ECOSYSTEMS **6 hours**

Concept of an ecosystem. Structure – functions – Producers, Consumers and Decomposers – Ecological succession – Food chains, Food webs and Ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystems: Forest, Desert and Lake.

UNIT III BIODIVERSITY AND ITS CONSERVATION **6 hours**

Introduction, Definition: Value of biodiversity: consumptive use, productive use, social, ethical and aesthetic values. Biogeographical zones of India. Threats to biodiversity: habitat loss, poaching of wildlife, Endangered and Endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT IV ENVIRONMENTAL POLLUTION 6 hours

Definition, Cause, effects and control measures of pollution – Air, Water, Soil and Noise. Solid Waste Management: Effects and control measures of urban and industrial wastes.

UNIT V SOCIAL ISSUES AND THE ENVIRONMENT 6 hours

Urban problems related to Water conservation, rain water harvesting and watershed management; Climate changes: global warming, acid rain, ozone layer depletion, nuclear accidents. Case Studies: Population growth, variation among nations and population explosion.

Course Outcomes:

At the end of the course, the students will be able to acquire

1. Ability to understand the natural environment, its relationship with human activities and need of the day to realize the importance of the renewable energy sources.
2. The knowledge of various ecosystems and their importance along with the concepts of food chains, food webs and ecological pyramids.
3. Familiarity with biodiversity, its importance and the measures for the conservation of biodiversity.
4. The knowledge about the causes, effects and controlling methods for environmental pollution, along with disaster management and solid waste management.
5. Awareness about the sustainable development, environmental ethics, social issues arising due to the environmental disorders.

Text Books:

1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press, 2005.
2. Environmental Studies by R. J. Ranjith Daniels and Jagdish Krishnaswamy, (Wiley Re- print version 2014).
3. Chemistry for Environmental Engineering/C.N. Sawyer, P.L. McCarty, G.F. Parkin (TataMcGraw Hill, Fifth Edition, 2003).
4. Environmental Chemistry by B.K. Sharma, (Goel Publishing House, 2014).
5. Environmental Studies by Benny Joseph (TataMcGraw Hill, Second Edition, 2009).

Reference Books:

1. Environmental Science & Engineering by Dr. A. Ravikrishnan, Hitech Publishing Company Pvt. Ltd. 2013.
2 Perspectives in Environmental Studies, Second edition, Anubha Koushik and C.P. Koushik, New Age International (P) Limited, Publishers, 2004.
3 R.N. Sharma, "Indian Social Problems ", Media Promoters and Publishers Pvt. Ltd.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

II Year II Semester

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech II Year II Semester

20HUM101 ECONOMICS AND FINANCIAL ACCOUNTING FOR ENGINEERS

L	T	P	C
3	0	0	3

Pre-requisite NIL

Course Description:

The Engineering Economics and Financial Accounting aims to provide an insight into production, cost analysis, market structure, Accounting Basic concepts and financial Statement Analysis. The course is designed to give emphasis on the application of real life examples on various fundamental issues of economics and accounts. This course introduces the accounting system, principles, types of accounts, and financial statements etc. The ratio analysis and financial analysis are useful to know the positions of financial statements are explained to know the analysis of financial matters.

Course Objectives:

1. Describe the nature of engineering economics in dealing with the issues of scarcity;

2. Know the supply, demand, production and cost analysis to analyze the impact of economic events on markets;

3. Explain the performance of firms under different market structures and Price determination in various market conditions.

4. Explain the accounting principles, types of accounting and preparation of final accounts; and

5. Describe the financial statement analysis and investment evaluation through ratios and capital budgeting techniques.

UNIT I DEMAND ANALYSIS 9 hours

Scope and Significance of Economics- Understanding the problem of scarcity and choice - Elements of market Economy: Demand, Supply and Market Equilibrium- Theory of Demand, Elasticity of Demand, Supply and Law of Supply.

UNIT II PRODUCTION AND COST ANALYSIS 9 hours

Production Function – Short-run and long- run production – Cost Analysis: Cost concepts - Cost Structure of Firms and output decision- Break-Even Analysis (BEA) – Managerial significance and limitations of BEA - Determination of Break Even Point (Simple Problems).

UNIT III MARKET STRUCTURE AND PRICING 9 hours

Classification of Markets - General Equilibrium and efficiency of Perfect competition, Monopoly, Monopolistic, Oligopoly, Duopoly – Price determination under various market conditions- Pricing objectives- Methods.

UNIT IV BASICS OF ACCOUNTING 9 hours

Uses of Accounting - Book Keeping Vs Accounting - Double Entry System - Accounting Principles - Classification Of Accounts - Rules Of Debit & Credit- Accounting Cycle: Journal, Ledger, Trial Balance. Final Accounts: Trading Account - Profit & Loss Account - Balance Sheet with Adjustments, (Simple Problems).

UNIT V FINANCIAL RATIO ANALYSIS AND CAPITAL BUDGETING 9 hours

Ratio Analysis - Liquidity, Leverage, Solvency, Activity and Profitability Ratios - Capital Budgeting. (Simple Problems).

Course Outcomes:

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

1. Understand Engineering economics basic concepts,

2. Analyze the concepts of demand, elasticity, supply, Production, Cost Analysis and its essence in floating of an organization,

3. Compare different market structures and identify suitable market,

4. Demonstrate an understanding and analyzing the accounting statements, and

5. Exhibit the ability to apply knowledge of ratio analysis and capital budgeting techniques in financial statement analysis and investment evaluation respectively.

Text Book(s):

1. Case E. Karl & Ray C. Fair, "Principles of Economics", Pearson Education, 8th Edition, 2007

2. Financial Accounting, S. N. Maheshwari, Sultan Chand, 2009

3 Financial Statement Analysis, Khan and Jain, PHI, 2009

4 Financial Management, Prasanna Chandra, T.M.H, 2009

Reference Books:

1. Lipsey, R. G. & K. A. Chrystal , "Economics", Oxford University Press, 11th Edition, 2007

2 Samuelson P. A. & Nordhaus W. D. "Economics", Tata McGraw-Hill 18th Edition, 2007

3 Financial Management and Policy, Van Horne, James, C., Pearson, 2009.

4. Financial Management, I. M. Pandey, Vikas Publications

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech II Year II Semester

20MAT112 DISCRETE MATHEMATICAL STRUCTURES

L	T	P	C
3	0	0	3

Pre-requisite 20MAT110

Course Description:

This course introduces the concepts of discrete mathematics and their applications in computer science. It covers algebraic structures, combinatory and finite state machines. It also provides insight into the concepts of graph theory and their applications.

Course Objectives:

1. To introduce the concepts of logic, rules of inference and predicates.
2. To discuss the concepts on combinatory.
3. To explain the concepts of algebraic structures.
4. To familiarize the principles of Lattices and Boolean algebra.
5. To illustrate the problems in graph theory.

UNIT I Mathematical Logic and Statement Calculus 9 hours

Introduction -Statements and Notation - Connectives – Tautologies – Two State Devices and Statement logic - Equivalence - Implications - The Theory of Inference for the Statement Calculus –- The Predicate Calculus - Inference Theory of the Predicate Calculus.

UNIT II Combinatory 9 hours

The Basics of Counting- The Pigeonhole Principle -Permutations and Combinations - Binomial Coefficients -Generalized Permutations and Combinations –Generating Permutations and Combinations.

UNIT III Algebraic Structures 9 hours

Semigroups and Monoids - Grammars and Languages –Types of Grammars and Languages – Groups – Subgroups – Lagrange's Theorem –Homomorphism: Introduction –Properties - Group Codes.

UNIT IV Lattices and Boolean algebra 9 hours

Relations - Partially Ordered Relations - Hasse Diagram - Poset - Lattices - Boolean algebra - Boolean Functions - Representation and Minimization of Boolean Functions - Karnaugh map representation.

UNIT V Graph Theory 9 hours

Basic Concepts of Graph Theory - Isomorphic graph - Matrix Representation of Graphs – Trees - Kruskal's and Dijkstra's algorithms - Storage Representation and Manipulation of Graphs - Introduction to Finite State Machines.

B. Tech Computer Science and Engineering (Cyber Security)

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Evaluate elementary mathematical arguments and identify fallacious reasoning (not just fallacious conclusions) for develop syntax of programming languages.
2. Apply the concepts inclusion/exclusion principle and the pigeonhole methodology in data structure and algorithm.
3. Learn elementary proofs and properties of modular arithmetical results; and explain their applications such as in coding theory and cryptography.
4. Apply proof techniques towards solving problems in Boolean algebra and computer circuit designing.
5. Apply graph theory models and finite state machines concepts to solve critical networking issues, shortest path problems, scheduling, etc.

Text Books:

1. J.P. Trembley and R.Manohar, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill – 13th reprint, 2012.
2. Kenneth H. Rosen, Discrete Mathematics and its applications, 6th Edition, Tata McGraw Hill, (2011)

Reference Books:

1. Richard Johnsonbaugh, "Discrete Mathematics", 6th Edition, Pearson Education, 2011.
2. S. Lipschutz and M. Lipson, "Discrete Mathematics", Tata McGraw Hill, 3rd Edition, 2010.
3. B.Kolman, R.C.Busby and S.C.Ross, "Discrete Mathematical structures", 6th Ed, PHI, 2010.
4. C.L.Liu, "Elements of Discrete Mathematics", Tata McGraw Hill, 3rd Edition, 2008.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech II Year II Semester

20CSC107 OPERATING SYSTEM FUNDAMENTALS FOR SECURITY

L	T	P	C
3	0	0	3

Pre-requisite NIL

Course Description:

Student will understand Modern Operating System and their principles. The course will cover theory as well as practice aspects of a subject through scheduled lectures and labs, course will cover details of processes, CPU scheduling, memory management, file system, storage subsystem, and input/output management.

Course Objectives:

1. This course deals with security concepts and procedures applied in operating systems.
2. To understand Processes, Threads and Scheduling algorithms.
3. To analyze the concept of Deadlocks and memory management schemes.
4. To understand I/O management and File systems.
5. This course deals with security concepts and procedures applied in operating systems.

UNIT I INTRODUCTION AND PROCESS MANAGEMENT 9 hours

Operating system overview: Objectives - Computer System Organization-Operating System Structure - Operating System Operations - System Calls, - Processes: Process Concept - Process Scheduling - Operations on Processes – Inter process Communication- Multithreading Models - CPU Scheduling Criteria - Scheduling Algorithms.

UNIT II SYNCHRONIZATION AND DEADLOCK MANAGEMENT 9 hours

The Critical- Section Problem – Synchronization Hardware – Semaphores – Classic problems of Synchronization – Critical regions – Monitors- Deadlocks: Deadlock Characterization - Methods for Handling Deadlocks - Deadlock Prevention - Deadlock Avoidance - Deadlock Detection - Recovery from Deadlock

UNIT III STORAGE MANAGEMENT 9 hours

Main Memory: Swapping - Contiguous Memory Allocation, Segmentation, Paging. Virtual Memory: Demand Paging - Page Replacement - Allocation of Frames - Thrashing- Mass Storage Structure: Disk Structure - Disk Scheduling - File Concepts - Directory Structure - File Sharing – Protection.

UNIT IV ACCESS CONTROL AND SECURE OS 9 hours

Access Control Fundamentals, Multics, Security in Ordinary Operating Systems, Verifiable Security Goals, Security Kernels - Secure Operating Systems - Security Goals - Trust Model - Threat model- Mandatory Protection Systems - Assessment Criteria.

UNIT V SECURITY IN WINDOWS AND UNIX 9 hours

Security in Windows and Unix: Protection System, Authorization, security Analysis and Vulnerabilities- The security Kernel- Secure Communications Processor – Retrofitting security into Operating Systems, Fault Tolerance Issues, OS Issues related to the Internet, Intranets, Pervasive Computing, Embedded Systems, Mobile Systems and Wireless Networks

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Understand operating system program, structures and operations with system calls.
2. Apply the process management concept for real time problems
3. Illustrate CPU scheduling algorithms and to handle the deadlock for the given situation
4. Explain the concepts of various memory management techniques the storage concepts of disk and file
5. Gain factual knowledge (terminology, classifications, methods, trends) about OS Security.

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", John Wiley & Sons ,Inc., 10th Edition, 2020.
2. TrentJaeger, OperatingSystemSecurity, Morgan &Claypool Publishers, 2008.

Reference Books:

1. Operating Systems - Internals and Design Principles. Stallings, 6th Edition 2009. Pearson education
2. Michael J.Palmer, "Guide to Operating Systems Security", Thomson/Course Technology, 2004.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech II Year II Semester

20CSC108 JAVA PROGRAMMING

L	T	P	C
3	0	0	3

Pre-requisite 20CSC105

Course Description:

Basics of Object-Oriented Programming - objects, classes, polymorphism, inheritance, static and dynamic binding. Object Oriented Programming using Java-classes, interfaces, inheritance, polymorphism, method dispatch, features for encapsulation and modularity.

Course Objectives:

1. Understand object-oriented programming concepts, and apply them in solving problems.
2. Learn the principles of inheritance and polymorphism; and demonstrate how they relate to the design of abstract classes.
3. To Introduce the implementation of packages and interfaces.
4. Learn the concepts of exception handling and multi-threading.
5. Learn the design of Graphical User Interface using applets and swing controls.

UNIT I INTRODUCTIONTOOOPSCONCEPTSANDCLASSES 9 hours

Introduction to Object Oriented Programming, Java buzzwords, Java Programming Basics, Sample programs, Data types and operators, Control statements. **Classes:** Classes, Objects, Methods, Constructors, this and static keywords, Method and Constructor Overloading, Access modifiers, Polymorphism. **Arrays:** One Dimensional and multi-dimensional arrays.

UNIT II STRINGS,INHERITANCE,INTERFACES,ANDPACKAGES 9 hours

Strings: Strings, String Handling. **Inheritance**: Basics, Usage of Super, Multi-level hierarchy, Method overriding, Abstract class, Final keyword. **Interfaces:** Creating, Implementing, Using, Extending, and Nesting of interfaces. **Packages:** Defining, Finding and Importing packages, Member Access.

UNIT III EXCEPTIONHANDLING&MULTI-THREADING 9 hours

Exception Handling: Fundamentals, Types, Multiple catch clauses, Nested try blocks, Thrown Class, Using Finally and Throws, Built-in exceptions, User-defined exceptions. **Multi-threading:** Thread Class, Runnable interface, creating multiple threads, life cycle of thread, thread properties, synchronization, thread communication, suspending, resuming and stopping threads.

UNIT IV I/OSTREAMS ANDCOLLECTION FRAMEWORKCLASSES 9 hours

I/O Streams: Byte Stream Classes and Character Stream Classes. **Collection Framework :**Hierarchy of collection framework, Array-List, Linked-List, Vector, Stack, Queue, Priority Queue, Hash Set, Linked Hash Set, TreeSet.

UNIT V GUI PROGRAMMING AND EVENT HANDLING 9 hours

Swing – Introduction, limitations of AWT, MVC architecture, components, containers, Event Handling-Handling mouse and keyboard events, Exploring Swing-JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons, Comboboxes, TabbedPanes, ScrollPanes, Trees, and Tables. JDBC: Connecting to Database, querying a database and processing the results, updating data with JDBC.

Course Outcomes:

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

1. Choose object-oriented programming concepts for problem solving.
2. Create and use packages and interfaces.
3. Develop multithreaded applications with synchronization.
4. Provide solutions by using java collection framework and I/O classes.
5. Design GUI based applications.

Text Books:

1. JavaTheCompleteReference,HerbertSchildt,MCGRAWHILLEducation,9th Edition, 2016.

Reference Books:

1. Core Java Volume I – Fundamentals, by Cay S. Horstmann, Gary Cornell Pearson Education Ninth Edition
2. "Java Fundamentals-A Comprehensive Introduction", Herbert Schildt and Dale Skrien, Special IndianEdition,McGrawHill,2013.
3. "Java–How to Program", Paul Deitel, Harvey Deitel, PHI.
4. "Thinking in Java", Bruce Eckel, Pearson Education.
5. Java and Object Orientation, an introduction, John Hunt, second edition, Springer.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech II Year II Semester

20CSC109 DESIGN AND ANALYSIS OF ALGORITHMS

L	T	P	C
2	1	0	3

Pre-requisite 20CSC104

Course Description:
This course emphasis on analysis of various types of algorithms. It provides idea to design the algorithm to solve the problems using divide and conquer, greedy method, dynamic programming, backtracking, branch and bound, approximation.

Course Objectives:
1. To introduce the concepts of Algorithm Analysis, Time Complexity, Space Complexity.
2. To discuss various Algorithm Design Strategies with proper illustrative examples.
3. To introduce Complexity Theory with NP and Approximation.

UNIT I INTRODUCTION & DIVIDE AND CONQUER 9 hours

Introduction: What is an algorithm?, Algorithm specification, Space Complexity, Time Complexity, Orders of Growth, Worst-Case, Best-Case, and Average-Case Efficiencies, Asymptotic notations.
Divide and Conquer: Master's Method, Substitution Method, Recursion Tree Method, Binary Search, Finding the maximum and minimum, Merge sort, Quick Sort, Strassen's matrix multiplication.

UNIT II GREEDY METHOD & DYNAMIC PROGRAMMING 9 hours

Greedy Method: General method, Fractional Knapsack problem, Huffman Code, Job Scheduling with Deadlines, Optimal merge pattern.
Dynamic Programming: General method, String Editing, Longest Common Subsequence, Matrix Chain Multiplication, 0/1 Knapsack problems, The traveling sales person problem.

UNIT III GRAPH ALGORITHMS 9 hours

BFT, DFT, Connected components, Biconnected Components, Spanning Trees, Minimum cost Spanning Trees, Kruskal's and Prim's algorithm, Topological sort, Shortest Path Algorithms: Dijkstra's Single Source Shortest Path Algorithm, Floyd-Warshall's All Pairs Shortest Path Algorithm.

UNIT IV BACK TRACKING & BRANCH AND BOUND 9 hours

Backtracking: General method, N-Queens Problem, Sum of subset problem, Graph Coloring Problem.
Branch and Bound: General method: FIFO, LIFO and LC, Travelling salesperson problem, 0/1 Knapsack problem.

UNIT V NP PROBLEMS &APPROXIMATION ALGORITHMS 9 hours

NP Problems: Complexity Class - P, NP, NP Complete, NP Hard. Reducibility, Cook's Theorem. **Approximation Algorithms:** Introduction, Absolute Approximation, **ϵ** - Approximation, Polynomial time Approximation.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Analyze the performance of different algorithms.
2. Identify optimal solution for different problems using greedy method and dynamic programming.
3. Implement various graph based algorithms.
4. Make use of backtracking and branch & Bound methods to solve real world problems.
5. Understand the complexity of NP problems and Approximation algorithms.

Text Books:

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Second Edition, Universities Press, 2008
2. Jon Kleinberg and Eva Tardos "Algorithm Design", Pearson Education, 2007

Reference Books:

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012
2. Micheal T. Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis and Internet examples", Second Edition, Wiley Publication, 2006
3. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, 2006

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech II Year II Semester

20CSC206 OPERATING SYSTEM FUNDAMENTALS FOR SECURITY LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite -NIL-

Course Description:

In this course, we will take an in depth look at operating system security concepts and techniques. We will examine theoretical concepts that make the world of security unique. Also, this course will adopt a practical hands-on approach when examining operating system security techniques. Along with examining different security strategies, this course will explore the advancement of security implementation, as well as, timeless problem solving strategies.

Course Objectives:

1. This course deals with security concepts and procedures applied in operating systems.
2. Students will examine security concepts that are uniquely implemented into operating systems.
3. This course will enable practical hands-on approach when testing operating system security techniques.
4. To demonstrating server support skills and designing and implementing OS security systems
5. To evaluate, analyze, and modify operating system software in a business environment using PC compatible hardware and software

List of Programs:

1. To Study basic concepts in OS with the help of Linux commands.
2. a) Write a shell script that accepts two integers as its arguments and computers the value of first number raised to the power of the second number.

   b) Write a shell script that takes a command –line argument and reports on whether it is directory, a file, or something else.

3. a) Write a shell script that displays a list of all the files in the current directory to which the user has read, write and execute permissions.

   b) Develop an interactive script that ask for a word and a file name and then tells how many times that word occurred in the file.
4. Simulate the following CPU scheduling algorithms

   a) Round Robin b) SJF c) FCFS d) Priority
5. Write Program For Dining Philosophers Problem
6. Write Program For Producer –Consumer Problem concept

7. Write a program for scanning port

8. Implement the Trust and confidentiality

9. Perform Auditing, Accounting, and Logging activity in OS

10. Write Policy for port scans run, password requirements, virus detectors, etc

11. Perform the Vulnerability Assessment using below mentioned concepts:
    - Port scanning,
    - Bad passwords,
    - Suid programs,
    - Unauthorized programs in system directories,
    - Incorrect permission bits set,
    - Program checksums / digital signatures
    - System scripts or configuration files.
    - New unauthorized accounts.

12. Implement the following concepts in Windows / Linux Operating System
    - Authentication (Username / Password, Usercard / key, User attribute-fingerprint / eye retina pattern / signature / Image / EEG)
    - One Time passwords (Random numbers / Secretkey / Network password)

13. Protect the Operating System from the virus (AntiVirus)
14. Configure the firewall to protect the system

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Demonstrate the fundamental UNIX commands & system calls
2. Apply the scheduling algorithms for the given problem
3. Apply the process synchronous concept using message queue, shared memory, semaphore and Dekker's algorithm for the given situation.
4. Experiment an algorithm to detect and avoid dead lock
5. Analyze Protection and Security Mechanism in Operating System

Text Books:

1. Trent Jaeger, Operating System Security, Morgan &Claypool Publishers, 2008.

Reference Books:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", John Wiley & Sons ,Inc., 9th Edition, 2012.
2. William Stallings, "Operating System: Internals and Design Principles", Prentice Hall, 7th Edition, 2012.
3. Tom Adelstein and Bill Lubanovic, "Linux System Administration", O'Reilly Media, Inc., 1st Edition, 2007.
4. Michael J.Palmer, "Guide to Operating Systems Security", Thomson/Course Technology, 2004.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech II Year II Semester

20CSC207 JAVA PROGRAMMING LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite -NIL-

Course Description:

Basics of Object-Oriented Programming - objects, classes, polymorphism, inheritance, static and dynamic binding. Object Oriented Programming using Java-classes, interfaces, inheritance, polymorphism, method dispatch, features for encapsulation and modularity.

Course Objectives:

1. Understand object-oriented programming concepts, and apply them in solving problems
2. Learn the principles of inheritance and polymorphism; and demonstrate how they relate to the design of abstract classes.
3. To Introduce the implementation of packages and interfaces
4. Learn the concepts of exception handling and multithreading.
5. Learn the design of Graphical User Interface using applets and swing controls

List of Programs:

1.
   a) Write a Java program that prints all real solutions to the quadratic equation ax2+bx+c=0. Read in a, b, c and use the quadratic formula. If the discriminant b2-4ac is negative, display a message stating that there are no real solutions.
   b) Write a Java program that find prime numbers between 1to n.
   c) Write a Java Program that find the factorial of a number
2.
   a) The Fibonacci sequence is defined by the following rule: The first two values in the sequence are 1 and 1. Every subsequent value is the sum of the two values preceding it. Write a Java program that print the nth value in the Fibonacci sequence.
   b) Write a Java program that checks whether a given string is a palindrome or not. Ex: MADAM is a Palindrome.
   c) Write a Java program for sorting a given list of names in ascending order.
3.
   a) Write a java program to split a given text file in to ‘n’ parts. Name each part as the name of the original file followed by part <n> where n is the sequence number of the part file.
   b) Write a java program to convert an Array List to an Array.
   c) Write a Java program to make frequency count of vowels, consonants, special symbols, digits, words in a given text.
4.
   a) a) Write a Java program that reads a file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type offline and the length of the file in bytes.
   b) Write a Java program that reads a file and displays the file on the screen, with a line number before each line.
   c) Implement Stack using queues.

5.
   a) Write a java program to make rolling apairofdice10,000timesandcountsthenumber of times doubles of are rolled for each different pair of doubles.Hint:Math.random().
   b) Write java program that inputs 5 numbers, each between 10 and 100 inclusive. As each number is read display it only if it‘s not a duplicate of any number already read display the complete set of unique values input after the user enters each new value.
   c) Write a java program to read the time intervals (HH:MM) and to compare system time if the system time between your time intervals print correct time and exit else try again to repute the same thing. By using String Toknizer class.

6.
   a) WritejavaprogramtocreateasuperclasscalledFigurethatreceivesthedimensionsoftwo dimensional objects. It also defines a method called area that computes the area of an object. The program derives two subclasses from Figure. The first is Rectangle and second is Triangle. Each of the sub class overridden area() so that it returns the area of a rectangle and a triangle respectively.
   b) Write a Java program that creates three threads. First thread displays ―Good Morning ‖ every one second, the second thread displays ―Hello ‖ every two seconds and the third thread displays―Welcome ‖ every three seconds

7.
   a) Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication.
   b) Use inheritance to create an exception super class called Exception A and exception subclass Exception Band Exception C, where Exception B inherits from Exception Aand Exception C inherits from Exception B. Write a java program to demonstrate that the catch block for type Exception A catches exception of type Exception Band Exception C

8. Write a Java Program to design login window using AWT components.
9. Develop an application for simple calculator. Use a grid layout to arrange buttons for the digits and for the +,-,*,%operations. Add a textfield to display the result
10. Design & Develop an application that creates a user interface to perform integer divisions. The user enters two numbers in the Jtext Fields, Num1 and Num2. The division of Num1and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 orNum2 were not an integer, the program would throw a Number Format Exception. If Num2were Zero, the program would throw an Arithmetic Exception Display the exception in a message dialog box.
11. Design a GUI application that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green. When a radio button is selected, the light is turned on, and only one light can be on at a time No light is on when the program starts.
12.
   a) Design a GUI application for Cafeteria bill generation.
   b) Create a database connection using JDBC & perform some basic operation such as add, remove, update record in database using JDBC.

B. Tech Computer Science and Engineering (Cyber Security)

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Solve real world problems using OOP techniques.
2. Implement string handling and file handling methods.
3. Design multithreaded applications with synchronization.
4. Develop web applications using AWT components.
5. Create GUI based applications

Text Books:

1. JavaTheCompleteReference,HerbertSchildt,MCGRAWHILLEducation,9th Edition, 2016.

Reference Books:

1. Core Java Volume I – Fundamentals, by Cay S. Horstmann, Gary Cornell Pearson Education Ninth Edition
2. "Java Fundamentals- A Comprehensive Introduction", Herbert Schildt and Dale Skrien, Special IndianEdition,McGrawHill,2013.
3. "Java–How to Program", Paul Deitel, Harvey Deitel, PHI.
4. "Thinking in Java", Bruce Eckel, Pearson Education.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech II Year II Semester

20CSC208 DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite 20CSC203

Course Description:

This course is aimed to provide hands on experience to analyse the time complexity of sorting, graph based, greedy, dynamic programming and backtracking algorithms.

Course Objectives:

1. To learn how to analyse a problem & design the solution for the problem.
2. To Strengthen the ability to identify and apply the suitable algorithm for the given real world problem.
3. To develop the optimal solution, i.e., time complexity & space complexity must be very low.

List of Programs:

1. Sort a given set of elements using the Quick sort method and determine the time required to sort the elements.
2. Implement Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements.
3. Implement Fractional Knapsack problem using Greedy Method
4. Implement Job Scheduling with Deadlines using Greedy Method
5. Implement 0/1 Knapsack problem using Dynamic Programming
6. Implement Traveling Salesperson problem to find the optimal tour using Dynamic Programming
7. Find Minimum Cost Spanning Tree of a given undirected graph using
   (a) Prim's algorithm. (b) Kruskal's algorithm
8. Implement the algorithm for Topological ordering of vertices in a DAG.
9. From a given vertex in a weighted connected graph, find shortest paths to all other vertices using Dijkstra's algorithm
10. Implement All-Pairs Shortest Paths Problem using Floyd-Warshall's algorithm
11. Find a subset of a given set $S = \{S_1, S_2, ...S_n\}$ of n positive integers whose sum is equal to a given positive integer d. For example, if S= {2, 3, 5, 7, 8} and d = 10 there are three solutions {2,3,5}, {3,7}. and {2,8}. A suitable message is to be displayed if the given problem instance doesn't have a solution.
12. Implement N Queen's problem using Back Tracking

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Analyse the performance of different algorithms.
2. Apply various problem solving approaches
3. Identify optimal solution for different problems using greedy method and dynamic programming.
4. Implement various graph based algorithms.
5. Make use of backtracking method to solve real world problems.

Text Books:

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Second Edition, Universities Press, 2008
2. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.

Reference Books:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.
2. S. Sridhar, "Design and Analysis of Algorithms", Oxford university press, 2014.
3. Web reference: http://nptel.ac.in/

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

Mandatory Course

B. Tech II Year II Semester

20HUM901 INDIAN CONSTITUTION

L	T	P	C
2	0	0	0

Pre-requisite NIL

Course Description:

The Constitution of India is the supreme law of India. Parliament of India can not make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the "basic structure" of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of "Constitutionalism" – a modern and progressive concept historically developed by the thinkers of "liberalism" – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state.

Course Objectives:

The course is intended to:

1. To know about Indian constitution;
2. To know about central and state government functionalities in India; and
3. To know about Indian society.

UNIT I INTRODUCTION 6 hours

Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Constitutional Remedies for citizens.

UNIT II STRUCTURE AND FUNCTION OF CENTRAL GOVERNMENT 6 hours

Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.

UNIT III STRUCTURE AND FUNCTION OF STATE GOVERNMENT 6 hours

State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature –Judicial System in States – High Courts and other Subordinate Courts.

UNIT IV CONSTITUTION FUNCTIONS 6 hours

Indian Federal System – Center – State Relations – President's Rule – Constitutional Amendments –Constitutional Functionaries - Assessment of working of the Parliamentary System in India.

UNIT V INDIAN SOCIETY 6 hours

Society: Nature, Meaning and definition; Indian Social Structure; Caste, Religion, Language in India Constitutional Remedies for citizens – Political Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections.

Course Outcomes:

At the completion of the course the students will be able to:

1. Understand the functions of the Indian government; and
2. Understand and abide the rules of the Indian constitution.

Text Books:

1. Durga Das Basu, "Introduction to the Constitution of India ", Prentice Hall of India, New Delhi
2. R.C.Agarwal, (1997) "Indian Political System", S.Chand and Company, New Delhi.
3. Maciver and Page, " Society: An Introduction Analysis ", Mac Milan India Ltd., New Delhi.
4. K.L.Sharma, (1997) "Social Stratification in India: Issues and Themes", Jawaharlal Nehru University, New Delhi.

Reference Books:

1. **S**harma, Brij Kishore, " Introduction to the Constitution of India:, Prentice Hall of India, New Delhi
2. U.R.Gahai, "Indian Political System ", New Academic Publishing House, Jalaendhar.
3. R.N. Sharma, "Indian Social Problems ", Media Promoters and Publishers Pvt. Ltd.

Mode of Evaluation: Assignments, Mid Term Tests

III Year I Semester

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech III Year I Semester

20CSC110 AUTOMATA THEORY AND COMPILER DESIGN

L	T	P	C
3	0	0	3

Pre-requisite Nil

Course Description:

This course deals with the set of abstract machines that serve as models for computation - Finite automata, Pushdown automata, and Turing machines - and examines the relationship between these automata and formal languages. It also introduces the system software like compiler, assembler, and interpreter. It provides the complete description of inner working of the Compiler phases.

Course Objectives:

1. To give an overview of the theoretical foundations of computer science from the perspective of formal languages
2. To illustrate finite state machines to solve problems in computing
3. To familiarize Regular grammars, context frees grammar.
4. To learn the process of translating a modern high-level language to executable code.
5. To apply the optimization techniques to have a better code for code generation

UNIT I AUTOMATA FUNDAMENTALS AND REGULAR EXPRESSIONS **9 hours**

Finite Automata – Deterministic Finite Automata – Non-deterministic Finite Automata – Finite Automata with Epsilon Transitions – Regular Expressions - Conversion of Regular Expression into DFA using Subset construction method - Minimization of DFA - Proving Languages not to be Regular.

UNIT II CONTEXT FREE GRAMMAR AND LANGUAGES **9 hours**

CFG – Parse Trees – Ambiguity in Grammars and Languages – Definition of the Pushdown Automata – Languages of Pushdown Automata – Pumping Lemma for CFL - Introduction to Turing Machines.

UNIT III INTRODUCTION TO COMPILER AND LEXICAL ANALYSIS **9 hours**

Compiler – Interpreter – Assembler – Language Processor - Phases of a compiler – Lexical Analysis – Role of Lexical Analyzer – Specification of Tokens – Recognition of Tokens – Lex.

UNIT IV SYNTAX ANALYSIS **9 hours**

Role of Parser - Top Down Parsing - General Strategies Recursive Descent Parser - Predictive Parser - LL(1) - Parser-Shift Reduce Parser - LR Parser - SLR - YAAC.

UNIT V INTERMEDIATE CODE, CODE GENERATION AND CODE OPTIMIZATION **9 hours**

Issues in Code Generation - Design of a simple Code Generator - Principal Sources of Optimization – Peep-hole optimization – DAG - Optimization of Basic Blocks.

Course Outcomes:

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

1. Construct automata, regular expression for any pattern.
2. Design PDA, Turing Machines for any Language.
3. Understand the different phases of compiler.
4. Apply different parsing algorithms to develop the parsers for a given grammar.
5. Learn to implement code optimization techniques and a simple code generator.

Text Book(s)

1. J.E.Hopcroft, R.Motwani and J.D Ullman, "Introduction to Automata Theory, Languages and Computations", Third Edition, Pearson Education, 2006.
2. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, "Compilers: Principles, Techniques and Tools", Second Edition, Pearson Education, 2014.

Reference Books

1. J.Martin, "Introduction to Languages and the Theory of Computation", Third Edition, TMH, 2003.
2. Steven S. Muchnick, "Advanced Compiler Design and Implementation", Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech III Year I Semester

	L	T	P	C
20CSC111 COMPUTER NETWORKS	**3**	**0**	**0**	**3**

Pre-requisite: NIL

Course Description:

The course introduces the concepts of Network Communication and the relevant protocols which are related to Communication.The course will well prepare the students to verify and validate the Network Communication and make the student familiar with the different layers of networks. Students will be also made well knowledge in internetworking and routing protocols.

Course Objectives:

1. Understand the division of network functionalities into layers
2. Be familiar with the components required to build different types of networks
3. Be exposed to the required functionality at each layer
4. Learn the flow control and congestion control algorithms
5. An exposure towards total interaction between different network layers.

UNIT I FUNDAMENTALS & LINK LAYER 9 hours

Overview of Data Communications- Networks –Data and Signals-Multiplexing-Transmission Medium- Building Network and its types– Overview of Internet – Protocol Layering – OSI Mode – Physical Layer – Overview of Data and Signals – introduction to Data Link Layer – Link layer Addressing- Error Detection and Correction

UNIT II MEDIA ACCESS & INTERNETWORKING 9 hours

Overview of Data link Control and Media access control – Ethernet (802.3) – Wireless LANs – Available Protocols – Bluetooth – Bluetooth Low Energy – WiFi – 6LowPAN–Zigbee – Network layer services – Packet Switching – IPV4 Address – Network layer protocols (IP, ICMP, Mobile IP)

UNIT III ROUTING 9 hours

Routing – Unicast Routing – Algorithms – Protocols – Multicast Routing and its basics – Overview of Intradomain and interdomain protocols – Overview of IPv6 Addressing – Transition from IPv4 to IPv6

UNIT IV TRANSPORT LAYER 9 hours

Introduction to Transport layer –Protocols-Socket Programming- User Datagram Protocols (UDP) and Transmission Control Protocols (TCP) –Services – Features – TCP Connection – State Transition Diagram – Flow, Error and Congestion Control – Congestion avoidance (DECbit, RED) – QoS – Application requirements.

UNIT V APPLICATION LAYER 9 hours

Application Layer Paradigms – Client Server Programming – World Wide Web and HTTP – DNS- - Electronic Mail (SMTP, POP3, IMAP, MIME) – Introduction to Peer to Peer Networks – Need for Cryptography and Network Security – Firewalls.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Identify the components required to build different types of networks
2. Choose the required functionality at each layer for given application
3. Identify solution for each functionality at each layer
4. Trace the flow of information from one node to another node in the network
5. Gain a wide knowledge on different application layers in network.

Text Books:

1. Behrouz A. Forouzan, Data communication and Networking‖, Fifth Edition, Tata McGraw – Hill, 2013

2. Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach‖, Fifth Edition, Morgan Kaufmann Publishers, 2011.

Reference Books:

1. James F. Kurose, Keith W. Ross, Computer Networking - A Top-Down Approach Featuring the Internet‖, Seventh Edition, Pearson Education, 2016.
2. Nader. F. Mir,Computer and Communication Networks‖, Pearson Prentice Hall Publishers, 2nd Edition, 2014.
3. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, ―Computer Networks: An Open Source Approach‖, Mc Graw Hill Publisher, 2011.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech III Year I Semester

20CSC112 SOFTWARE ENGINEERING

L	T	P	C
3	0	0	3

Pre-requisite NIL

Course Description:

The basic objective of Software Engineering is to develop methods and procedures for software development that can scale up for large systems to consistently produce high quality software at low cost and with a small cycle time. Software Engineering is the systematic approach to the development, operation, maintenance, and retirement of software. This course provides a thorough introduction to fundamental principles of software engineering. The organization is broadly based on the classical analysis-design-implementation framework.

Course Objectives:

1. To make students to learn different Life Cycle models.
2. To make students to learn different phases in Software Engineering.
3. To make students to learn testing strategies.

UNIT I INTRODUCTION 9 hours

Software engineering, Dual role of software, Software Crisis history, Various Myths Associated with Software, Different Software Process Models, The Linear Sequential Model, The Prototyping Model, The RAD Model, Evolutionary Process Models, Component-Based Development, Process, Product and Process. Overview of Quality Standards like ISO 9001, SEI-CMM

UNIT II SOFTWARE DESIGN 9 hours

Software Requirement Analysis, Design and Coding Problem Analysis, Software Requirement and Specifications, Behavioural and non-behavioural requirements, Software Prototyping, Cohesion & Coupling, Classification of Cohesiveness & Coupling, Function Oriented Design, Object Oriented Design, User Interface Design, Top-down and Bottom-up Structured Programming, Information hiding.

UNIT III SOFTWARE TESTING 9 hours

Stware Reliability, Testing and Maintenance, Failure and Faults, Reliability Models: Basic Model, Logarithmic Poisson Model, Software process, Functional testing: Boundary value analysis, Equivalence class testing, and Structural testing: path testing, Data flow and mutation testing, Unit testing, Integration and System testing, Debugging, Testing Tools & Standards. Management of maintenance, Maintenance Process, Maintenance Models, Reverse Engineering, Software RE-engineering

UNIT IV SOFTWARE METRICS 9 hours

Software Metrics and Project Planning Size Metrics like LOC, Token Count, Function Count, Design Metrics, Data Structure Metrics and Information Flow Metrics. Cost estimation, Static, Single and Multivariate models, COCOMO model, Putnam Resource Allocation Model, Risk Management.

UNIT V SECURITY ENGINEERING 9 hours

Analyzing Security Requirements, Security and Privacy in an Online World, Security Engineering Analysis, Security Assurance, Security Risk Analysis, The Role of Conventional Software Engineering Activities, Verification of Trustworthy Systems.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Understand various software engineering principles and their application (Understand)
2. Demonstrate use of various Agile methodologies for software development (Apply)
3. Apply various modelling techniques for designing system requirement (Apply)
4. Identify different types of risk and evaluate its impact on software system(Evaluate)
5. Distinguish different testing strategies and Create test cases. (Create)

Text Books:

1. Roger S.Pressman, Software engineering- A practitioner's Approach, McGraw-Hill International Editions, 8th edition 2019.

2. Ian Sommerville, Software engineering, Pearson education Asia, 9th edition 2011.

Reference Books

1. Pankaj Jalote, Software Engineering– A Precise Approach, Wiley India 2010.

2. Software Engineering Fundamentals by Ali Behhforoz & Frederick Hudson OXFORD.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech III Year I Semester

20CSC209 COMPUTER NETWORKS LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite NIL

Course Description:
This course helps the students to understand comprising simulation of various protocols and performance, TCP/IP Level Programming, Routing Algorithms and internetworking. Communication between Computer networks will be highlighted and the performance will also be calculated in the Networking layers.

Course Objectives:

1. To provide the students the ideas of Cabling, outlet installation, addressing, LAN setup, and configuring a router.
2. To provide students with a theoretical and practical base in computer networks protocols
3. Student will be able purse his study in advanced networking courses
4. Prepare students for easy transfer from academia into practical life
5. To provide the students the awareness of simulation tools

List of Programs

1. Practice LAN setup and Router configuration
2. Create a socket for HTTP for webpage upload and download
3. Write a program for client Server chat application
4. Perform Protocol analysis, Packet Capture & Traffic Analysis with Wireshark
5. Implementation of Link State Routing Algorithm
6. Write a socket program for echo/ping/talk commands
7. Implementation of Distance Vector Routing Algorithm
8. Write a program for client Server chat application
9. Write a program to generate CRC code for checking error
10. Write a program to transfer data between two nodes using NS
11. Write a program to simulate data transfer and packet loss using NS
12. Study on Network simulator and Simulation of Congestion Control Algorithm using Network Simulator.

Course Outcomes:
Upon successful completion of the course, students will be able to

1. Implementation of congestion control protocols.
2. Implementation of various sockets.
3. Implement error detection and correction techniques
4. Simulate the various network and transport layer protocols
5. Analyze packets using packet analyzer tools

Text Books:

1. Behrouz A. Forouzan, ―Data communication and Networking‖, Fifth Edition, Tata McGraw – Hill, 2013

Reference Books:

1. Data communications and networking", Behrouz A. Forouzan, Mc Graw Hill Education, 5th edition, 2012.
2. "Computer Networks", Andrew S. Tanenbaum, Wetherall, Pearson,5th edition, 2010.
3. "Understanding Communications and Networks", Third Edition, W.A.Shay, Cengage Learning.
4. "Computer Networking: A Top-Down Approach Featuring the Internet", James F.Kurose,
5. K.W.Ross, Third Edition, Pearson Education

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech III Year I Semester

20CSC210 SOFTWARE ENGINEERING LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite -NIL-

Course Description:
This course presents software engineering techniques and explains the software development life cycle. The main goal of this course is to build their ability to do useful applications that could be released for real-world use.

Course Objectives:
1. To make students learn different Life Cycle models
2. To make students learn different phases in Software Engineering
3. To make students learn testing strategies

List of Programs:
For any given case/ problem statement do the following;

1. Prepare a SRS document in line with the IEEE recommended standards.
2. Draw the use case diagram and specify the role of each of the actors. Also state the precondition, post condition and function of each use case.
3. Draw the activity diagram.
4. Identify the classes. Classify them as weak and strong classes and draw the class diagram.
5. Draw the sequence diagram for any two scenarios.
6. Draw the collaboration diagram.
7. Draw the state chart diagram.
8. Draw the component diagram.
9. Perform forward engineering in java. (Model to code conversion)
10. Perform reverse engineering in java. (Code to Model conversion)
11. Draw the deployment diagram.

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Identify ambiguities, inconsistencies and incompleteness from a requirements specification and state functional and non-functional requirement
2. Identify different actors and use cases from a given problem statement and draw use case diagram to associate use cases with different types of relationship
3. Draw a class diagram after identifying classes and association among them
4. Graphically represent various UML diagram and associations among them and identifythe logical sequence of activities undergoing in a system, and represent them pictorially
5. Use modern engineering tools for specification, design, implementation and testing.

Text Books:

1. Roger S.Pressman, Software engineering- A practitioner's Approach, McGraw-Hill International Editions,8th edition,2019.
2. Ian Sommerville, Software engineering, Pearson education Asia, 9th edition,2011.

Reference Books:

1. Pankaj Jalote, Software Engineering– A Precise Approach, Wiley India 2010 .
2. Software Engineering Fundamentals by Ali Behhforoz & Frederick Hudson OXFORD

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

Mandatory Course

III Year I Semester

20CE901 DISASTER MANAGEMENT

L	T	P	C
2	0	0	0

Pre-requisite: None

Course Description:

The goal of this course is to expose the under graduate students regarding different types of disasters and preparedness needed to mitigate their effects. The course matrix will cover various natural, biological, chemical and emerging hazards and risks that may cause property, loss of lives, and livestock's. Thus, the future engineers will understand the social responsibility for the preparedness and mitigation of the damages caused by the disasters.

Course Objectives:

1. To make aware the students about disasters and their impact on living beings.
2. 2. To ensure the students for the understanding on vulnerability, disasters, disaster prevention
3. and risk reduction.
4. To gain a preliminary understanding of approaches for the Disaster Risk Reduction (DRR)
5. To enhance awareness of institutional processes available in the country for the disaster risk mitigation.

UNIT I INTRODUCTION 6 hours

Introduction, Etymology of disaster, Concepts and definitions: disaster, hazard, vulnerability, risks, Resilience, prevention and mitigation.

UNIT II TYPES OF DISASTERS 6 hours

Types of Disaster; natural disasters (earthquakes, volcanoes, forest fires and explosions, heat and cold waves, floods, draught, cyclones, tsunami, landslides, soil erosion); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.), hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

UNIT III DISASTER IMPACTS 6 hours

Disaster Impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

UNIT IV DISASTER RISK MITIGATION MEASURES 6 hours

Disaster Risk Reduction (DRR) - Disaster management- four phase approach; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications), DRR programmers in India and the activities of National Disaster Management Authority. Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction.

UNIT V IMPACT OF DEVELOPMENTAL ACTIVITIES 6 hours

Disasters, Environment and Development - Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, landuse changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

Course Outcomes:

The students after completing the course will be able to:

1. Explain various disaster concepts
2. Differentiate between categories of disasters
3. Analyze impact of various types of disasters
4. Select disaster risk mitigation measures
5. Identify the impact of development activities

Text Books:

1. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation

Data Books:

1. C P Kothandaraman & S Subramanyan, Heat and Mass Transfer data book, New Age International Publishers, Eight Edition.

Reference Books:

1. http://ndma.gov.in/ (Home page of National Disaster Management Authority)
2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home affairs).
3. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
4. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
5. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003
6. Inter Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC

Mode of Evaluation: Assignments, Mid Term Tests

III Year II Semester

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech III Year II Semester

20CSC113 CLOUD COMPUTING

L	T	P	C
3	0	0	3

Pre-requisite 20CST105, 20CST107

Course Description:

This course will cover a top-down view of cloud computing, from applications and administration to programming and infrastructure. The aim is to provide skills and knowledge about operations and management in cloud technologies and design cloud infrastructure to meet the business needs.

Course Objectives:

1. To learn the design and development process involved in creating a cloud-based application.
2. To implement and use parallel programming using various tools.
3. To learn Various service models such as IaaS and PaaS and deployment models such as private, public, hybrid, and community.
4. To provide skills to design suitable cloud infrastructure that meets the business services and customer needs.
5. To identify various security and privacy issues in cloud.

UNIT I INTRODUCTION TO CLOUD COMPUTING 9 hours

Inception and need for cloud computing: Motivations from distributed computing predecessors - Evolution - Characteristics - Business Benefits – Challenges in cloud computing - Exploring the Cloud Computing Stack - Fundamental Cloud Architectures – Advanced Cloud Architectures - Specialized Cloud Architectures

UNIT II SERVICE DELIVERY AND DEPLOYMENT MODELS 9 hours

Service Models (XaaS): Infrastructure as a Service (IaaS) - Platform as a Service (PaaS) – Software as a Service(SaaS) - Deployment Models: Types of cloud - Public cloud - Private cloud – Hybrid cloud – Service level agreements - Types of SLA – Lifecycle of SLA- SLA Management.

UNIT III VIRTUALIZATION 9 hours

Virtualization as Foundation of Cloud – Understanding Hypervisors – Understanding Machine Image and Instances - Managing Instances – Virtual Machine Provisioning and Service Migrations

UNIT IV CLOUD COMPUTING: APPLICATIONS AND PARADIGMS 9 hours

Existing Cloud Applications and Opportunities for New Applications - Architectural Styles for Cloud Applications - Workflows: Coordination of Multiple Activities - Coordination Based on a State Machine Model: The ZooKeeper - The Map Reduce Programming Model - A Case Study: The GrepTheWeb Application

UNIT V CLOUD PLATFORMS AND SECURITY 9 hours

Comparing Amazon web services, Google AppEngine, Microsoft Azure from the perspective of architecture (Compute, Storage Communication) services and cost models. Cloud application development using third party APIs, Working with EC2. Security Clouds

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Understand the evolution, principles, and benefits of Cloud Computing in order to assess existing cloud infrastructures to choose an appropriate architecture that meets business needs.
2. Decide a suitable model to capture the business needs by interpreting different service delivery and deployment models.
3. Understand virtualization foundations to cater the needs of elasticity, portability and resilience by cloud service providers.
4. Infer architectural style, workflow of real-world applications and to implement the cloud applications using map reduce programming models.
5. Design a cloud framework with appropriate resource management policies and mechanism

Text Books:

1. Rajkumar Buyya, James Broberg, Andrzej, M. Goscinski, Cloud Computing: Principles and Paradigms, Wiley, 1st Edition, 2013.
2. Dongarra, Jack, Fox, Geoffrey, Hwang, Kai,"Distributed and Cloud Computing",.1st Edition, Morgan Kaufmann, 2013.
3. Marinescu, Dan C. Cloud Computing: Theory and Practice. Morgan Kaufmann, 2017.

Reference Books:

1. Buyya, Rajkumar, Christian Vecchiola, and S. Thamarai Selvi. Mastering Cloud Computing: Foundations and Applications Programming, Tata Mcgraw Hill, 1st Edition, 2017.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, Mc Graw Hill Education, 1st Edition, 2017.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech III Year II Semester

20CSC114 FOUNDATIONS OF CRYPTOGRAPHY

L	T	P	C
3	0	0	3

Pre-requisite 20CSC107, 20CSC111

Course Description:

This course provides the principles and practice of cryptography and network security. It also provides better understanding for E-mail security, and web security. Further, it helps to implement the security concepts is real-time applications.

Course Objectives:

After successfully completing the course the student should be able to

1. Understand the fundamental principles of access control models and techniques, authentication and secure system design.
2. Have a strong understanding and describe of different cryptographic protocols and techniques be able to use them.
3. Become knowledgeable in various methods and protocols to maintain E-mail security, and web security.
4. Analyze & develop methods for authentication, access control, intrusion detection and prevention.
5. Identify and mitigate software security vulnerabilities in existing systems.

UNIT I SECURITY & CRYPTOGRAPHY CONCEPTS 9 hours

Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security.

Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, steganography, key range and key size, possible types of attacks.

UNIT II SYMMETRIC & ASYMMETRIC CIPHERS 9 hours

Symmetric key Ciphers: Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers, RC4. Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange.

UNIT III HASHING & AUTHENTICATION SYSTEMS 9 hours

Cryptographic Hash Functions: Message Authentication, Secure Hash Algorithm (SHA-512).

Message authentication codes: Authentication requirements and functions, HMAC, CMAC.

UNIT IV AUTHENTICATION APPLICATIONS 9 hours

Distribution of public keys, Kerberos, X.509 Authentication Service, Public Key Infrastructure, Digital signatures,

UNIT V NETWORK SECURITY APPLICATIONS 9 hours

Email Security: Pretty Good Privacy (PGP) and S/MIME**. IP Security**: IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, **Web Security:** Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET), Intruders, Viruses and related threats.

Course Outcomes:

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

1. Understand the basic definitions and concepts of the information security
2. Analyze & differentiate between several types of security schemes
3. Design & develop information security schemes
4. Apply the security concepts with various applications.
5. Implement network security schemes to protect information system resources

Text Books:

1. Stallings, W.Cryptography and Network Security: Principles and Practice, 5th ed., Prentice Hall PTR, 2011.
2. Cryptography and Network Security; 2nd ed., Behrouz A. Forouzan, Debdeep Mukhopadhyay, McGraw Hill, 2011.

Reference Books

1. AtulKahate, Cryptography and Network Security, 2nd ed., Tata McGraw Hill education Private Limited, 2011.
2. Computer Security, Dieter Gollman,3rded, Wiley Publications,2011.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech III Year II Semester

20CSC115 AI TOOLS, TECHNIQUES AND APPLICATIONS

L	T	P	C
3	0	0	3

Pre-requisite NIL

Course Description:
To understand the importance of AI and its applications, Machine learning and Deep Learning algorithms and smart solutions for various domains. This course aims to introduce the students to the theoretical foundation for the process of computation and to impart an understanding of Automata, Regular Languages, Context Free Languages, Push down Automata and Turing Machine.

Course Objectives:
The objectives of this course are

1. Expose fundamental concepts in AI
2. Demonstrate the capability to create simple AI applications using Natural Language Processing, Speech recognition, Computer Vision, Pattern recognition..
3. Present various modelling and formulation techniques to solve problems using AI techniques.
4. Introduce state-of-art AI tools and techniques to solve various problems faced by Engineers in design and analysis.
5. To develop intelligent systems by assembling solutions to concrete computational problems

UNIT I FUNDAMENTALS OF AI 9 hours

What is AI? Historical background, Turing test, Definition of AI, Applications of AI, Knowledge representation and reasoning, Hypothesis testing, Null and alternate hypothesis, Analysis Of Variance (ANOVA), Linear Regression –univariate and multivariate, Ridge regression, Machine Learning – What is Machine Learning? Supervised and Unsupervised Learning.

UNIT II UNSUPERVISED,SEMI SUPERVISED AND REINFORCEMENT LEARNING 9 hours

Unsupervised Learning – K-means clustering, Competitive Learning, Self-Organizing Map (SOM), Outlier and Anomaly Detection, Semi-supervised Learning - Reinforcement Learning.

UNIT III SUPERVISED LEARNING 9 hours

Supervised Learning – Single Layer Perceptron (SLP), Nearest Neighbor Classifier, k-Nearest Neighbor Classifier, Parzen window, Kernel method, Evaluation of Classifier Performance – Confusion matrix, FP, FN, F-score, ROC, Log loss, Cross entropy, Multi-Layer Perceptron (MLP) and Back-Propagation Training, Decision Tree, Random forest, Support Vector Machine (SVM), Logistic Regression.

UNIT IV NATURAL LANGUAGE PROCESSING 9 hours

Stemming and Lemmatization, Term Frequency (TF), Inverse Document Frequency (IDF), Document classification, UV Factorization, Latent Semantic Analysis/Indexing, Topic modelling concepts and tools Introduction to Speech Recognition, Hidden Markov.

UNIT V IMAGE PROCESSING 9 hours

Image processing - Noise Removal, Image Enhancement, Segmentation Object Classification and detection – Filters and Transforms for feature extraction, Boltzmann machine and Convolution Neural Network (CNN), Introduction to Deep Neural Network (DNN) and its use for object detection.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Evaluate Artificial Intelligence (AI) methods and describe their foundations.
2. Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation and learning.
3. Analyze and illustrate how search algorithms play vital role in problem solving
4. Illustrate the construction of learning and expert system
5. Discuss current scope and limitations of AI and societal implications

Text Books:

1. Tom Markiewicz & Josh Zheng,Getting started with Artificial Intelligence, Published by O'Reilly Media,2017
2. Russell, S. and Norvig, P. 2015. Artificial Intelligence - A Modern Approach, 3rd edition, Prentice Hall.
3. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer 2010.
4. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016.

Reference Books:

1. Aurélien Géron,Hands on Machine Learning with Scikit-Learn and TensorFlow [Concepts, Tools, and Techniques to Build Intelligent Systems], Published by O'Reilly Media, 2017
2. Luger, G.F. 2008. Artificial Intelligence -Structures and Strategies for Complex Problem Solving, 6th edition, Pearson.
3. Munesh Chandra Trivedi, A classical approach to Artificial Intelligence, Khanna Publications.
4. Chandra S.S. & H.S. Anand, Artificial Intelligence and Machine Learning, PHI Publications

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech III Year II Semester

20CSC211 CLOUD COMPUTING LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite 20CSC209

Course Description:
This course is designed to provide basic understanding on cloud computing and its design principles. It provides knowledge in different Virtualization technologies such as Virtual Box, VMware workstation and to create and deploy a web application in a variety of cloud environments. It also illustrates to mimic a cloud environment to build novel scheduling algorithms for cloud data centre automation.

Course Objectives:
1. To develop web applications in cloud.
2. To learn the design and development process involved in creating a cloud-based application.
3. To provide skills and knowledge about operations and management in cloud technologies to implement large scale systems.

List of Programs:

1. Install VirtualBox/VMware Workstation with different flavors of Linux or windows OS on top of windows OS.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Install Google App Engine. Create hello world app and other simple web applications using python/java.
4. Install the Hadoop framework and create an application using Map Reduce Programming Model
5. Experiment cloud scheduling algorithms using any Cloud tools.
6. Experiment cloud load balancing algorithms using Cloud Sim or any tools.
7. Launch EC2 AWS – Instance Creation, Migration.
8. Experiment VPC in EC2 Instances.
9. Create the Load balance in EC2.
10. Design and implementation the Web application and launch in AWS Server.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Configure various virtualization tools such as Virtual Box, VMware workstation.
2. Create and deploy a Virtual Machine in a Cloud environment.
3. Learn how to simulate a cloud environment to implement Load Balancer.
4. Install and use a generic cloud environment that can be used as a private cloud.
5. Design and develop a real-world application in EC2 AWS.

Text Books:

1. Rajkumar Buyya, James Broberg, Andrzej, M. Goscinski, Cloud Computing: Principles and Paradigms, Wiley, 1st Edition, 2013.
2. Marinescu, Dan C. Cloud Computing: Theory and Practice. Morgan Kaufmann, 2017.

Reference Books:

1. Buyya, Rajkumar, Christian Vecchiola, and S. Thamarai Selvi. Mastering Cloud Computing: Foundations and Applications Programming, Tata Mcgraw Hill, 1st Edition, 2017.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, Mc Graw Hill Education, 1st Edition, 2017.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech III Year II Semester

20CSC212 CRYPTOGRAPHY LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite 20CSC206, 20CSC209

Course Description:

We cover in this course principles and practice of cryptography and network security: classical systems, symmetric block ciphers (DES, AES, other contemporary symmetric ciphers), linear and differential cryptanalysis, perfect secrecy, public-key cryptography (RSA, discrete logarithms), algorithms for factoring and discrete logarithms, cryptographic protocols, hash functions, authentication, key management, key exchange, signature schemes, email and web security, viruses, firewalls, digital right management, and other topics.

Course Objectives:

After successfully completing the course the student should be able to

1. Understand the fundamental principles of access control models and techniques, authentication and secure system design.
2. Have a strong understanding and describe of different cryptographic protocols and techniques be able to use them.
3. Become knowledgeable in various methods and protocols to maintain E-mail security, and web security.
4. Analyze & develop methods for authentication, access control, intrusion detection and prevention.
5. Identify and mitigate software security vulnerabilities in existing systems.

List of Programs

1. Write a Java program to perform encryption and decryption using the following Algorithms:
   a. Ceaser cipher b. Substitution cipher c. Hill Cipher
2. Write a C/JAVA program to implement the DES algorithm logic.
3. Write a Java program to implement RSA algorithm.
4. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.
5. Implement message authentication MAC algorithms.
6. Implement message authentication HASH algorithms.
7. Write a program to calculate the message digest of a text using the SHA-1 algorithm in JAVA
8. Write a program to calculate the message digest of a text using the MD5 algorithm in JAVA.
9. Send and receive an encrypted email message using S/MIME.
10. Explore and study any Network Intrusion Detection Tool used to detect network attacks.

Course Outcomes:

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

1. Understand the basic definitions and concepts of the information security.
2. Analyze & differentiate between several types of security schemes.
3. Design & develop information security schemes.
4. Identify the threats.
5. Implement security schemes to protect information system resources.

Text Books:

1. Stallings, W.Cryptography and Network Security: Principles and Practice, 5th ed., Prentice Hall PTR,2011.
2. Cryptography and Network Security; 2nd ed., Behrouz A. Forouzan, Debdeep Mukhopadhyay, McGraw Hill 2011.

Reference Books:

1. AtulKahate, Cryptography and Network Security, 2nd ed., Tata McGraw Hill education Private Limited, 2011.
2. Computer Security, Dieter Gollman,3rded, Wiley Publications,2011.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

B. Tech III Year II Semester

20CSC213 AI TOOLS, TECHNIQUES AND APPLICATIONS LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite -NIL-

Course Description:

This course introduces the concepts of performing data labelling, building custom models, object recognition, speech recognition, building chatbot, configuring neural network, building virtual assistant, and building convolutional neural network.

Course Objectives:

The objectives of this course are to

1. Perform data labelling
2. Develop custom models for object recognition
3. Build chatbot.
4. Configure neural network.

List of Programs:

1. Implement simple linear regression to predict profits for a food truck based on the population of the city that the truck would be placed in.
2. Build a classification model that estimates the probability of admission based on the exam scores using logistic regression
3. Implement un-regularized and regularized versions of the neural network cost function and compute gradients via the backpropagation algorithm.
4. Implement an anomaly detection algorithm using a Gaussian model and apply it to detect failing servers on a network.
5. Supervisely - Perform Data Labelling for various images using object recognition
6. Lobe.ai - Build custom models using the visual tool for Object recognition and sentiment analysis that can convert facial expressions into emoticons
7. Teachable Machine - In Browser Object Recognition through Brain.JS
8. Liv.ai - App for Speech recognition and Synthesis through APIs
9. Building a Chatbot using AWS Lex, Pandora bots
10. Configure an existing Neural Network by manipulating various parameters involved
11. Build a virtual assistant for Wikipedia using Wolfram Alpha and Python
12. Build a Convolutional Neural Network for Cat vs Dog Image Classification

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Label the data based on object recognition
2. Develop virtual assistant using speech recognition
3. Develop Chatbots based on the user requirements
4. Design and configure Neural Networks for various real world applications
5. Create convolution neural network model for image classification Implement exceptions and triggers to solve the real time problems.

Text Books:

1. Tom Markiewicz & Josh Zheng,Getting started with Artificial Intelligence,Published by O'Reilly Media,2017
2. Programming collective Intelligence: Building Smart Web 2.0 Applications-Toby Segaran

Reference Books

1. Aurélien Géron,Hands on Machine Learning with Scikit-Learn and TensorFlow [Concepts, Tools, and Techniques to Build Intelligent Systems], Published by O'Reilly Media,2017
2. Machine Learning with Python, Abhishek Vijayvargia, BPB publications

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

Mandatory Course
B. Tech III Year I Semester

20HUM902[**]/20HUM102[#] UNIVERSAL HUMAN VALUES

L	T	P	C
2[**]/3[#]	0	0	0[**]/3[#]

Pre-requisite None.

Course Description:

This course discusses students' role in their family and briefly touches issues related to their role in the society and the nature.

Course Objectives:

This course enables students to

1. Understand Happiness and Prosperity correctly and basic Human Aspirations
2. Able to self-verify the Harmony in the Human Being
3. Visualize a universal harmonious order in society which leads to Undivided Society at Universal Order- from family to world family.
4. Understanding Harmony in the Nature and Existence - Whole existence as Coexistence
5. Implicate the UHV in professional ethics.

UNIT I The Process for Value Education - Basic Human Aspirations 8 hours

L1: Purpose and motivation for the course, recapitulation from Universal Human Values-I

L2: Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration

L3: Continuous Happiness and Prosperity- A look at basic Human Aspirations

L4: Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority

L5: Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario

L6: Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

T1 & T2: Discussion on natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

UNIT II Understanding Harmony in the Human Being - Harmony in Myself! 8 hours

L7: Understanding human being as a co-existence of the sentient 'I' and the material 'Body'

L8: Understanding the needs of Self ('I') and 'Body' - happiness and physical facility

L9: Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)

L10: Understanding the characteristics and activities of 'I' and harmony in 'I'

L11: Understanding the harmony of I with the Body: Self-regulation and Health; correct appraisal of Physical needs, meaning of Prosperity in detail.

L12: Programs to ensure Self-regulation and Health.

T3 & T4: Discussion on the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

UNIT III Understanding Harmony in the Family and Society 7 hours

L13: Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship

L14: Understanding the meaning of Trust; Difference between intention and competence

L15: Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship

L16: Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals

L17: Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

T5 & T6: Reflection on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

UNIT IV Understanding Harmony in the Nature and Existence 6 hours

L18: Understanding the harmony in the Nature

L19: Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self- regulation in nature

L20: Understanding Existence as Co-existence of mutually interacting units in all-pervasive space

L21: Holistic perception of harmony at all levels of existence.

T7 & T8: Discussion on human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT V Implications of Holistic Understanding of Harmony on Professional Ethics 11 hours

L22: Natural acceptance of human values

L23: Definitiveness of Ethical Human Conduct

L24: Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

L25; Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

L26: Case studies of typical holistic technologies, management models and production systems

L27: Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations

L28: Sum up.

T9-T14: Exercises and Case Studies For e.g. Individual discussion on the conduct as an engineer or scientist etc.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Understood the natural acceptance in human being as the innate acceptance,
2. More aware of themselves,
3. Maintain harmony with family and society by recognizing Harmony in Human-Human Relationship,

4. Try to get Harmony in the Nature and Existence by realizing existence as Coexistence
5. More responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind with better critical ability.

Text Book(s)

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

3. The Story of Stuff (Book).

4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

Mode of Evaluation: Assignment / Quiz, Classroom participation, Mini project / Report, Internal Mid Examination and external semester end examination.

Open Elective – II

B. Tech Computer Science and Engineering (Cyber Security)

Open Elective - II

20MAT301 ADVANCED NUMERICAL METHODS

L	T	P	C
3	0	0	3

Pre-requisite: 20MAT101, 20MAT107, 20MAT110

Course Description:
This course reviews and continues the study of computational techniques for evaluating interpolations, derivatives and integrals; solving system of algebraic equations, transcendental equations, ordinary differential equations and partial differential equations. The course emphasizes on numerical and mathematical methods of solutions with appropriate error analysis. The students use MATLAB as the computer language to obtain solutions to a few assigned problems.

Course Objectives:

6. To introduce computation methods of solving algebraic and transcendental equations.
7. To avail the basics of numerical techniques for solving the system of linear equations
8. To familiarize the knowledge of interpolation and numerical calculus.
9. To use numerical calculus for solving ordinary differential equations.
10. To introduce the computational techniques for solving partial differential equations.

UNIT I SOLUTIONS OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS **9 hours**

Introduction to MATLAB, errors, sources of errors, floating point arithmetic, significant digits, relative error, propagation of errors, how to avoid loss of significant digits, evaluation of polynomial - Bisection method, False-position method, Secant method, Fixed-point iteration method, Newton's method – single and multiple roots, Order of convergence of the methods.
Exercises of Bisection method and Newton's method through MATLAB

UNIT II SOLUTIONS OF SYSTEM OF ALGEBRAIC EQUATIONS **9 hours**

Gaussian Elimination, LU decomposition, Thomas algorithm for the tridiagonal systems, Norms-Euclidean, mini-maxi, Frobenius and 1-,2- and ∞-norms, Condition numbers and errors in computed solutions. Jacobi's method, Gauss-Seidel method, Power method for obtaining eigenvalues and eigenvectors of matrices.Exercises of Gaussian Elimination and Gauss-Seidel method through MATLAB

UNIT III INTERPOLATION & NUMERICAL CALCULUS **9 hours**

Existence and Uniqueness of interpolating polynomial, Lagrange polynomials, Divided differences, Evenly spaced points, Error of interpolation, cubic spline, Inverse interpolation, Derivatives from difference table, Higher order derivatives, Trapezoidal rule, Simpsons rule, a composite formula, Gaussian Quadrature - Exercises of Divided differences and Simpson's rule through MATLAB

UNIT IV NUMERICAL SOLUTIONS TO ORDINARY DIFFERENTIAL EQUATIONS **9 hours**

Taylor series method, Euler and Modified Euler's method, Runge-Kutta methods for initial value problems, Shooting method, Finite difference method for boundary value problems.
Exercises of Runge-Kutta method and Shooting method through MATLAB.

UNIT V NUMERICAL SOLUTION TO PARTIAL DIFFERENTIAL EQUATIONS **9 hours**

Finite difference methods for one-dimensional Wave and Heat equations; Laplace and Poisson equations (five-point formula) - Exercises of Finite difference method (forward, central and backward differentiation) and Crank-Nicolson method through MATLAB

Course Outcomes:

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

6. Solve the system of algebraic and transcendental equations.
7. Apply the numerical techniques to find the solution to system of equations.
8. Calculate and analyze the rate of variations and numerical sum of such changes using numerical calculus relevant to the field of Engineering.
9. Find the accurate numerical solutions to ordinary differential equations representing some Engineering problems.
10. Compute the solutions for engineering problems represented by partial differential equations.

Text Books:

1. Curtis F. Gerald, Patrich O. Wheatley, Applied Numerical Analysis, Pearson Education, 7th Edition, 2003.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, 43rd edition (2014), Khanna publishers.
2. Burden and Faires, Numerical Analysis 7th ed., Thomson Learning, 2001.
3. Advanced Engineering Mathematics by E. Kreyszig, 10th ed., Wiley, 2010.
4. Applied Numerical Methods with MATLAB for Engineers and Scientists by Steven C. Chapra, 3rd ed., Mc Graw Hill, 2012.
5. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering, New Age International Ltd., 5th Edition, 2010.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

Open Elective - II

20MAT302 ENGINEERING OPTIMIZATION

L	T	P	C
3	0	0	3

Pre-requisite: 20MAT101, 20MAT106, 20MAT104, 20MAT108, 20MAT109, 20MAT110.

Course Description:
Unconstrained and constrained optimization, Linear programming problem, transportation and assignment problems, dynamic programming problem, project management and queuing models.

Course Objectives:
1. Understand the optimization techniques for solving engineering problems.
2. Formulate and solve linear programming problem.
3. Obtain the optimal solution for transportation and assignment problems.
4. Avail knowledge to solve dynamic programming problem using recursive relations.
5. Analyze the techniques of project management and queuing models.

UNIT I CLASSICAL OPTIMIZATION 9 hours

Introduction to optimization, unconstrained optimization with single variable and multi variable. Constrained multivariable optimization with equality constraints- Lagrange multipliers method, constrained multivariable optimization with inequality constraints - Kuhn-Tucker conditions.

UNIT II LINEAR PROGRAMMING PROBLEM 9 hours

Linear Programming Problem (LPP), Mathematical formulation, graphical solution, simplex method. Artificial variable technique - Big M-method and two phase simplex method. Duality, dual Simplex method.

UNIT III TRANSPORTATION PROBLEM AND ASSIGNMENT PROBLEM 9 hours

Transportation problem: definition and algorithm, transshipment problem. Assignment problem, travelling salesman problem.

UNIT IV DYNAMIC PROGRAMMING 9 hours

Introduction, developing optimal decision policy, Dynamic Programming Problem (DPP) under certainty, DPP approach for solving LPP.

UNIT V PROJECT MANAGEMENT AND QUEUING MODELS 9 hours

Network analysis: Network representation, Critical Path Method (CPM) and Project Evolutionary and Review Technique (PERT). Introduction to queuing system, single server queuing models (M/M/1) :(∞/FCFS), (M/M/1): (N/FCFS).

Course Outcomes:

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

1. Understood the importance of unconstrained and constrained optimization to solve engineering problems.
2. Get an idea about the linear programming techniques.
3. Solve transportation and assignment problems in engineering situations.
4. Apply the Bellman principle of optimality to solve dynamic programming problem.
5. Analyze the problems of network analysis for project management and Queuing systems engineering & industry.

Text Books:

1. J K Sharma, Operations Research: Theory and Practice, Macmillan Publishers India Ltd, 5th edition,2013.
2. B.S. Grewal, Higher Engineering Mathematics, 43rd edition (2014), Khanna publishers.

Reference Books

1. Hamdy A Taha, Operations Research: An Introduction, Pearson Education, 9/E, 2011.
2. FS Hillier and GJ Lieberman, Introduction to Operations Research, TMH, 8/E, 2006.
3. JC Pant, Introduction to Optimization: Operations Research, Jain Brothers, New, 6/E, 2004.
4. A Ravindran, DT Philips and JJ Solberg, Operations Research: Principles and Practice, John Wiley& Sons, Singapore, 2nd edition.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

Open Elective - II

20PHY301 OPTICAL PHYSICS AND ITS APPLICATIONS

L	T	P	C
3	0	0	3

Pre-requisite: None

Course Description:
The course will cover Geometrical optics, Aberrations, Physical Optics, Diffraction and Optical fibers.

Course Objectives:
Students will

1. Knowledge of basic principles and concepts in optics and the techniques used to deal with them.
2. Explain the limitations associated with spherical and chromatic aberration
3. Describe optical systems such as microscopes and telescopes with reference to parameters such as angular magnification and depth of field
4. Provide students with a working knowledge of optical physics, including interference, diffraction and physical optics.
5. Introduce construction and concepts of basic fiber optic communication system and to make the students learn about its important applications for societal needs.

UNIT I INTRODUCTION 9 hours

Corpuscular and wave theory, Fermat's principle, Matrices for translation, refraction and reflection, Unit and nodal planes, Eigenvalues and Eigenvectors.

UNIT II ABERRATIONS AND OPTICAL INSTRUMENTS 9 hours

Types of aberrations, Chromatic and monochromatic aberrations. Different types of monochromatic aberrations. Simple and Compound microscopes, Astronomical and Terrestrial telescopes. Ramsden's and Huygens' eye pieces.

UNIT III WAVE OPTICS & INTERFERENCE 9 hours

Huygens's principle, Superposition of waves, Fourier transforms, representation of slits and apertures, Two beam interference by Division of wave front. Applications of Interference, Nonlinear interaction of light with matter (self-study).

UNIT IV DIFFRACTION & POLARISATION 9 hours

Fraunhoffer diffraction, Diffraction from single slit, double slit & multiple slits, Fresnel half-period zones, Zone plate, Applications of diffraction, Polarization, Malus' law, double refraction. Applications of polarization.

UNIT V FIBER OPTICS 9 hours

Construction and working principle of optical fibers, Numerical aperture and acceptance angle, Types of optical fibers. Attenuation and losses in optical fibers, Analog and Digital optical fiber communication system. Applications of optical fibers in communications, sensors and medicine.

B. Tech Computer Science and Engineering (Cyber Security)

Course Outcomes:

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

1. Recollect the fundamental characteristics of light and their mathematical principles.
2. Learn the principles of superposition, Interference and Diffraction
3. Understand nonlinear optics and photonics phenomena.
4. Be exposed to the application of optical techniques in cutting edge research areas.
5. Describe the basic laser physics, working of lasers and principle of propagation of light in optical fibers.

Text Books:

1. Optics by Ghatak, 4th Edition, Tata McGraw Hill (2011).

Reference Books

1. Optics by Lipson, Lipson & Lipson, 4th Edition, Cambridge Univ Press (2010).
2. Optics by Hecht, 4th Edition, Addison-Wesley (2002).

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

Open Elective – II

20PHY302 LASER PHYSICS AND ADVANCED LASER TECHNOLOGY

L	T	P	C
3	0	0	3

Pre-requisite: Basic knowledge of atomic structure at intermediate (10+2) level is sufficient

Course Description:
Laser usage is rampant in various technological applications. Several fields gaining attention in the usage of lasers. This course covers the introduction to the theory and mechanism of laser action, various types of lasers and their applications and future use.

Course Objectives:
1. Make the student to understand the detailed principles of various lasers.
2. Profound understanding of different variety of lasers will provide them to think of superior selection and usage of lasers in practical technological applications.
3. Students are aware of latest developments in certain areas of Laser technology which have important applications for societal needs.
4. Explain how material processing is accomplished with lasers. Estimate laser operation parameters for material processing.
5. Exposure about Lasers applications in engineering, communications, spectroscopy and material process etc.

UNIT I INTRODUCTION TO LASER TECHNOLOGY 9 hours

Laser characteristics, The Einstein Coefficients, Absorption and Emission Cross Sections, Spontaneous and Stimulated emission of radiation, Population inversion, Methods of Population Inversion, Laser Rate Equations, stable two minor optical resonators, Mode selection, Gain in the regenerative laser cavity.

UNIT II GASES AND LIQUIDS LASING MEDIUM 9 hours

Energy levels & Radiative properties of Atoms and molecules; Atomic lasers: He-Ne laser, Argon Ion laser; Molecular Lasers: Carbon dioxide laser, Liquid energy levels and their radiative properties, Organic Dye laser.

UNIT III SOLID STATE LASERS 9 hours

Energy Levels in solids-dielectric medium, Solid-state lasing materials, Narrow line width laser materials, broad band line width laser materials, solid state lasers: Nd:YAG, Nd:YLF; Ti:Sapphire (introduction only)
Energy Levels in solids-semiconductor medium, direct and indirect band gap semiconductors, Semiconductor diode laser, Quantum dot lasers (Introduction only);

UNIT IV PULSED OPERATION OF LASERS 9 hours

Nanosecond: Q-Switching, Techniques of Q-Switching: electro-optic, Acousto-Optic.

Femtosecond: Relationship between pulse duration and Spectral Width, Passive mode-locking, Active mode locking, Kerr lens mode locking, Amplification of femtosecond pulses.

UNIT V LASER APPLICATIONS 9 hours

Laser processing of materials: laser cutting, laser drilling, welding; Lasers in metrology- Accurate measurement of length, light wave communications; Laser spectroscopy: Laser fluorescence and Raman scattering.

Course Outcomes:

Upon completion of this course the students shall be able to:

1. Understand the principle of phenomenon of laser and identify the operating principle involved in various type of lasers.
2. Estimate stability requirements in producing laser light by different types of sources
3. Differentiate or list the various types of lasers and their means of excitation.
4. Assess (Identify) which laser would best meet the need for a particular industrial or research task.
5. Student can knowledge of latest technological developments in laser technology. Femtosecond laser etc.

Text Books:

1. Laser Fundamentals: William T Silfvast. Cambridge Publication.
2. Laser Theory and Applications: A.K. Ghatak and K. Thyagarajan, Springer
3. Femtosecond Laser Pulses Principles and Experiments: Claude Rulli`ere, Springer
4. Principles of Laser: O. Svelto
5. Laser Physics: Peter W Miloni, Joseph H Eberly.

Reference Books

1. Solid State Laser Engineering: Walter Koechner. Springer series in optical sciences.
2. Ultrafast Optics, Andrew M. Weiner
3. Laser spectroscopy: Demtroder
4. Laser Applications: Monte Ross

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

Open Elective - II

20CHE301 INTRODUCTION TO PETROLEUM INDUSTRY

L	T	P	C
3	0	0	3

Pre-requisite: Basic Chemistry at Intermediate or equivalent level.

Course Description:
It deals with basic principles of petroleum engineering and the processes involved in petroleum industry.

Course Objectives:
Students will

1. To understand the basic concepts of crude oil, distillation process, internals, petroleum products and their properties, Instruments used for fuel testing.
2. To understand the type of chemicals and their application in petroleum industry.
3. To introduce the basic principles of hydroprocessing and fluid catalytic cracking and familiarize the processes involved there.
4. To familiarize the basic concepts of catalysis, bioprocesses in the refinery.
5. Health, environment, process safety and management in petroleum companies.

UNIT I BASIC PROCESSES IN PETROLEUM REFINING AND FUEL TESTING — 9 hours

Source of Crude oils and types, Overview of refinery process, Atmospheric Distillation, Vacuum distillation, Desalter, Desulphurization, Cracking, catalysis, Effluent treatment plant. Density, viscosity, pour point, flashpoint, octane number, cetane number, Fire point, Chromatography, Ductility, Water content, Sulphur analysis, MCRT, SARA, HFRR, calorofic value etc.

UNIT II CHEMICALS AND THEIR IMPORTANCE IN PETROLEUM INDUSTRY — 9 hours

Types of products in the refinery and their structural properties, Netralizing amines, Corrosion inhibitors, Multifunctional additives, viscosity improvers, drag reducing agents, antioxidants, Lubricity improvers, Antifoam additives, Oil spill absorbers, Dispersants and their applications, Types of Catalysts used in the refinery, Chemicals for ETP plant.

UNIT III ROLE OF HYDROPROCESSING AND FLUID CATALYTIC CRACKING IN PETROLEUM INDUSTRY — 9 hours

Objectives, Hydrocracking Reactions, Hydrocracking feedstocks, Modes of Hydrocracking, Effects of process variables, Hydro treating process and catalysts Resid hydro processing, FCC Cracking, Catalyst coking and regeneration, Design concepts, New Designs for Fluidized-Bed Catalytic Cracking Units

UNIT IV ROLE OF CATALYSTS, BIOPROCESSES IN PETROLEUM INDUSTRY — 9 hours

Types of catalyst and their importance, Design of catalyst, selection of catalyst, Catalytic processes. Introduction to biotechnology, oil recovery from reservoirs, refining of petroleum using biodesulphurisation, Bioremediation, commercial processes for bioethanol, propanol.

UNIT V HEALTH, ENVIRONMENT, PROCESS SAFETY AND MANAGEMENT IN PETROLEUM INDUSTRY **9 hours**

Safety policy, Personal protective equipment, Different type of extinguishers, Types of gloves and their application, Hydrants and their role, Safety indicators, Safety contact, Environmental pollution, precaution and first aid, precautions safety, Occupational safety and management, different elements and their role.

Course Outcomes:

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

1. Be able to understand the overview of petroleum industry
2. Be able to understand the concepts of crude oil, types of crude oils, properties of fuels such as octane number, cetane number, viscosity, density etc. Instruments.
3. Be familiarized with importance and their use of chemicals involved in the petroleum industry.
4. Be familiarized with the processes involved in hydroprocessing and fluid catalytic cracking.
5. Be familiarized the types of catalysts and bioprocesses in the petroleum industry.
6. Understanding the PPE, different types of extinguishers, First aid, process safety and management in the petroleum industry.

Text Books:

1. Mohamed A. Fahim, Taher A. Al-Sahhaf, Amal Elkilani, Fundamentals of Petroleum Refining, Elsevier,2009
2. David T Day, Handbook of the Petroleum Industry, Volume 1, ISBN: 137595962X, CHIZINE PUBN, 2017
3. S. P. Srivastava Jenő Hancsók, *Fuels and fuel additives*, Wiley VCH Verlag Gmbh & Co, Weinheim, 2004.
4. Robert O. Anderson, *Fundamentals of the Petroleum Industry*–University of Oklahoma Pres, 1987.
5. James G.Speight, *Handbook of Petroleum Product Analysis*, John Wiley & Sons, Inc, 2015
6. Physical Chemistry by G.W. Castellan (Addison Wesley Publishing Company)

Reference Books

1. Sankara Papavinasam, Corrosion Control in the Oil and Gas Industry, Elsevier, 2013
2. Petroleum Engineering Handbook (Vol. 1 through VIII). Editor in Chief: Larry W. Lake, Society of Petroleum Engineers.
3. Srinivasan Chandrasekaran. Health, safety and Environmental Management for offshore and Petroleum Engineers, John Wiley and Sons, U.K., ISBN: 978-11-192-2184-5, 2016.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

Open Elective – II

20CHE302 GREEN CHEMISTRY AND CATALYSIS FOR SUSTAINABLE ENVIRONMENT

L	T	P	C
3	0	0	3

Pre-requisite: Basic Chemistry at Intermediate or equivalent level.

Course Description:

This course aims to introduce the interdisciplinary concept for engineering's to enhance their knowledge that they need to contribute with relevance and confidence in developing green technologies. This course covers feedstocks, green metrics and the design of safer, more efficient processes, as well as the role catalysts and solvents and green processes for Nanoscience.

Course Objectives:

Students will

1. Learn an interdisciplinary approach to the scientific and societal issues arising from industrial chemical production, including the facets of chemistry and environmental health sciences that can be integrated to promote green chemistry
2. Sensitize the students in redesigning of chemicals, industrial processes and products by means of catalysis.
3. Understand the use of alternatives assessments in using environmentally benign solvents.
4. Emphasize current emerging greener technologies and the need of alternative energies.
5. Learn to adopt green chemistry principles in practicing Nanoscience.

UNIT I PRINCIPLES AND CONCEPTS OF GREEN CHEMISTRY 9 hours

Introduction, Green chemistry Principles, sustainable development and green chemistry, atom economy, atom economic: Rearrangement and addition reactions and un-economic reactions: Substitution, elimination and Wittig reactions, Reducing Toxicity. Waste - problems and Prevention: Design for degradation.

UNIT II CATALYSIS AND GREEN CHEMISTRY 9 hours

Introduction to catalysis, Heterogeneous catalysts: Basics of Heterogeneous Catalysis, Zeolites: Catalytic cracking, ZSM-5 catalyst and high silica zeolites, TS1 Oxidation catalyst, Catalytic Converters, Homogeneous catalysis: Hydrogenation of alkenes using wilkinson's catalyst, Phase transfer catalysis: Hazard Reduction, C–C Bond Formation, Oxidation Using Hydrogen Peroxide.

UNIT III ORGANIC SOLVENTS: ENVIRONMENTALLY BENIGN SOLUTIONS 9 hours

Organic solvents and volatile organic compounds, solvent free systems, supercritical fluids: Super critical carbondioxide, super critical water and water as a reaction solvent: water based coatings, Ionic liquids as catalyst and solvent.

UNIT IV EMERGING GREENER TECHNOLOGIES AND ALTERNATIVE ENERGY SOURCES 9 hours

Biomass as renewable resource, Energy: Fossil Fuels, Energy from Biomass, Solar Power, Fuel Cells(Hydrogen—oxygen fuel cell), Photochemical Reactions: Advantages of and Challenges Faced by Photochemical Processes, Examples of Photochemical Reactions(caprolactum), Chemistry Using Microwaves: Microwave Heating, Microwave-assisted Reactions, Sonochemistry.

UNIT V GREEN PROCESSES FOR GREEN NANOSCIENCE 9 hours

Introduction and traditional methods in the nanomaterials synthesis, Translating green chemistry principles for practicing Green Nanoscience. Green Synthesis of Nanophase Inorganic Materials and Metal Oxide Nanoparticles: Hydrothermal Synthesis, Reflux Synthesis, Microwave-Assisted Synthesis, Other methods for Green synthesis of metal and metal oxide nanoparticles, Green chemistry applications of Inorganic nanomaterials

Course Outcomes:

Upon completion of this course the students should:

1. Recognize green chemistry concepts and apply these ideas to develop respect for the interconnectedness of our world and an ethic of environmental care and sustainability.
2. Understand and apply catalysis for developing eco-friendly processes.
3. Be in a position to use environmental benign solvents where ever possible.
4. Have knowledge of current trends in alternative energy sources.
5. Apply green chemistry principles in practicing green Nanoscience.

Text Books:

1. M. Lancaster, Green Chemistry an introductory text, Royal Society of Chemistry, 2002.

2. Paul T. Anastas and John C. Warner, Green Chemistry Theory and Practice, 4th Edition, Oxford University Press, USA

Reference Books

1. Edited by Alvise Perosa and Maurizio Selva , Hand Book of Green chemistry Volume 8: Green Nanoscience, wiley-VCH

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

Open Elective – II

20CE301 GROUND IMPROVEMENT TECHNIQUES

L	T	P	C
3	0	0	3

Pre-requisite: None

Course Description:
Identification of problematic soils; ground improvement techniques; densification in granular soils; densification in cohesive soils; soil stabilization; confinement; reinforced earth; geo-synthetics; improvement of expansive soils.

Course Objectives:
Students will

1. To introduce engineering properties of soft, weak and compressible deposits, principles of treatment for granular and cohesive soils and various stabilization techniques.
2. To bring out concepts of reinforced earth.
3. Applications of geotextiles in various civil engineering projects.

UNIT I DEWATERING & GROUTINHG — 9 hours

Introduction- Need for engineered ground improvement, classification of ground modification techniques; suitability, feasibility and desirability of ground improvement technique.
Methods of de-watering- sumps and interceptor ditches- wells- drains- Electro- osmosis. Objectives of grouting- grouts and their properties-grouting methods.

UNIT II DENSIFICATION — 9 hours

In - situ densification methods in cohesionless Soils: - Vibration at the ground surface, Impact at the Ground Surface, Vibration at depth, Impact at depth. In - situ densification methods in cohesive soils: - preloading or dewatering, Vertical drains - Sand Drains- Sand wick geo-drains
- Stone and lime columns - thermal methods.

UNIT III STABILIZATION — 9 hours

Methods of stabilization-mechanical-cement- lime-bituminous-chemical stabilization with calcium chloride- sodium silicate and gypsum.

UNIT IV REINFORCED EARTH & GEOSYNTHETICS — 9 hours

Principles - Components of reinforced earth - factors governing design of reinforced earth walls design principles of reinforced earth walls. Geotextiles- Types, Functions and applications - geo- grids and geo-membranes - functions and applications.

UNIT V EXPANSIVE SOILS — 9 hours

Problems of expansive soils - tests for identification - methods of determination of swell pressure. Improvement of expansive soils - Foundation techniques in expansive soils - under reamedpiles.

Course Outcomes:

After successful completion of the course, student will be able to

1. Evaluate basic deficiencies of various soil deposits and able to decide various dewatering methods to improve the soil.
2. Implement different techniques of soil densification.
3. Choose the best method for stabilizing the soil for a given soil condition.
4. Choose-the best geosynthetic materials in different engineering applications.
5. Assessing various types of foundation techniques and methods to control swelling of soil

Text Books:

1. Dr. Purushotham Raj, P., Ground Improvement Techniques, Laxmi Publications, New Delhi.

2. Dr. Sivakumar Babu, GL, An Introduction to Soil Reinforcement & Geosynthetics, Universities Press

Reference Books

1. Hausmann M.R., Engineering Principles of Ground Modification, McGraw-Hill International Edition, 1990.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

Open Elective – II

20CE302 ENVIRONMENTAL IMPACT ASSESSMENT

L	T	P	C
3	0	0	3

Pre-requisite: None

Course Description:
The course will focus on Basic concept of Environmental Impact Assessment (EIA), EIA Methodologies, Impact of Developmental Activities and Land use in soil, water, and vegetation, Environmental Audit, Post Audit activities, The Environmental pollution Acts.

Course Objectives:
Students will
1. To impart knowledge on Environmental management and Environmental Impact Assessment.
2. To give the student the brief knowledge about various legislations and audit protocols.
3. To give student knowledge about the framing of environmental audit through case studies.

UNIT I CONCEPTS AND METHODOLOGIES IN EIA 9 hours

Introduction - Elements of EIA - Factor affecting EIA -Impact evaluation and analysis - Preparation of Environmental Base map - Classification of environmental parameters. Criteria for the selection of EIA Methodology - EIA methods: Ad-hoc methods - matrix methods - Network method - Environmental Media Quality Index Method -overlay methods - cost/benefit Analysis.

UNIT II IMPACT OF DEVELOPMENTAL ACTIVITIES 9 hours

Introduction and Methodology for the assessment of soil and ground water - Delineation of study area - Identification of actives. Procurement of relevant soil quality - Impact prediction - Assessment of Impact significance -Identification and Incorporation of mitigation measures. EIA in surface water - Air and Biological environment.

UNIT III IMPACT ON VEGETATION AND WILD LIFE 9 hours

Assessment of Impact of development Activities on Vegetation and wildlife - environmental Impact of Deforestation - Causes and effects of deforestation.

UNIT IV ENVIRONMENTAL AUDIT 9 hours

Environmental Audit & Environmental legislation objectives of Environmental Audit - Types of environmental Audit - Audit protocol - stages of Environmental Audit - onsite activities - evaluation of audit data and preparation of audit report - Post Audit activities.

UNIT V ENVIRONMENTAL POLLUTION ACTS 9 hours

The water Act-1974 - The Air Act-1981 (Prevention & Control of pollution Act.) - Wild life Act- 1972 - Indian Forest Conservation Act-1980 -National Green Tribunal Act –2010 - Biological Diversity Act-2002.

Course Outcomes:

The students after completing the course will be able to:

1. Apply the various methods used in predicting environmental impacts.
2. Apply site information to interpret impacts on land and groundwater.
3. Evaluate environmental impacts of various development activities on existing ecosystem.
4. Apply the procedures and various protocols involved in preparation of environmental audit report.
5. Apply the implications of environmental prevention and protection acts in relation to environmental impact assessment.

Text Books:

1. Anjaneyulu, Y., Environmental Impact Assessment Methodologies, B.S. Publication, Sultan Bazar, Kakinada.

Reference Books

1. Glynn, J. and Gary W. Hein Ke., Environmental Science and Engineering, Prentice Hall Publishers
2. Suresh K. Dhaneja Environmental Science and Engineering, S.K., Katania& Sons Publication, New Delhi.
3. Dr. Bhatia, H.S., Environmental Pollution and Control, Galgotia Publication (P) Ltd, Delhi.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

Open Elective – II

20CE303 WATERSHED MANAGEMENT

L	T	P	C
3	0	0	3

Pre-requisite: None

Course Description:
Topic covers basic concepts of watershed, sustainable watershed management approached and practices, integrated watershed management and modelling, social aspect in watershed management, quantification of water quality and quantity at the catchment outlet using modern techniques, drought, flood and storm management at catchment scale.

Course Objectives:
1. To discuss various aspects of water resources development and management on watershed basis.
2. To proliferate the sustainable use and development of natural resources.
3. To enrich the students for change in the hydrological fluxes due altered physiographic condition (land use or elevation) on a watershed scale.
4. To improve the quantitative problem solving skills of the students for natural resources management .

UNIT I CONCEPT OF WATERSHED 9 hours

Concept of watershed - classification of watershed - introduction to watershed management - objective of watershed development - Hydrological cycle - water balance equation - different stakeholders and their relative importance - watershed management policies and decision making. Factor Affecting Watershed Development**:** Morphological characteristics: linear - Arial and Relief aspect - land use - vegetation - soil and geological characteristics - Hydrology and geology and socio-economic characteristics.

UNIT II WATERSHED MODELING 9 hours

Watershed delineation - modelling of rainfall - runoff process - Concept of integrated watershed management conjunctive use of water resources - Integrated water resources management. PRA - Private sector participation - Institutional issues - Socio- economy issues - Integrated development - Water legislation and implementations - Tools and emerging technologies for watershed management and planning.

UNIT III EROSION AND SEDIMENTATION 9 hours

Types of erosion - factor affecting erosion - effect of erosion on land fertility and capacity - estimation of soil loss due to erosion: universal soil loss equation - Prevention And Control To Erosion: contour techniques - ploughing - furrowing- trenching - bunding - terracing - gully control - rockfill dams - check dams - brushwood dam - Gabion structure.

UNIT IV WATER HARVESTING 9 hours

Rain water harvesting - catchment harvesting - harvesting structures - soil moisture conservation - check dams - artificial recharge from pond - percolation tanks - Flood And Drought Management: Definition of flood - Flood frequency analysis: Weibul - Gumbel - and log Pearson methods - Definition and classification of drought - drought analysis techniques - drought mitigation planning - Management Of Water Quality: Water quality and pollution - types and Sources of pollution - water quality modelling- environmental guidelines for water quality.

UNIT V COVER MANAGEMENT 9 hours

Land use land cover change estimation through satellite imageries - land capability classification - management of forest - agricultural - grassland and wild land - Reclamation of saline and alkaline soil. Classification of columns based on slenderness ratio - reinforcement & loading - Design of rectangular and circular columns subjected to axial load - (axial load + uni-axial bending) and (axial load + bi-axial bending). Different Types of Footings - Design of isolated - square - rectangular and circular footings. Integrated Cropping System For Watersheds: Intercropping - mix cropping strip and terrace cropping - sustainable agriculture - cover cropping (biomass conservation) - horticulture - dryland agriculture and afforestation.

Course Outcomes:

The students after completing the course will be able to:

1. Classify watershed and Identify factors to consider for watershed Development.
2. Apply the concepts of watershed development and planning
3. Evaluate the erosion rate and total amount of soil loss from a watershed
4. Select the flood and drought mitigation measures
5. Quantify the change in land use land/cover and its impact on hydrological processes.

Text Books:

1. Kenneth N. Brooks Peter F. Ffolliott Joseph A. Magner. Hydrology and the Management of Watersheds. A John Wiley & Sons, Inc., Publication (4th Edition)
2. VVN, Murthy. Land and Water Management- Kalyani Pblication

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

Open Elective – II

20ME301 MATERIAL SCIENCE FOR ENGINEERS

L	T	P	C
3	0	0	3

Pre-requisite: None

Course Objectives:

1. To understand the relation between structure and properties of metallic materials.
2. To understand the strengthening mechanism of metals
3. To comprehend the various electrical and electronic properties of materials.
4. To understand origins and various types of magnetism and its applications.
5. To comprehend the transmission of light in various solids and study of photonic behavior.

UNIT I STRUCTURE OF MATERIALS 9 hours

Introduction: Historical prospective - importance of materials - Classification of Materials and its Properties. Bonding in solids: bonding forces and energies - primary and secondary bonding. Crystallography and Metallic structures: Unit cell - Crystallographic directions and planes, FCC, BCC, HCP, SC and other structure – miller indices, Linear and planar densities - close- packed crystal structures. Packing of atoms in solids. Packing factor

UNIT II CRYSTAL IMPERFECTIONS AND DIFFUSION 9 hours

Crystal Imperfections: Types, Vacancies and interstitials, Dislocations, and grain boundaries. Diffusion: Fick's Law of diffusion – Diffusion mechanism – Steady state and non-steady state, factors affecting diffusion.

UNIT III ELECTRICAL PROPERTIES OF MATERIALS 9 hours

Introduction and Electrical Conduction: Ohm's Law, Electrical Conductivity, Electronic and Ionic Conduction - Energy Band Structures in Solids, Electron Mobility - Electrical Resistivity of Metals Semi conductivity: Intrinsic and Extrinsic Semiconduction - Temperature Dependence of Carrier Concentration, Factors that Affect Carrier Mobility, The Hall Effect, Semiconductor Devices. Conduction in Ionic Materials, Electrical Properties of Polymers. Dielectric Materials: Capacitance, Ferroelectric Materials, Piezoelectric Materials.

UNIT IV MAGNETIC PROPERTIES OF MATERIALS 9 hours

Introduction and Basic Concepts, Diamagnetism, Paramagnetism, Ferromagnetism, Anti ferromagnetism, Ferrimagnetism, Influence of Temperature on Magnetic Behavior, Domains and Hysteresis, Magnetic Anisotropy, Soft and Hard Magnetic Materials, Magnetic Storage, Superconductivity.

UNIT V PHOTONIC MATERIALS 9 hours

Introduction, Electronic Radiation in Vacuum; Reflection, Refraction, and absorption in materials; Absorption and Chemical Bonding: Color, X-Ray absorption, Photon absorption Devices - Photon Emission: X-Ray Emission, Emission of electromagnetic radiation and devices: LED's, OLEDs and LASERs. Optical Fibers in communication

B. Tech Computer Science and Engineering (Cyber Security)

Course Outcomes:

At the end of the course students will be able:

1. To develop deep knowledge of crystal structure and effect of structure on the properties of the materials
2. To demonstrate knowledge of various imperfections in crystal, and diffusion mechanism in materials
3. To explain the origins of various electronic and electrical properties in the materials
4. To understand the concept of magnetism, its origin and types, while choosing the right material for the given application
5. To summarize various optical properties of the material and light's transmission behavior

Text Books:

1. W. Callister, "Materials Science and Engineering", Wiley, 7th Edition, 2007.
2. Charles M. Gilmore, "Materials Science and Engineering Properties", Cengage Learning, SI Edition, 2016

Reference Books

1. Donald R. Askeland, Pradeep P. Phule, "The Science and Engineering of Materials", Cengage Learning, 5th Edition, 2006.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

Open Elective – II

20ME302 ELEMENTS OF MECHANICAL ENGINEERING

L	T	P	C
3	0	0	3

Pre-requisite: None

Course Objectives:

Students belonging to all branches of Engineering are made to learn following fundamental topics related to mechanical engineering:

1. To teach students the basic concepts of Thermodynamics.
2. To teach students the basic Classification and working principles of boilers and turbines.
3. To teach students about IC engines, Refrigeration, and Air-Conditioning systems.
4. To teach students about engineering materials and casting manufacturing processes.
5. To teach students and machines tools and manufacturing systems.

UNIT I THERMODYNAMICS 9 hours

Basic concepts of Thermodynamics: Introduction, Important terminologies used in thermodynamics, Specific heat capacity, First law of thermodynamics, Second law of thermodynamics, Reversible and irreversible processes, the Carnot cycle and the Clausius inequality.

UNIT II BOILERS, TURBINES AND PUMPS 9 hours

Boilers: Introduction to boilers, Classification of boilers, requirements of a good boiler, Cochran, Babcock, Locomotive, and Lancashire boilers.

Turbines: Hydraulic Turbines-Classification and specification, Principles, and operation of Pelton wheel turbine, Francis turbine, and Kaplan turbine (elementary treatment only).

Hydraulic Pumps: Introduction, Classification, and specification of pumps, reciprocating pump, and centrifugal pump.

UNIT III IC ENGINES AND REFRIGERATION SYSTEMS 9 hours

Internal Combustion Engines: Classification, I.C. Engines parts, 2 and 4 stroke petrol and 4-stroke diesel engines, Working principle of IC engines, Valve timing diagrams, Otto cycle, Diesel cycle, and Dual cycle. Refrigeration and Air conditioning Refrigeration – Introduction, Refrigerator, and Heat pump, Components of refrigeration system, Types of refrigeration system, and Type of refrigerants.

UNIT IV MATERIALS, CASTING AND TRANSMISSION 9 hours

Engineering Materials: Introduction, mechanical properties of engineering materials, mechanical testing of engineering materials, Impact test, and Classification of engineering materials.

Casting: Introduction to casting processes, Classification of casting processes, Sand casting, and special casting methods.

Power Transmission Devices: Introduction, belt drive, rope drive, Chain drive, Gear drive, Classification of gears.

UNIT V TOOLS AND MANUFACTURING SYSTEMS 9 hours

Machine Tools: Introduction, Mechanism of metal cutting, Geometry of single point cutting tool, Orthogonal and oblique metal cutting, Lathe, and Milling machines.

Manufacturing Systems Introduction, Computer Integrated Manufacturing, CAD/CAM, Numerical Control (NC), Computer Numerical Control, and Dynamics Numerical Control.

Course Outcomes:

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

1. State first, second and third law of thermodynamics.
2. Sketch components of boilers and turbines.
3. State working principle of IC engines and R& AC systems.
4. Fair understanding of application and usage of various engineering materials, Casting process, and different types of drives with applications.
5. Explain the role of Computers in manufacturing systems.

Text Books:

1. "Basic Mechanical Engineering" by Pravin Kumar, Pearson Edition ISBN: 9789332505759, 9789332505759.

Reference Books

1. George E Dieter, "Mechanical Metallurgy", 3rd Edition, McGraw Hill, 2017
2. S. Kalpakjian and S. R. Schmid, "Manufacturing Engg, and Technology", 7th Edition, Pearson, 2018
3. P K Nag, "Engineering Thermodynamics", 6th Edition, McGraw Hill, 2017

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

Open Elective – II

220EEE301 INDUSTRIAL ELECTRICAL SYSTEMS

L	T	P	C
3	0	0	3

Pre-requisite: 20EEE101

Course Description:
This course deals with basics of electrical wiring systems for residential, commercial and industrial consumers, and its representation with standard symbols and drawings, various components of industrial electrical systems and its sizing and control aspects of industrial electrical system using PLC and SCADA.

Course Objectives:
1. To understand the electrical wiring systems for residential, commercial and industrial consumers.
2. To learn the representation of systems with standard symbols and drawings.
3. To understand the various components of industrial electrical systems.
4. To analyze and select the proper size of several electrical system components.
5. To study the control aspects of industrial electrical system using PLC and SCADA

UNIT I ELECTRICAL SYSTEM COMPONENTS 9 hours

LT system wiring components, selection of cables, wires, switches, distribution box, metering system, Tariff structure, protection components- Fuse, MCB, MCCB, ELCB, inverse current characteristics, symbols, single line diagram (SLD) of a wiring system, Contactor, Isolator, Relays, MPCB, Electric shock and Electrical safety practices.

UNIT II RESIDENTIAL AND COMMERCIAL ELECTRICAL SYSTEMS 9 hours

Types of residential and commercial wiring systems, general rules and guidelines for installation, load calculation and sizing of wire, rating of main switch, distribution board and protection devices, earthing system calculations, requirements of commercial installation, deciding lighting scheme and number of lamps, earthing of commercial installation, selection and sizing of components.

UNIT III ILLUMINATION SYSTEMS 9 hours

Understanding various terms regarding light, lumen, intensity, candle power, lamp efficiency, specific consumption, glare, space to height ratio, waste light factor, depreciation factor, various illumination schemes, Incandescent lamps and modern luminaries like CFL, LED and their operation, energy saving in illumination systems, design of a lighting scheme for a residential and commercial premises, flood lighting.

UNIT IV INDUSTRIAL SUBSTATION SYSTEMS 9 hours

HT connection, industrial substation, Transformer selection, Industrial loads, motors, starting of motors, SLD, Cable and Switchgear selection, Lightning Protection, Earthing design, Power factor correction – kVAR calculations, type of compensation, Introduction to PCC, MCC panels. Specifications of LT Breakers, MCB and other LT panel components.

UNIT V INDUSTRIAL SYSTEM AUTOMATION 9 hours

DG Systems, UPS System, Electrical Systems for the elevators, Battery banks, Sizing the DG, UPS and Battery Banks, Selection of UPS and Battery Banks.

Study of basic PLC, Role of in automation, advantages of process automation, PLC based control system design, Panel Metering and Introduction to SCADA system for distribution automation.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Discuss the various component representation involved in the design of electrical wiring for Low Tension.
2. Understand the guidelines for wiring of household and commercial buildings.
3. Understand the various components of illumination in industrial electrical systems.
4. Select the proper size of various electrical system components required for designing different electrical wiring systems.
5. Understand the control aspects of industrial electrical system using PLC and SCADA.

Text Books:

1. S. L. Uppal and G. C. Garg, "Electrical Wiring, Estimating & Costing", Khanna publishers, 2008
2. K. B. Raina, "Electrical Design, Estimating & Costing", New age International, 2007.

Reference Books

1. S. Singh and R. D. Singh, "Electrical estimating and costing", Dhanpat Rai and Co., 1997.
2. H. Joshi, "Residential Commercial and Industrial Systems", McGraw Hill Education, 2008.
3. https://www.bis.gov.in/

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

Open Elective – II

20EEE302 INTRODUCTION TO MEMS

L	T	P	C
3	0	0	3

Pre-requisite: 20EEE101

Course Description:
This course describes about manufacturing, modeling and applications of MEMS.

Course Objectives:

1. To know the fundamentals of MEMS materials, their physical properties and Principles of operation of MEMS devices.
2. To know various MEMS microfabrication technologies.
3. To provide various MEMS technology for mechanical, optical, and chemical sensors and actuator

UNIT I INTRODUCTION **9 hours**

Overview – History and industry perspectives – Working principles – Mechanics and dynamics — Scaling law

UNIT II MICRO SENSORS & ACTUATORS **9 hours**

Micro sensors: Pressure sensors, accelerometers, gyroscopes-Micro actuators: comb drive actuators – Micro-electromechanical systems.

UNIT III MICRO MANUFACTURING **9 hours**

Materials for MEMS and Microsystems- Micro fabrication processes: Photolithography, Ion Implantation, Diffusion, Oxidation, Chemical Vapour Deposition- Physical Vapour Deposition, Micro manufacturing: Bulk micromachining, surface micromachining, LIGA Process- Packaging.

UNIT IV MODELING IN MEMS **9 hours**

Micro system design: Finite Element Methods-– Modeling of simulation – piezoelectric, Gyroscope

UNIT V MEMS APPLICATIONS **9 hours**

Micro fluids-sensors for turbulence measurement and control, micro-actuators for flow control, RFMEMS- filters, Oscillators and phase shifters, Optical MEMS, micro robotics – Case studies

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Explain the fundamentals of MEMS materials, their physical properties and Principles of operation of MEMS devices.
2. Analyze the Micro sensors and actuators and its fabrication.
3. Explain the materials for MEMS and Microsystems.
4. Design MEMS using microfabrication techniques.
5. Explain the advantages of MEMS technology for mechanical, optical, and chemical sensors and actuator

Text Books:

1. Chang Liu, 'Foundations of MEMS', Pearson Education Inc., 2006

2. G.K. Ananthsuresh et al ,'Micro and Smart Systems', Wiley, India, 2010

Reference Books

1. NadimMaluf, "An introduction to Micro electro mechanical system design", ArtechHouse, 2000.
2. Mohamed Gad-el-Hak, editor, "The MEMS Handbook", CRC press Baco Raton, 2000.
3. James J.Allen, micro electro mechanical system design, CRC Press published in 2005
4. Stephen D. Senturia, Microsystem Design, Kluwer Academic Publishers, 2001

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

Open Elective – II

20ECE301 BIO-MEDICAL ELECTRONICS

L	T	P	C
3	0	0	3

Pre-requisite: None

Course Description:
This course provides the fundamental knowledge on applications of electronics in bio-medical signal measurements and processing, bio-medical instrumentation and imaging techniques.

Course Objectives:
This course enables students to

1. Acquire the basic knowledge on human physiology and biological transducers.
2. Learn about bio-electrodes and bio-amplifiers used in bio-signal acquisition.
3. Understand the working principle of bio-medical measuring instruments.
4. Study various types of imaging techniques used in medicine.
5. Learn the applications of medical instrumentation in designing artificial medical aids

UNIT I HUMAN PHYSIOLOGY AND BIOMEDICAL TRANSDUCERS 9 hours

Introduction to human physiology - Biomedical transducers for measuring displacement, velocity, force, acceleration, potential, dissolved ions and gases.

UNIT II BIO-ELECTRODES AND AMPLIFIERS 9 hours

Introduction to bio-potential, Bio-electrodes, Typical waveforms and characteristics of ECG, EMG and EEG, Bio-potential amplifiers for ECG, EMG and EEG – Lead systems and recording methods.

UNIT III BIOMEDICAL MEASURING INSTRUMENTS 9 hours

Measurement of blood pressure and temperature, Blood flow meter, Cardiac output measurement, Respiratory measurement, Blood cell counter, Impedance plethysmography.

UNIT IV MEDICAL IMAGING 9 hours

X-ray, Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Nuclear imaging, Ultrasonic Imaging.

UNIT V PROSTHESES AND AIDS 9 hours

Pacemakers, Defibrillators, Heart-lung machine, Artificial kidney, Aids for the handicapped, Safety aspects

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Understand the applications of biological transducers in medical field.
2. Analyze the design of bio-electrodes and bio-amplifiers.
3. Apply suitable measuring instruments to measure various medical parameters.
4. Understand and test various imaging techniques used in bio-medical diagnosis.
5. Analyze the applications of artificial medical aids.

Text Books:

1. W.F. Ganong, Review of Medical Physiology, 26th Edition, Tata McGraw-Hill, New Delhi, 2019.

2. J.G. Websster, ed., Medical Instrumentation, 3rd Edition, Wiley India Pvt. Ltd. 2009

Reference Books

1. A.M. Cook and J.G. Webster, eds., Medical Devices and Human Engineering, Taylor & Francis, 2014
2. R.S.Khandpur,"Handbook of Biomedical Instrumentation", 2nd edition, Tata McGraw - Hill, New Delhi, 2005
3. LeslieCromwell,"BiomedicalInstrumentationandMeasurement",Prentice-Hall, New Delhi, 2011.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

Open Elective – II

20ECE302 VLSI DESIGN

L	T	P	C
3	0	0	3

Pre-requisite: None

Course Description:
This course describes about various VLSI design methodologies, fundamentals of CMOS technology. It incorporates basics of MOSFET models, CMOS design rules, Design of VLSI Systems, combinational logic design, sequential logic design, logic families and VLSI Design flow.

Course Objectives:
This course enables students to

1. Study the fundamentals of CMOS circuits and its characteristics
2. Learn the design and realization of combinational digital circuits.
3. Learn the design and realization of sequential digital circuits.
4. Architectural choices and performance tradeoffs involved in designing and realizing the circuits in CMOS technology are discussed
5. Learn the different FPGA architectures and testability of VLSI circuits.

UNIT I INTRODUCTION TO MOS TRANSISTOR 9 hours

MOS Transistor, CMOS logic, Inverter, Pass Transistor, Transmission gate, Layout Design Rules, Gate Layouts, Stick Diagrams, Long-Channel I-V Charters tics, C-V Charters tics, Non ideal I-V Effects, DC Transfer characteristics, RC Delay Model, Elmore Delay, Linear Delay Model, Logical effort, Parasitic Delay, Delay in Logic Gate, Scaling.

UNIT II COMBINATIONAL MOS LOGIC CIRCUITS 9 hours

Circuit Families: Static CMOS, Ratioed Circuits, Cascode Voltage Switch Logic, Dynamic Circuits, Pass Transistor Logic, Transmission Gates, Domino, Dual Rail Domino, CPL, DCVSPG, DPL, Circuit Pitfalls.
Power: Dynamic Power, Static Power, Low Power Architecture.

UNIT III SEQUENTIAL CIRCUIT DESIGN 9 hours

Static latches and Registers, Dynamic latches and Registers, Pulse Registers, Sense Amplifier Based Register, Pipelining, Schmitt Trigger, Monostable Sequential Circuits, Astable Sequential Circuits.
Timing Issues: Timing Classification Of Digital System, Synchronous Design.

UNIT IV DESIGN OF ARITHMETIC BUILDING BLOCKS AND SUBSYSTEM 9 hours

Arithmetic Building Blocks: Data Paths, Adders, Multipliers, Shifters, ALUs, power and speed tradeoffs, Case Study: Design as a tradeoff.

Designing Memory and Array structures: Memory Architectures and Building Blocks, Memory Core, Memory Peripheral Circuitry.

UNIT V IMPLEMENTATION STRATEGIES AND TESTING 9 hours

FPGA Building Block Architectures, FPGA Interconnect Routing Procedures. Design for Testability: Ad Hoc Testing, Scan Design, BIST, IDDQ Testing, Design for Manufacturability, Boundary Scan

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Realize the concepts of digital building blocks using MOS transistor.
2. Design combinational MOS circuits and power strategies
3. Design and construct Sequential Circuits and Timing systems.
4. Design arithmetic building blocks and memory subsystems.
5. Apply and implement FPGA design flow and testing.

Text Books:

1. Neil H.E. Weste, David Money Harris "CMOS VLSI Design: A Circuits and Systems Perspective", 4th Edition, Pearson , 2017.

2. Jan M. Rabaey ,Anantha Chandrakasan, Borivoje. Nikolic, "Digital Integrated Circuits:A Design perspective", Second Edition , Pearson , 2016.

Reference Books

1. Operating Systems - Internals and Design Principles. Stallings, 6th Edition2009. Pearson education.

2. William Stallings, "Operating Systems – Internals and Design Principles", 7th Edition, Prentice Hall, 2011.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

Open Elective – IV

B. Tech Computer Science and Engineering (Cyber Security)

Open Elective - IV

20PHY303 THIN FILM TECHNOLOGY AND ITS APPLICATIONS

L	T	P	C
3	0	0	3

Pre-requisite: None

Course Description:

Nucleation, crystallization, surface energy, various thin film coating processes including both physical vapour deposition such as evaporation, sputtering, pulsed laser deposition and chemical vapour deposition, spray coating, and other methods such as spin-coating, plasma polymerization, Langmuir Blodgett, transport phenomena in thin films, various properties of thin films, techniques and method to characterize thin films, current application of thin film, introduction to fabrication of thin film devices

Course Objectives:

11. To provide students with a comprehensive overview on the fundamentals of thin film preparation and characterization.
12. To enable the students to develop a thorough understanding of how core physics can be used to understand thin film deposition processes.
13. To establish the correlation between processing variables and materials characteristics and performance within the framework of key modern technologies.
14. To realize thin film applications to science and technology

UNIT I PHYSICS OF THIN FILMS 8 hours

Introduction - Role of thin films in devices - Thin film definition - Crystalline and amorphous films - Crystal defects - Nucleation and growth - film formation.

UNIT II THIN FILM DEPOSITION TECHNIQUES 10 hours

Physical methods of films deposition-evaporation, e-beam, sputter deposition, pulsed laser, molecular beam epitaxy. Chemical methods of film deposition -Deposition of Inorganic films from Solutions-Chemical vapour deposition - Electrolysis, Anodization, Spray pyrolysis, Other techniques: Langmuir Blodgett and Spin Coating.

UNIT III PROPERTIES OF THIN FILMS 8 hours

Structural-Optical-Electrical-Magnetic-Mechanical and Thermal properties of thin films.

UNIT IV CHARACTERIZATION OF THIN FILMS 10 hours

Imaging Techniques (SEM, AFM, TEM) - Structural Techniques (XRD, Raman)-Optical Techniques (UV-Vis-NIR, PL)-Electrical Techniques (Hall Effect, IV, CV)-Magnetic Techniques (EPR, H-V curve)-Mechanical Techniques (Hardness testing)-Thickness measurement (profilometer, ellipsometry).

UNIT V APPLICATIONS OF THIN FILMS 9 hours

Transparent conducting coating - Optical coating – Solar cells – Photocatalytic – Sensors - Superconductivity- Superhard coatings – Thin film transistors.

Course Outcomes:

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

11. Discuss the differences and similarities between different vacuum based deposition techniques, evaluate and use models for nucleating and growth of thin films.
12. Asses the relation between deposition technique, film structure, and film properties.
13. Know the typical thin film applications.
14. Motivate selection of deposition techniques for various applications.

Text Books:

1. Thin Film Deposition: Principles and Practice, Donald L. Smith, McGraw Hill, Singapore, 2001.

2. Maissel, L.I and Glang. R, "Handbook of thin film technology", McGraw Hill, 1970.

Reference Books:

1. Thin film phenomena / Kasturi L. Chopra, New York: McGraw-Hill, c1969.

2. G. Cao, "Nanostructures & Nanomaterials: Synthesis, Properties & Applications" Imperial College Press, 2004.

3. G. Cao, "Nanostructures & Nanomaterials: Synthesis, Properties & Applications" Imperial College Press, 2004.

4. Thin film processes, John L Vossen, Werner Kehn editors, Academic Press, New York, 1978.

5. Thin film physics / O.S. Heavens, London: Methuen, c1970.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

Open Elective - IV

20CHE303 INTRODUCTION TO NANO SCIENCE AND TECHNOLOGY

L	T	P	C
3	0	0	3

Pre-requisite: None

Course Description:
This is primarily a lecture course which brings together relevant knowledge from the disciplines of physics and chemistry to give students a fundamental understanding of the integrated multidisciplinary nature of Nanotechnology.

Course Objectives:

6. To understand the emergence of nanoscience and technology through history.
7. The various process techniques available for nanostructured materials.
8. The role of nanotechnology in electronics how basic nano-systems work
9. To use physical reasoning to develop simple nanoscale models to interpret the behaviour of such physical systems

UNIT I MOLECULE TO MATERIALS: BASICS OF NANOTECHNOLOGY 8 hours

History & emergence (Feynman to present) of Nanoscience and Nanotechnology, Challenges in Nanotechnology. Atomic Structures: Rutherford and Bohr's model of atom. Bohr's model to Quantum: Wave function, Uncertainty principle, Orbital quantum numbers, Shape of the orbitals. Types of simple crystal structures, defects in crystals.

UNIT II TYPES AND SYNTHESIS OF NANOSTRUCTURES 10 hours

Definition of a Nano system - Zero Dimensional (OD), One Dimensional (1D) - Two Dimensional (2D) - Three Dimensional (3D) nanostructured materials. Nanoscale building blocks, Top-down and Bottom-up approaches. Synthesis of Nanomaterials – Physical & Chemical methods: Chemical Vapour Deposition (CVD), Atomic Layer Deposition (ALD), Chemical Reduction, Co-precipitation, Emulsion Polymerization (Polymer and Organic NPs), Sol-Gel, Green synthesis of Nanoparticle (NP).

UNIT III PROPERTIES OF NANOMATERIAL 8 hours

Thermal, Mechanical, Optical, Electrical and Magnetic properties of nanomaterials (Metal oxides, Ceramics, Nanocomposites, Semiconductors). Carbon age materials: CNTs, and other Carbon-based materials). Effect of size and shape on the properties of nanomaterials.

UNIT IV CHARACTERIZATION OF NANOMATERIALS 10 hours

Structure: Powder XRD (SAXS); Composition: XPS; Thermal: TG-DTA; Optical & Electron microscopes: Atomic force microscopes (AFM), Scanning electron microscope (SEM), Transmission electron microscope (TEM); Magnetic characterization (SQUID).

UNIT V APPLICATIONS OF NANOMATERIALS 9 hours

Molecular electronics and nano-electronics – LED applications, Quantum electronic devices - CNT based transistor and Field Emission Display – Biological (anti-bacterial, anti-fungal, anti-microbial) applications - Biochemical sensor - Membrane based water purification, Target based drug delivery system.

Course Outcomes:

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

5. Understand the correlation between atomic, molecular structures and nanomaterials
6. Classify the types and synthesis the nanomaterials based on the needs of the society and environment.
7. Infer and interpret the properties of nanomaterials
8. Apply the knowledge of characterization tools towards making the sustainable engineering products.
9. Illustrate the application of various nanomaterials in daily life, industry towards the sustainable development.

Text Books:

1. M. Wilson, K. Kannangara, G. Smith, M. Simmons, and B. Raguse, Nanotechnology: Basic science and Emerging technologies, Overseas Press India Pvt Ltd, New Delhi, First Edition, 2005.
2. C. N. R. Rao, A. Muller, and A. K. Cheetham (Eds), The chemistry of nanomaterials: Synthesis, properties and applications, Wiley VCH Verlag Gmbh & Co, Weinheim, 2004.
3. Kenneth J. Klabunde (Eds), Nanoscale Materials Science, John Wiley & Sons, InC, 2001.
4. C. S. S. R. Kumar, J. Hormes, and C. Leuschner, Nanofabrication towards biomedical applications, Wiley - VCH Verlag GmbH & Co, Weinheim, 2004.
5. T. Pradeep, Nano: The Essentials, Understanding Nanoscience and Nanotechnology, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007.

Reference Books

1. W. Rainer, Nano Electronics and information Technology, Wiley, 2003.
2. K. E. Drexler, Nano systems, Wiley, 1992.
3. G. Cao, Nanostructures and Nanomaterials: Synthesis, properties and applications, Imperical College Press, 2004.
4. P. Yang, Chemistry of Nanostructured Materials, World Scientific Publishers, 2005.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

Open Elective - IV

20CHE304 COMPUTATIONAL METHODS IN MATERIALS SCIENCE AND ENGINEERING

L	T	P	C
3	0	0	3

Pre-requisite: Exposure to Introductory engineering mathematics, introductory materials science and introductory programming courses is preferred.

Course Description:

This course deals with various computational approach and mathematical methods to understanding and apply different concepts in materials science and engineering.

Course Objectives:

1. To get exposed to the basic concepts in Materials Science and Engineering.
2. To understand the basic concepts of Programming and Graphical plotting.
3. To introduce the basic concepts of Data types and handling of various data.
4. To familiarize the basic concepts of modelling and simulation.
5. To acquire and apply the current knowledge and trends in the field of Computational Materials Science.

UNIT I INTRODUCTION TO COMPUTATIONAL MATERIALS SCIENCE AND ENGINEERING **9 hours**

Concepts in materials science and engineering; use of computers and freely available open source software to: data handling; understand concepts and solve problems of engineering interest.

UNIT II PROGRAMMING AND PLOTTING **9 hours**

Introductions to the advanced concept C programming language; open source software for numerical computations and visualization (gnuplot, GNU Octave, Scilab); introduction to the LaTeX software for report preparation along with other miscellaneous software and programs.

UNIT III DATA TYPES AND HANDLING TECHNIQUES **9 hours**

Classification, and understanding of data properties, data handling - plotting, fitting, functional forms, interpolation, and integration.

UNIT IV COMPUTATIONAL MODELING AND SIMULATIONS **9 hours**

Understanding the materials properties; atomistic and electronic modelling of materials; concepts in molecular dynamics and its application using Quantum ESPRESSO.

UNIT V CURRENT TRENDS IN COMPUTATIONAL MATERIALS SCIENCE **9 hours**

Applied materials for various engineering field; research literature exploration; real-time application of computational methods in materials science and engineering, mini-project.

Course Outcomes:

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

1. Understand the importance and applications of computational methods in Materials Science and Engineering.
2. Be familiarized with the tools of the trade, namely programming and graphical plotting.
3. Be able to understand and access the various types of data sets and appropriately handle it to productively work with it.
4. Get the knowledge about handling various open source computational tools and their effective usage to do computational modeling and simulations.
5. Be familiarized with up to date trends in computational materials science by taking up real time research problems and provide solutions.

Text Books:

1. Computational Materials Science: An Introduction, Second Edition 2nd Edition, by June Gunn Lee, 2014
2. Materials science and engineering: an introduction, William D Callister, Sixth edition, John Wiley & Sons, 2013.
3. The C programming language, Brian W Kernighan and Dennis M Ritchie, Second edition, PHI Learning Private Limited, 2010.
4. Materials science and engineering: a first course, V Raghavan, Fifth edition, PHI Private Limited, 2008.
5. Physical metallurgy principles, Robert E. Reed-Hill, Second edition, Affiliated East-West Press Pvt. Limited, 2008.
6. An introduction to materials science and engineering, Kenneth M Ralls, Thomas H Courtney, and John Wulff, Wiley India Pvt. Ltd., 2011.

Reference Books

1. Materials Science and Engineering,V Raghavan,Prentice-Hall India, 2004
2. Advanced Engineering Mathematics, E Kreyzig, Wiley-India,1999.
3. A Review of Computational Methods in Materials Science, International Journal of Molecular Sciences 10(12):5135-216

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

Open Elective - IV

20CE304 GREEN BUILDINGS AND ENERGY CONSERVATION

L	T	P	C
3	0	0	3

Pre-requisite: None

Course Description:
The course covers various aspects of bioclimatic architecture like climate sensitive design, passive solar architecture, Water management, green building materials and construction techniques.

Course Objectives:

1. The course introduces concepts of sustainability and bioclimatic design in planning, construction and life of buildings.
2. This course intends to equip students with technical knowledge of energy-efficient green buildings
3. This course guide students, through projects, to apply concepts and ideas for the design of a green building by introducing them to green initiatives and ratings.
4. This course also initiates students in basics of functional design and drawing of the various buildings using the above concepts.

UNIT I GREEN BUILDING CONCEPTS 9 hours

Introduction to bioclimatic architecture - Sustainability in building science and Functional planning - Orientation - Elements of building design and drawing - Building regulations and bylaws - Traditional and VernacularArchitecture - Climate zones - Design Charts - sun path diagram - Solar angles - Indices of thermal comfort - Vernacular buildings in different climate zones.

UNIT II CLIMATE RESPONSIVE SCIENTIFIC PROCESS OF DESIGN 9 hours

Introduction - various steps in Site planning - Plan form Building envelope Land form -Topography - vegetation - water bodies; Orientation - S/V ratio - P/A ratio - Walls, Fenestration - Roof and floors - Active and passive solar strategies - Passive solar architecture.

UNIT III THERMAL FLOW IN BUILDINGS 9 hours

Calculation of thermal conductance - Heat flow through different building elements - Ventilation and day lighting- Design and placement of openings- Water management in buildings- Techniques to recycle, reuse and harvest water.

UNIT IV GREEN BUILDING MATERIALS AND CONSTRUCTION 9 hours

Material properties - Energy efficiency using various materials - emerging new materials Construction techniques- Techniques for roof, wall and foundations.

UNIT V ECONOMY OF GREEN BUILDING 9 hours

Cost of building - operation and maintenance - Green building rating system - Evaluation criteria of LEED - TERI GRIHA case studies - Case studies in different climate zones.

Course Outcomes:

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

1. Use various regulations and by laws for green building construction0.
2. Do site planning for Green Building.
3. Compute thermal flow through different building elements
4. Identify energy efficient building materials
5. Compute cost of building/operation and maintenance

Text Books:

1. Krishnan, A., Baker, N., Yannas, S., & Szokolay, S. (Eds.). (2001). Climate responsive architecture, a design handbook for energy efficient buildings. New Delhi: Tata McGraw- Hill Publishing Company.
2. TERI & ICAEN (InstitutCatalad'Energia). (2004). Sustainable building design manual (Vol. II). New Delhi: The Energy and Resources Institute(TERI) Press.

Reference Books

1. Bureau of Indian Standards. (1995). SP:41, Handbook on functional requirements of buildings (other than industrial buildings) (First reprint ed.). New Delhi: Bureau of Indian Standards.
2. Indian Green Building Council, LEED-India. (2011). LEED 2011 for India- Green building rating system, abridged reference guide for new construction and major renovations (LEED India NC). Hyderabad: Indian Green Building Council.
3. Koenigsberger, O., ingersoll, T. G., Mayhew, A., & Skozolay, S. V. (2011). Manual of Tropical Housing and Building. Hyderabad: Universities Press.
4. Prabhu, Balagopal T S, K Vincent Paul, and C Vijayan. Building Design and Drawing. Calicut: Spades Publishers, 2008.
5. Szokolay, S. V. (2008). Introduction to Architectural Science - The Basis of sustainable Design (Second ed.). Architectural Press/Elsevier.
6. The Energy and Resources Institute (TERI). (2011). Green Rating for Integrated Habitat Assessment (GRIHA) manual. New Delhi: TERI press.
7. Journals: Energy and Buildings, Building and Environment, Other relevant publications.
8. National Building Code, Bureau of Indian Standards: New Delhi. 2005; Building Bye laws and building rules of selected Indian urban and rural areas
9. Swamy, N. K., & Rao, A. K. (2013). Building planning and Drawing,New Delhi, CharotharPublishing House

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

Open Elective - IV

20CE305 ENVIRONMENTAL ENGINEERING

L	T	P	C
3	0	0	3

Pre-requisite: None

Course Description:

The course covers demand, quality and treatment of water along with characterization, water and wastewater treatment plant units and design , low cost treatment of wastewater and household drainage. Similarly, air pollution, noise pollution and solid waste management are also included. Further the course also covers basic laboratory

Course Objectives:

1. To explain different sources of water, water quality standards, water demands, distribution of water, population forecast, characteristics of water.
2. To analyze various water treatment plant units and their design considerations, advanced water treatment systems.
3. To explain the generation and collection of wastewater; wastewater treatment plant design, various wastewater treatment units and sludge treatment.
4. To explain various impacts of air and noise pollution and various methods to control them air and noise pollution
5. To describe about solid waste generation, characterization, impacts and various management techniques

UNIT I WATER SUPPLY ENGINEERING 9 hours

Water- Sources of Water, Water quality standards, Quantity of water: water demands, percapita demand, design period, population forecast, fluctuation in demand. General requirement for water supply: Sources, Types of intakes, Pumping and distribution of water; Quality of water: Physical, chemical, and biological characteristics of water and significance, necessity of treatment, water quality standards for various water uses.

UNIT II WATER TREATMENT 9 hours

Engineering system for water purification: Aeration, Screening, Coagulation and Flocculation, Sedimentation, Softening, Filtration, Disinfection; Methods of treatment: Removal of color, tastes and odor control, removal of iron and manganese, fluoridation and defluorination. Advanced water treatment: Ion exchange, electro-dialysis, RO (principles only.

UNIT III WASTEWATER TREATMENT 9 hours

Generation and collection of wastewaters- sanitary, storm and combined sewerage systems, quantities of sanitary wastes and storm water, design of sewerage system. Engineered system for wastewater treatment: Primary treatment, Screening, Grit removal, Sedimentation, Sedimentation aided with coagulation. Secondary treatment: Basis of microbiology, Growth and food utilization, Suspended growth systems, Attached growth systems, Secondary clarification, Disinfections of effluents; Sludge treatment and disposal: Sludge characteristics, thickening, disposal.

UNIT IV AIR AND NOISE POLLUTION 9 hours

Air - Composition and properties of air, urban air pollution, Air quality standards, Measures and major equipment for air pollution control, Noise - Basic concept, measurement, and various noise control methods.

UNIT V SOLID WASTE MANAGEMENT 9 hours

Solid waste management-Municipal solid waste, Composition, and various chemical and physical parameters of MSW, MSW management: Collection, transport, treatment, and disposal of MSW. Effects of solid waste on environment: effects on air, soil, water surface and ground, health hazards. Disposal of solid waste-segregation, reduction at source, recovery and recycle, Disposal methods.

Course Outcomes:

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

1. Estimate water demand and population forecasting and characteristics of water
2. Estimate water generation and perform basic design of the unit operations that are used in water treatment plants.
3. Explain various wastewater generation sources and different units of wastewater treatment and sludge treatment techniques
4. Describe the impacts of air and noise pollution and review various air and noise pollution control methods
5. Discuss about the impacts of solid waste and various solid waste management techniques

Text Books:

1. Environmenatal Engineering (Volume I & II) by S. K. Garg-Khanna Publishers.
2. Rao M and Rao H. V. N. Air Pollution, McGraw Hill Education, 2017.
3. Jagbir Singh and Ramanathan A. L., Solid Waste Management: Present and Future Challenges, I K International Publishing House Pvt. Ltd., 2009
4. Environmental Engineering by H. S. Peavy, D.R. Rowe and G. Tchobanoglous, MGH.

Reference Books

1. Birdie, G.S, Birdie, J.S., Water supply and sanitary Engineering, Including Environmental Engineering, Water and Air Pollution Laws and Ecology, Dhanpat Rai Publications, 1996.
2. Punmia, B.C, Ashok Kr Jain, Arun Kr Jain., Waste Water Engineering, Laxmi Publications, 1998.
3. Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication
4. Metcalf & Eddy, Wastewater Engineering Treatment and Dispose, McGraw Hill Publication

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

Open Elective - IV

20ME303 TOTAL QUALITY MANAGEMENT

L	T	P	C
3	0	0	3

Pre-requisite: None

Course Description:

Total quality management (TQM) is a philosophy, methodology and system of tools aimed to create and maintain mechanism of organization's continuous improvement. It involves all departments and employees for the improvement of processes and products. TQM encompasses various principles, techniques, and tools for identifying and solving problems, fostering a culture of quality, promoting teamwork, and striving for excellence in all areas of the organization. The goal of TQM is to achieve sustainable and long-term success by consistently delivering high-quality products and services that meet or exceed customer expectations while improving overall organizational performance.

Course Objectives:

Students will

6. Study comprehensive knowledge about the principles, practices, tools and techniques of total quality management.
7. Gain knowledge on leadership, customer satisfaction, addressing customer complaints, team work, employee involvement, related to customer and supplier partnership.
8. Gather information on various tools and techniques, concept on Six Sigma, bench marking and Failure Mode Effective Analysis (FMEA).
9. Know the importance of Quality circle, Quality Function Deployment, Taguchi design and case studies related to TQM.
10. Facilitate the understanding of standards of quality.

UNIT I INTRODUCTION **9 hours**

Introduction - Evolution of Quality - Historical Perspective, Basic Concepts of Quality – Quality control, Quality management and Quality Assurance - Definition of TQM – Basic concepts of TQM - TQM Framework - Contributions by Deming, Juran, Crosby and Feigenbaum – Dimensions of product and service quality

UNIT II TQM PRINCIPLES **9 hours**

TQM principles - Strategic quality planning, Quality statements – Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention – Role of Leadership and Commitment in Quality Deployment, Team Building, Motivation and Rewards, Total Employee Empowerment, Performance appraisal - Continuous process improvement – Supplier partnership – Partnering, Supplier selection,

UNIT III TOOLS OF TQM **9 hours**

The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – KAIZEN, 5S, JIT, Documentation – Failure mode and Effect Analysis (FMEA)

UNIT IV TQM TECHNIQUES **9 hours**

Quality circles – Quality Function Deployment (QFD) – House of Quality – Design of Experiments – Taguchi quality engineering – Orthogonal Arrays – Signal to Noise Ratio – TPM – Concepts, improvement needs – Cost of Quality – Performance measures

UNIT V IMPELMENTATION OF TQM **9 hours**

Introduction – Benefits of ISO Registration – ISO 9000 Series of Standards –Implementation – Environmental Management System: Introduction – ISO 14000 Series Standards – Concepts of ISO 14001 – Requirements of ISO 14001, Case studies on TQM principles followed by Indian Industries.

Course Outcomes:

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

6. Understand the various principles and practices of TQM to achieve quality.
7. Identify the various statistical approaches for Total Quality Control.
8. Demonstrate the TQM tools for continuous process improvement.
9. Adopt the importance of ISO and Quality systems.
10. Make use of the concepts of TQM to solve case studies

Text Books:

1. Dale H. Besterfield, et al., Total Quality Management, Pearson Education Asia, Third Edition, Indian Reprint (2003).

Reference Books

1. James R. Evans and William M. Lindsay, The Management and Control of Quality, (6th Edition), South-Western (Thomson Learning), 2005.
2. Oakland, J.S. TQM – Text with Cases", Butterworth – Heinemann Ltd., Oxford, Third Edition (2003).
3. Suganthi,L and Anand Samuel, Total Quality Management, Prentice Hall (India) Pvt. Ltd. (2006) Model.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

Open Elective – IV

20ME304 ENTREPRENEURSHIP

L	T	P	C
3	0	0	3

Pre-requisite: None

Course Description:
This course is designed to ignite the entrepreneurship idea into the young minds of engineers. This course gives the complete details to setup an enterprise which includes the generating business ideas, writing business plan and executing the plan successfully.

Course Objectives:
6. Understand the requirements of entrepreneurship as a profession.
7. Understand and develop the business plan.
8. Identify the various financial terms and conditions of new business venture.
9. Selection of plant location and choosing layout.
10. Analyse the market research for new ventures and small businesses.

UNIT I INTRODUCTION 9 hours

Introduction to Entrepreneurship, history of entrepreneurship development, social Entrepreneurship, Intrapreneurship, Definition of Entrepreneur, Entrepreneurial Traits, Entrepreneur vs. Manager, Entrepreneur vs Intrapreneur. The Entrepreneurial decision processes. Role of Entrepreneurship in Economic Development, Ethics and Social responsibility of Entrepreneurs. Opportunities for Entrepreneurs in India and abroad. Woman as Entrepreneur. Realities & Case studies about successful Entrepreneur

UNIT II CREATING AND STARTING THE VENTURE 9 hours
Sources of new Ideas, Methods of generating ideas. The Business Plan Nature and scope of Business plan, Writing Business Plan, Evaluating Business plans, implementation of business plans. Case studies of successful business plan, Marketing plan, financial plan, and organizational plan, Launching formalities. Developing business plan and evaluation with team.

UNIT III FINANCING AND MANAGING THE NEW VENTURE 9 hours
Sources of capital, venture capital, angel investment, Record keeping, recruitment, motivating and leading teams, financial controls. Marketing and sales controls. Ecommerce and Entrepreneurship, Internet advertising. New venture Expansion Strategies and Issues, Features and evaluation of joint ventures, acquisitions, merges, franchising. Case studies about entrepreneur who success or failure in their business based on the financial control

UNIT IV PLANT LAYOUT 9 hours
Definition of plant layout and its types, Issues related to Selection of layout. Production and Marketing Management, Selection of production Techniques, plant utilization and maintenance. Case study about selection of site and plant layout for new business venture.

UNIT V MARKET ANALYSIS AND PROJECT MANAGEMENT 9 hours

Inventory control, material handling and quality control. Marketing functions, market segmentation, market research and channels of distribution, Sales promotion and product pricing. Case studies on market analysis on entrepreneur perspective. Project Organization- Project Planning, Monitoring, Control and Learning. Detailed life cycle and post-mortem analysis, Resource allocation, Risk and uncertainty, Budget constraints, Project feasibility.

Course Outcomes:

Upon completion of this course the students shall be able to:

6. Describe the sources of new business ideas, methods to develop new ideas and use the problem-solving techniques.
7. Write a business plan which includes financial plan, organizational plan and marketing plan.
8. Identify the financial sources for new business ventures.
9. Select a plant layout and draw a plant layout.
10. Design a workplace and analyse the market research for new business.

Text Books:

1. Entrepreneurship, Robert Hisrich, & Michael Peters, 5/e TMH.
2. Entrepreneurship, Dollinger, Pearson, 4/e, 2004.

Reference Books

1. Dynamics of Entrepreneurial Development and Management, Vasant Desai, Himalaya Publ. House, 2004.
2. Harvard Business Review on Entrepreneurship. HBR Paper Back, 1999.
3. Entrepreneurial Management, Robert J.Calvin, TMH, 2004.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

B. Tech Computer Science and Engineering (Cyber Security)

OPEN ELECTIVE – IV

20EEE303 ROBOTICS

L	T	P	C
3	0	0	3

Pre-requisite Nil Nil

Course Description:

Robotics is an interdisciplinary area ranging from mechanical & electrical component design to advanced sensor technology, incorporating computer systems and Artificial Intelligence (AI). With advances in AI-techniques & computational power in recent years, it has become one of the most interesting areas for multidisciplinary research, with lots of commercial applications already in market.

Course Objectives:

This course enables students to

1. To know the fundamentals of Robotics & its applications.
2. To make students capable of handling robot manipulator tasks in real, as well as in simulation environment.
3. To know about kinetic and Jacobian modeling.
4. To know about sensors and actuators.

UNIT I INTRODUCTION, TRANSFORMATION AND MAPPING 9 hours

Evolution of Robots and Robotics, Laws of Robotics, Advancement in Robots, Robot Anatomy, Human Arm Characteristics, Design and Control Issues, Manipulation and Control, Sensors and Vision, Robotic Programming and Future Prospects

Coordinate Frames, Object Description in Space, Transformation of Vectors, Inverting a homogenous transform, Fundamental Rotation Matrices.

UNIT II ROBOT DRIVE SYSTEMS AND END EFFECTORS 9 hours

Pneumatic Drives-Hydraulic Drives-Mechanical Drives-Electrical Drives-D.C. Servo Motors, Stepper Motors, A.C. Servo Motors-Salient Features, Applications and Comparison of all these Drives, End Effectors-Grippers-Mechanical Grippers, Pneumatic and Hydraulic- Grippers, Magnetic Grippers.

Vacuum Grippers; Two Fingered and Three Fingered Grippers; Internal Grippers and External Grippers; Selection and Design Considerations.

UNIT III SENSORS AND MACHINE VISION 9 hours

Requirements of a sensor, Principles and Applications of the following types of sensors- Position sensors - Piezo Electric Sensor, LVDT, Resolvers, Optical Encoders, pneumatic Position Sensors, Range Sensors Triangulations Principles, Structured, Lighting Approach, Time of Flight, Range Finders, Laser Range Meters, Touch Sensors, binary Sensors., Analog Sensors, Wrist Sensors, Compliance Sensors, Slip Sensors, Camera, Frame Grabber, Sensing and Digitizing Image Data- Signal Conversion, Image Storage, Lighting Techniques, Image Processing and Analysis-Data Reduction, Segmentation, Feature Extraction, Object Recognition, Other Algorithms, Applications- Inspection, Identification, Visual Serving and Navigation.

UNIT IV ROBOT KINEMATICS **9 hours**

Forward Kinematics, Inverse Kinematics and Difference; Forward Kinematics and Reverse Kinematics of manipulators with Two, Three Degrees of Freedom (in 2 Dimension), Four Degrees of freedom (in 3 Dimension) Jacobians, Velocity and Forces-Manipulator Dynamics, Trajectory Generator, Manipulator Mechanism Design-Derivations and problems.

UNIT V ROBOT PROGRAMMING, IMPLEMENTATION AND ECONOMICS **9 hours**

Lead through Programming, Robot programming Languages-VAL Programming-Motion Commands, Sensor Commands, End Effector commands and simple Programs. RGV, AGV; Implementation of Robots in Industries-Various Steps; Safety Considerations for Robot Operations - Economic Analysis of Robots.

Course Outcomes:

After completing this Unit, students will be able to

- **1**. Understand the fundamentals of Robotics.
- **2.** Analyze the mechanical structure and notations kinematic model.
- **3**. Analyze the jacobian and dynamic modeling.
- **4**. Explain the robot manipulator control and path planning.
- **5**. Describe the various sensors and actuators.

Text Book(s)

1. Mittal, R. K. and Nagrath, I.J., Robotic and Control, Tata McGraw Hill, New Delhi, 2003.

2. Arshdeep Bahga, Vijay Madisetti, Internet of Things: A Hands-On Approach, Universities Press, 2015. ISBN: 978-8173719547

Reference Books

1. Fu, K.S., Gonzalez, R.C., and Lee, C.S.G., Robotics Control, Sensing, Vision and Intelligence, McGraw Hill, 1988.

2. Craig, J.J., Introduction to Robotics: Mechanism & Control. Addison Wesley, 1986.

3. Paul, R.P., Robot Manipulator: Mathematics Programming & Control. MIT Press, 1981.

4. Pugh, A., Robot Sensors, Vision Vol.-I. Springer Verlag, 1986.

5. Groover, M.P., Industrial Robotics Technology, programming & Application, McGraw Hill,

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Open Elective – IV

20EEE304 ELECTRICAL SAFETY

L	T	P	C
3	0	0	3

Pre-requisite Nil 20EEE101

Course Description:

To provide a comprehensive exposure to electrical hazards, various grounding techniques, safety procedures and various electrical maintenance techniques.

Course Objectives:

This course enables students to

1. To impart knowledge on electrical hazards and safety equipment.
2. To analyze and apply various grounding and bonding techniques.
3. To select appropriate safety method for low, medium and high voltage equipment.
4. To understand how to participate in a safety team.
5. To carry out proper maintenance of electrical equipment by understanding various standards.

UNIT I ELECTRICAL HAZARDS 9 hours

Primary and secondary hazards- arc, blast, shocks-causes and effects-safety equipment- flash and thermal protection, head and eye protection-rubber insulating equipment, hot sticks, insulated tools, barriers and signs, safety tags, Classification of insulating materials, locking devices- voltage measuring instruments- proximity and contact testers-safety electrical one-line diagram- electrician's safety kit.

UNIT II GROUNDING AND BONDING 9 hours

General requirements for grounding and bonding- definitions- grounding of electrical equipment- bonding of electrically conducting materials and other equipment- connection of grounding and bonding equipment- system grounding- purpose of system grounding- grounding electrode system- grounding conductor connection to electrodes-use of grounded circuit conductor for grounding equipment- grounding of low voltage and high voltage systems Ground resistance measurement using megger.

UNIT III SAFETY METHODS 9 hours

The six step safety methods- pre job briefings- hot -work decision tree-safe switching of power system- lockout-tag out- flash hazard calculation and approach distances- calculating the required level of arc protection-safety equipment, procedure for low, medium and high voltage systems- the one minute safety audit.

UNIT IV SAFETY TEAM 9 hours

Electrical safety programme structure, development- company safety team- safety policy- programme implementation- employee electrical safety teams- safety meetings- safety audit- accident prevention-first aid- rescue techniques-accident investigation.

UNIT V MAINTENANCE OF ELECTRICAL EQUIPMENT 9 hours

Safety related case for electrical maintenance- reliability centred maintenance (RCM) - eight-step maintenance programme- frequency of maintenance- maintenance requirement for specific equipment and location- regulatory bodies- national electrical safety code- Indian standard for electrical safety in work place- occupational safety and health administration standards.

Course Outcomes:

After completing this Unit, students will be able to

1. Understand various types of dielectric materials, their properties in various conditions.
2. Analyze and apply various grounding and bonding techniques.
3. Select appropriate safety method for low, medium and high voltage equipment.
4. Participate in a safety team.
5. Carry out proper maintenance of electrical equipment by understanding various standards**.**

Text Book(s)

1. Dennis Neitzel, Al Winfield, 'Electrical Safety Handbook', McGraw-Hill Education, 4th Edition,2012.

Reference Books

1. John Cadick, 'Electrical Safety Handbook', McGraw-Hill School Education Group, 1994.

2. The Institution of Electric Engineers, 1994.

3. Ray A. Jones, Jane G. Jones, 'Electrical safety in the workplace', Jones & Bartlett Learning, 2000.

4. Tareev, 'Electrical Engineering Materials', Verlag Technik, Berlin

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Open Elective – IV

20ECE303 EMBEDDED SYSTEMS

L	T	P	C
3	0	0	3

Pre-requisite None

Course Description:

The course will provide strong foundation on embedded system design. The course covers theory and logic to develop programming expertise. Student will understand application of embedded microcontrollers ARM.

Course Objectives:

This course enables students to

1. To provide knowledge on the basics, building blocks of Embedded System.
2. To provide basic of operating system and Real time programming languages
3. To teach automation using scheduling algorithms and Real time operating system.
4. To understand firmware design and Architectural Support for Operating Systems for various applications
5. To discuss on different Phases & Modeling of a new embedded product.

UNIT I THE CONCEPT OF EMBEDDED SYSTEMS 9 hours

Embedded System Design, Introduction to Embedded Hardware Elements, Sensors and Actuators, Embedded Processors, Memory Architectures. Embedded System vs. General Purpose computing systems, Examples of embedded systems, Embedded memories, Embedded microcontroller cores

UNIT II SOFTWARE ASPECTS OF EMBEDDED SYSTEMS – I 9 hours

Operating System Basics, types of Operating Systems, Task and Task States, Semaphores and shared Data, RTOS services and design using RTOS, Tasks, Process and Threads, Multiprocessing and Multitasking, Real time programming languages.

UNIT III SOFTWARE ASPECTS OF EMBEDDED SYSTEMS- II 9 hours

Task Communication: Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication Synchronization Issues, Task Synchronization Techniques, Device Drivers, how to Choose an RTOS, Integrated Development Environment (IDE).

UNIT IV FIRMWARE AND ARCHITECTURAL SUPPORT FOR OPERATING SYSTEMS 9 hours

Firmware and Bootloader, an introduction to operating systems, The ARM system control coprocessor Embedded ARM Applications, CP15 protection unit registers, CP15 MMU registers, ARM MMU architecture, Synchronization, Context switching, Input/Output, Example and exercises, The ARM7500 and ARM7500FE.

UNIT V MODELLING WITH HARDWARE/SOFTWARE DESIGN APPROACHES 9 hours

Modelling embedded systems- embedded software development approach -Overview of UML modelling with UML, UML Diagrams-Hardware/Software Partitioning, Co-Design Approaches for System Specification and modelling- Co-Synthesis- features comparing Single-processor Architectures & Multi-Processor Architectures-design approach on parallelism in uniprocessors & Multiprocessors.

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Course Outcomes:

Upon successful completion of the course, students will be able to

1. To understand the functionalities of processor internal blocks, with their requirement
2. Understand the basics of operating systems and then to learn the programming language used for real time operating system.
3. systems and related terms.
4. Understand the role and features of RT operating system, that makes multitask execution possible by processors.
5. Understand that using multiple CPU based on either hard-core or softcore helps data overhead management with processing.

Text Book(s)

1. M.A. Mazdi & J.G. Mazdi, The 8051 Microcontroller and Embedded System, Pearson Education India , 2013
2. Andrew N. Sloss & Dominic Symes, ARM System Developer's Guide Designing and Optimizing System Software, Morgan Kaufmann Publisher, 2004.

Reference Books

1. Steve Furber, Arm System-On-Chip Architecture, 2000.
2. J.K. Peckol, Embedded Systems A contemporary Design Tool, Wiley Student Edition , 2008
3. K J Ayala, The 8051 Microcontroller Architecture, Programming and Application, Penram International Publishing (India)
4. S. Heath, Embedded Systems Design, Elsevier, 2009

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Open Elective – IV

20ECE304 DSP ARCHITECTURE

L	T	P	C
3	0	0	3

Pre-requisite 20ECE110

Course Description:

The course will provide an insight into the architectures of DSP processors for handling the bottlenecks in executing DSP algorithms. On the application side the students can develop FPGA based DSP Systems and can understand the concept of multicore DSP as HPC infrastructure

Course Objectives:

This course enables students to

1. Understand the programmable digital signal processing hardware.
2. study the architecture of TMS320CX processor and block diagram
3. Know syntax and write the assembly language programming for digital signal processors.
4. Study the architecture of FPGA based DSP for various applications.
5. Study about High-Performance Computing using P-DSP.

UNIT I PROGRAMMABLE DSP HARDWARE 9 hours

Introduction: Digital signal-processing system, discrete Fourier Transform (DFT) and fast Fourier transform (FFT), differences between DSP and other microprocessor architectures. Processing Architectures (von Neumann, Harvard), DSP core algorithms (FIR, IIR, Convolution, Correlation, FFT), IEEE standard for Fixed and Floating-Point Computations, Special Architectures, Modules used in Digital Signal Processors (like MAC unit, Barrel shifters), On-Chip peripherals, DSP benchmarking.

UNIT II STRUCTURAL AND ARCHITECTURAL CONSIDERATIONS 9 hours

Parallelism in DSP processing, Commercial digital Signal-processing Devices, Basics of TMS320C54x and C55x Families in respect of Architecture improvements and new applications fields, Data Addressing Modes of TMS32OC54xx., TMS320C5416 DSP Architecture, Memory Map, Interrupt System, Peripheral Devices, Illustrative Examples for assembly coding.

UNIT III VLIW ARCHITECTURE 9 hours

Current DSP Architectures, GPUs as an alternative to DSP Processors, TMS320C6X Family, Addressing Modes, Optimizations, Heuristics. Replacement of MAC unit by ILP, Detailed study of ISA, Assembly Language Programming, Code Composer Studio, Mixed C and Assembly Language programming, On-chip peripherals, Simple application developments as an embedded environment.

UNIT IV FPGA BASED DSP SYSTEMS 9 hours

Limitations of P-DSPs, FPGA based signal processing design-case study of a complete design of DSP processor.

UNIT V HIGH PERFORMANCE COMPUTING USING P-DSP 9 hours

Modified bus structures and memory access in PDSPs, special addressing modes in PDSPs, Preliminaries of HPC, MPI, OpenMP, multicore DSP as HPC infrastructure.

Course Outcomes:

After completing this Unit, students will be able to
1. Identify and formalize architectural level characterization of DSP hardware.
2. Design and test various digital signal processors.
3. Write assembly language programming for various digital signal processors.
4. Utilize FPGA based DSP hardware for Control, Audio and Video Signal processing applications.
5. Understand the High-Performance Computing using P-DSP.

Text Book(s)

1. B. Venkataramani, M. Bhaskar, "Digital Signal Processors: Architecture, Programming and Applications", Tata McGraw-Hill Education Private Limited, 2011.

2. Phil Lapsley; Jeff Bier; Amit Shoham; Edward A. Lee, "DSP Processor Fundamentals: Architectures and Features", Wiley-IEEE Press, 1997.

Reference Books

1. Emmanuel C. Ifeachor, Barrie W. Jervis, "Digital Signal Processing: A practical approach", Pearson-Education, PHI, 2002.

2. Sen M. Kuo, Woon-Seng S. Gan, "Digital Signal Processors: Architectures, Implementations, And Applications", Pearson/Prentice Hall, 2005.

3. Peter Pirsch, "Architectures for Digital Signal Processing", John Wiley & Sons, 2009

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Open Elective – IV

20ECE305 COMMUNITY RADIO TECHNOLOGY

L	T	P	C
3	0	0	3

Pre-requisite

Course Description:

This course offers a comprehensive exploration of Community Radio, from foundational concepts to practical implementation. It begins with an introduction to the principles of Community Radio and guides students through the process of establishing a Community Radio Station (CRS). Key topics include Studio Technology, Operations and Management along with detailed instruction in Audio Pre-Production and Post-production techniques. Students will also gain essential knowledge of Radio Transmission technology, including the setup of an FM transmitter. By the end of the course, students will have a thorough understanding of Community Radio principles and the Practical skills required to effectively operate a Community Radio station.

Course Objectives:

This course enables students to

1. Associate the concept of fundamentals in Community Radio in Local Communication and development.
2. Gain knowledge of Studio technology and operations including Soundboards, Microphones, Recording, scheduling, content creation, and team coordination.
3. Develop skills in Audio Pre-production and post-production such as recording, editing, and mixing audio content.
4. Categorize the Radio Transmission Technology comprising signal requirements aligning with factors affecting Coverage and Shadow Areas.
5. Explore Radio Transmission technology essentials and understand the technical aspects of setting up and maintaining an FM transmitter.

UNIT I COMMUNITY RADIO FUNDAMENTALS AND SETUP 9 hours

Introduction to Radio Broadcasting in India - Community Radio: Evolution - Community Radio Policy – Technical principles; Components of a CR Station - Radio Waves and Spectrum - Basics of Electricity - Power Backup and Voltage Stabilization

UNIT II STUDIO TECHNOLOGY & OPERATIONAL PRACTICES 9 hours

Basics of Sound - Analog and Digital Audio - Components of the Audio Chain - Studio Acoustics; Good Engineering Practices for Studio Setup - Studio Equipment: Preventive & Corrective Maintenance - Content Distribution: Alternative Mechanisms

UNIT III AUDIO PRE & POST PRODUCTION 9 hours

Audio Hardware and Field Recording – Microphones - Audio Cables and Connectors - Free and Open-Source Software - Telephony for Radio - Landline Systems - GSM/CDMA - Voice Over Internet Protocol (VoIP); Sound Recording and Editing - Mixing and Mastering - File Formats and Compression Transmission - Storing and Retrieval

UNIT IV RADIO TRANSMISSION TECHNOLOGY 9 hours

Transmission Chain Overview – Live and Pre-recorded Transmission - Principles of FM Transmission – FM Transmitter console- Antenna System - Types of Mast/Towers - Layers of Atmosphere and Radio Wave Propagation - Factors Affecting Coverage and Shadow Areas - Signal Requirements and Coverage Planning Parameters

UNIT V FM TRANSMITTER SETUP 9 hours

Connecting Audio Feed to the Transmitter - Back Panel Connectors - Mounting and Connecting the Transmitter - Probable Causes of Failure of Transmitters - Fault Diagnostics and Corrective Maintenance - Transmitter Operation and Upkeep Issues

Course Outcomes:

Upon the completion of the course, Student will be able to

1. Interpret the evolution with a framework of Community Radio with Technical Principles and essential Radio Spectrums.
2. Apply Studio Technology and Operational practices with the components of the Audio Chain including Acoustics and Equipment maintenance.
3. Conduct Comprehensive Audio Pre & Post-production to operate field Recordings with Hardware and Open-source software to manage sound recording, editing, mixing, mastering, and file compression.
4. Infer the principles of FM transmission, Antenna systems, Radio wave propagation and factors affecting coverage.
5. Demonstrate knowledge of the connecting audio feeds for Transmitter setup by resolving operational Issues with corrective maintenance.

Text Book(s)

1. Pooja Murada R. Sreedher, “Community Radio in India”, Aakar Books, 2019.
2. Prof. Raj Misra , “Community Radio By the people, For the People”, Orange Books Publication, 2022
   Fraser, Colin, and Sonia Restrepo Estrada, “Community radio handbook”. Paris: Unesco, 2001.

Reference Books

1. Juliet Fox, “Community Radio’s Amplification of Communication for Social Change”, 7th Edition, Palgrave Macmillan (Springer International Publishing.), 2019.
2. Kanchan K. Malik, Vinod Pavarala, “Community Radio in South Asia: Reclaiming the Airwaves”, Routledge India, 2020.
3. Vinod Pavarala and Kanchan K. Malik, “Other voices: the struggle for community radio in India”,Sage Publications India Pvt Ltd, 2007.
4. Michael C. Keith, “The Radio Station: Broadcast, Satellite & Internet”, 7th Edition, Focal Press (Elsevier Inc.), 2007.
5. “Certificate in Community Radio Technology (CCRT)”
   https://www.cemca.org/resources/certificate-community-radio-technology-ccrt-0

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Open Elective – V

B. Tech Computer Science and Engineering (Cyber Security)

Open Elective - V

20HUM301 PRINCIPLES OF MANAGEMENT

L	T	P	C
3	0	0	3

Pre-requisite NIL

Course Description:

The course provides students with a practical and concrete explanation of management concepts and techniques they will need to manage today's and tomorrow's organizations. The course will follow the "planning, organizing, leading, controlling" format of managerial functions while putting together many small pictures presented by individual modules into one bigger meaningful picture in which managerial knowledge would apply. At the end of the course students are expected to understand role of components of bigger picture and interactions between and among components.

Course Objectives:

The course is intended to:

1. Describe the concepts of Management theories, approaches and their application with organizations around us;

2. Know the concepts of planning and management;

3. Explain the basic concepts of organization, types and structure of organization;

4. Make the students know leading, good communication, theories of motivation; and

5. Explain controlling, operations management, value chain management and management audit.

UNIT I INTRODUCTION 9 hours

Introduction to Management and Organizations- Management definition, skills, roles, goals and functions of a manager, organization, value of studying management - Managing in a Global Environment- Global Perspective, Understanding global environment, - Social Responsibility and Managerial Ethics.

UNIT II PLANNING 9 hours

Decision-making process, Types of decisions and decision making conditions, styles, biases and errors, Planning: Meaning of planning, establishing goals and developing plans, contemporary issues in planning - Strategic Management-Importance of strategic management, strategic management process, types of organizational strategies, current issues in strategic management.

UNIT III ORGANIZING 9 hours

Organizational structures - HRM process, Contemporary issues in HRM – Departmentation – decentralization – delegation of Authority - Managing Change and Innovations.

UNIT IV COMMUNICATION, MOTIVATION AND LEADING 9 hours

Functions of communication, Inter-personal communication, Barriers of Communication – Understanding Information Technology- Motivation**:** Theories of motivation and current issues in motivation. Leading: Leaders and Leadership, Leadership theories - Leadership issues in twenty first century

UNIT V CONTROLLING 9 hours

Process of Control – Problems of Control Process-Types of Control – Techniques of Control-Essential conditions for effective control- Contemporary issues in control – Strategic role of Operations Management - Value Chain Management.

Management Audit: Objectives-Importance-Activities of Management Auditor.

Course Outcomes:

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

1. Understand the various concepts, approaches and theories of management in the real situation,

2. Analyze the concept of planning and apply on the decisions in strategic management,

3. Compare organization structure designs and chart diligently with theoretical learning concepts,

4. Apply communication and theories of motivation in an organization, and

5. Understand various tools for controlling organizational performance, management audit and apply to achieve the corporate objectives.

Text Book(s)

1. Stephen P. Robbins, Mary Coulter "Management", Pearson Education, 2010, 10th edition.

2. P. Subba Rao "Management and Organizational Behavior", Himalaya Publishing House.

Reference Books

1. Gary Dessler, "Management", Prentice Hall, Inc., 1998, 1st edition.

2 Daft Richard L. 'Management' Thomson South Western, 5th edition.

3 Koontz H. and Weihrich H., "Essentials of Management", McGraw Hill Int. ed., 2004, 6th edition.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Open Elective - V

20HUM302 HUMAN RESOURCE DEVELOPMENT

L	T	P	C
3	0	0	3

Pre-requisite NIL

Course Description:

The course content includes: Introduction to HRM, strategic human resource challenges, work flows, job analysis, managing diversity, concepts, goals, mechanism and system of HRD, recruitment and selection, downsizing and outplacement, appraising and managing employee performance, training, career development, managing compensation, rewarding performance, designing benefit plans, employee relation and employee discipline, and workplace safety and health.

Course Objectives:

The course is intended to:

1. Explain the nature and scope of HRM, its functions, policies and strategies;
2. Describe the human resource planning, work analysis and importance in designing jobs;
3. Know the recruitment, selection and the process of performance appraisal;
4. Make the student to learn about training and development, compensation management and
5. Explain the trade unions, industrial relations and grievance.

UNIT I INTRODUCTION 9 hours

Understanding the nature and scope of Human Resource Management- Definition, Evolution of HRD, Functions - objectives, organization of department. Human Resource Management v/s Personnel Management, Role and responsibility of HRM.

UNIT II HUMAN RESOURCE PLANNING 9 hours

Human Resource Planning- Factors affecting HRP, the planning process, managerial succession planning. Job Analysis, Methods of collecting job data, Competency based Job Analysis, Job design approach, contemporary issues in Job Description.

UNIT III RECRUITMENT, SELECTION AND PERFORMANCE APPRAISAL 9 hours

Recruiting and selecting employees-, Selection process, Barriers, selection in India. Performance Management, Process of Performance Appraisal, Methods of Performance Appraisal - Errors in Performance Appraisal.

UNIT IV TRAINING AND DEVELOPMENT 9 hours

Meaning – importance and benefits of Training and Development, Training v/s Development – Training Methods - challenges in training - Career development: Definition-objectives—importance of career development – Reward Management – Compensation Management: Nature-Objectives-Components of Compensation- Theories of Compensation-Factors influencing employee compensation.

UNIT V INDUSTRIAL RELATIONS, TRADE UNIONS 9 hours

Trade Unions: Importance-Objectives- Functions and Structure of the Trade Unions- Trade Union movement in India- Industrial Relations: Nature--Importance- Approaches-essential conditions for sound IR. Industrial Disputes: Meaning – Types- Causes-Industrial disputes settlement machinery. Grievance: Sources and Process of Redressal,

Course Outcomes:

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

1. Understand the concept of HRM, its nature, scope, functions, policies and strategies;
2. Analyse human resource planning and apply in designing jobs;
3. Evaluate the recruitment, selection and the process of performance appraisal;
4. Understand the importance of training and development activities, compensation management and
5. Examine the trade unions, industrial relations and grievance.

Text Book(s)

1. Aswathappa K., Human Resource Management- Text and Cases, Tata McGraw Hill, 6th Edition, 2010
2. Gomez-Mejia, L.R., Balkin, D.B., & Cardy, R.L. Managing Human Resource Management 6th edition, Pearson Edu. 2007.
3 VSP Rao, Human Resource Management-Text & Cases, Excel Books.

Reference Books

1. Garry Dessler, BijuVarkkey , Human Resource Management ,11th Edition, Pearson Education, 2009.
2 R. Wayne Mondy, Human Resource Management, 10th Edition, 2010
Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Open Elective - V

20HUM303 SOFT SKILLS

L	T	P	C
3	0	0	3

Pre-requisite NIL

Course Description:

Soft skills are the personal attributes that make a student a valuable employee and a wholesome personality. They include aspects like communication, teamwork, problem-solving, and time management. Employers are increasingly looking for employees with strong soft skills, as they are essential for success in the workplace. This course will help students analyze themselves and build soft skills needed for their personal and career success.

Course Objectives:

The course is intended to:

1. Analyze their strengths and skills, and build confidence in presenting themselves
2. Work seamlessly as a team and negotiate for solutions
3. Think laterally and critically to evaluate a situation and present it with clarity
4. Write business emails effectively
5. Prepare holistically for a job interview

UNIT I SELF ANALYSIS AND DEVELOPMENT 10 hours

Personal ethics (politeness, empathy, and honesty); self-motivation / building confidence and assertiveness; identifying one's unique selling points (USPs) through skills introspection and recognizing strengths and weaknesses; nurturing strengths and fixing weaknesses; self-introduction.

UNIT II TEAM WORKING AND DYNAMICS 12 hours

Brainstorming techniques, team building, collaboration, and negotiation skills; team role plays (involving negotiation and decision making); group discussion etiquette (greetings and body language), idea generation, and common GD phrases; group discussion practice

UNIT III THINKING AND REASONING SKILLS 6 hours

Lateral thinking, critical thinking and logical reasoning through texts, images, and videos; Speaking activities (e.g. JAM) involving lateral thinking and reasoning through thought-provoking pictures, videos, cartoons, comic strips or articles.

UNIT IV PRESENTATION SKILLS 7 hours

Presentation etiquette; slides design; and presentation practice.

UNIT V INTERVIEW SKILLS 10 hours

Preparing resume and cover letter for job interviews; interview etiquette: dress code, body language, tone, and greeting; HR interviews: answering common interview questions, practice for HR interviews.

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Course Outcomes:

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

1. Understand and express themselves with confidence
2. Work as an active team member
3. Think and express their views logically and speak on varied topics without hesitations.
4. Prepare business presentations and emails effectively
5. Attend job interviews with confidence

Text Book(s)

1. Sabina Pillai and Agna Fernandez; Soft Skills and Employability Skills; Cambridge University Press, 2018.

2. Archana Ram, PlaceMentor, 2018, Oxford University Press

Reference Books

1. Karen Kindrachuk, Introspection, 2010, 1st Edition

2 Karen Hough, The Improvisation Edge: Secrets to Building Trust and Radical Collaboration at work, 2011, Berrett-Koehler Publishers

3. Colin Swatridge, Oxford Guide to Effective Argument and Critical Thinking 1st Edition, Oxford University Press

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Open Elective - V

20HUM304 NATIONAL CADET CORPS

L	T	P	C
3	0	0	3

Pre-requisite: NCC B-Certificate

Course Description:
The main aim of this course is to mould the youth into responsible citizens of the nation. It helps to improve character and leadership qualities towards nation building. This course also motivates the youth to offer Selfless service to the society and nation. The course comprises Common subjects, Service subjects of NCC, societal aspects and basic organization of Indian Armed Forces.

Course Objectives:
This course enables the student to –

1. Get aware of NCC organization and general structure of Defence Forces.
2. Learn leadership and national integration.
3. Motivate towards to maintain Health and hygiene, personality development.
4. Learn elementary characteristics of disaster management, Field craft and Battle craft.
5. Acknowledge the Social activities, Communication and Military History.

UNIT I **10 hours**

INTRODUCTION TO NCC
Introduction, History of NCC , NCC Motto, NCC Flag, Aims of NCC, Cardinal points of NCC, Organization of defence forces in general, Organizational structure of Indian Army(Armed forces), Organizational structure of NCC, NCC Song, Incentives of NCC, Ranks in Army, Navy and Air Force, current representatives – Certificate Examination in NCC– Honours and Awards.

FOOT DRILL BASICS
Aims of Drill, Word of Commands, Attention, Stand at Ease, Turning Left, Right and Inclining at the Halt. Sizing, Forming up in three Ranks and Numbering, Open and Close March Order, Dressing the Squad, Saluting at the Halt, Getting on Parade, Falling Out and Dismissing, Marching, Guard of Honour.

UNIT II **10 hours**

LEADERSHIP
Meaning, Leadership Traits, Types of Leadership, Discipline & Duty of an Indian Citizen, Motivation, Code of Ethics, Perception, Communication, Customs of Services, Importance of Team Work, leaders(swami Vivekananda).

NATIONAL INTEGRATION
Meaning and Importance, Unity in Diversity, Indian History and Culture, Religion and Customs of India, India and its Neighbours, Contribution of Youth in Nation Building, Contribution of leaders in nation unification .

UNIT III **12 hours**

HEALTH AND HYGIENE
Structure and Function of Human Body, Hygiene and Sanitation, Preventable Diseases, First Aid, Yoga: Introduction and Exercises, Physical and Mental Health, Fractures: Types and Treatment.

PERSONALITY DEVELOPMENT

Introduction to personality development, Physical and social factors influencing / shaping personality, psychological and philosophical factors influencing / shaping personality, Self-awareness, SWOT analysis, mind set, interpersonal relationship and communication, effective communication, barriers of communication.

ENVIRONMENT AND ECOLOGY

Environment: Meaning, Global Warming, Acid Rain, Depletion of Ozone Layer, Conservation of Environment. Ecology: Introduction, Component of Ecological System, Forest Ecology, Wild Life, Pollution Control.

UNIT IV **10 hours**

DEFENCE AND DISASTER MANAGEMENT

Civil Defence: Meaning, Organization and its Duties, Civil Defence Services, Fire Fighting : Meaning, Mode of Fire, Fire Fighting Parties, Fire Fighting Equipment. Introduction, Classification of Disaster: Natural Disaster & Man Made Disaster, Disaster Management During Flood, Cyclone and Earth Quake, Assistance in Removal of Debris, Collection and Distribution of Aid Material, Message Services.

SOCIAL SERVICE ACTIVITIES (Social Service And Community Development)

Basics of Social Service, Weaker Sections in the Society and its Identification, Contribution of Youth towards Social Welfare, NGOs and their Role and Contribution , Social Evils, Drug Abuse, Family Planning, Corruption, Counter Terrorism, Eradication of Illiteracy – Aids Awareness programme – Cancer Awareness Programme.

UNIT V **10 hours**

COMMUNICATION

Types of communication, characteristics of wireless technology, Walkie/talkie, Basic RT procedure, Latest trends and development(Multimedia, video conferencing, IT)

MILITARY HISTORY

Biography of Indian Historical Leaders: Chatrapati Shivaji, Maharana Pratap, Akbar Famous Battles / Wars of India: Indo – Pak War 1971(all wars), Kargil War.(Categorise: before/ After independence)
Biography of Successful Leaders: General Patton, General Mac. Arthur, Field Marshal Sam Maneksha.

Course Outcomes:

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

6. Analyse the NCC structure and different ranks in Indian Armed Forces along with foot drill.
7. Notify the leadership traits and the need of national integrity towards nation building.
8. Instill respect and responsibility towards personal health and hygiene, develop dynamic personality with adequate qualities.
9. Identify different disasters and judging measurements on the ground.
10. Recognise various communication devices, analyse the Military Organization.

Text Books:

1. HAND BOOK OF NCC – "SANJAY KUMAR MISHRA, MAJOR RC MISHRA", published by Kanti prakashan-2020.
2. NCC HAND BOOK - "SHASHI RANJAN & ASHISH KUMAR", published by Goodwin Publications-2021.

Reference Books:

1. NCC Hand book – "R.Gupta's", Ramesh Publishing House-2021.
2 NCC (ARMY WING)- "R.Guptas's",RPH Editorial Board-2021
3 Hand Book Of N.C.C. – "Ashok Pandey", Kanti Publications-2017

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

Professional Elective – I

B. Tech Computer Science and Engineering (Cyber Security)

Professional Elective – I

20CSC401 BIG DATA ANALYTICS

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

Course Description:
This course introduces fundamental concepts and tools required to understand Data analytics. The also discusses big data applications in Data Science and covers the applications and technologies needed to process the large-scale data.

Course Objectives:
1. To learn data mining and big data basics
2. To learn the big data in technology perspective
3. To learn Hadoop framework for data analytics
4. Applying MapReduce paradigm to solve problems
5. To interpret the potential applications in big data scenario.

UNIT I INTRODUCTION TO DATA MINING AND BIG DATA 9 hours

Introduction to Data mining, KDD process, Data Mining Techniques: Mining Frequent patterns, Association rule, Cluster analysis, Classification and Regression. Introduction to Big Data - What is Big Data? Explosion in Quantity of Data, Big Data Characteristics, Types of Data, Common Big data Customer Scenarios, BIG DATA vs. HADOOP, A Holistic View of a Big Data System, Limitations of Existing Data Analytics Architecture.

UNIT II DATA ANALYTICS LIFE CYCLE 9 hours

Introduction to Big data Business Analytics - State of the practice in analytics role of data scientists- Key roles for successful analytic project - Main phases of life cycle - Developing core deliverables for stakeholders.

UNIT III INTRODUCTION TO HADOOP 9 hours

Hadoop Distribution, Hadoop Key Characteristics, RDBMS vs. Hadoop, Hadoop 2.x Cluster Architecture, Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands, Anatomy of File Write and Read. Name Node, Secondary Name Node, and Data Node, Hadoop 2.0 New Features – Name Node High Availability, HDFS Federation, MRv2, YARN, Running MRv1 in YARN Hadoop Distributed File System.

UNIT IV PROGRAMMING FOR DATA ANALYTICS 9 hours

MapReduce program in Java – Map Reduce API – Programming Examples- Combiner Functions Streams and Files - Streams – Text Input and Output – Reading and Writing Binary Data.

UNIT V DATA SCIENCE AND APPLICATIONS 9 hours

Data Loading Techniques & Data Analysis, Text Analytics for Large unstructured information, Analytic Stack, Big Data Applications - Fraud detection in Stock markets, Sentiment Analysis.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Apply data mining algorithms for classification and clustering.
2. Understand Big data framework.
3. Understand the map reduce way of solving analytic problems.
4. Illustrate the problem and its solution.
5. Analyze big data applications.

Text Book(s)

1. Jiawei Han MichelineKamber Jian Pei, Data Mining: Concepts and Techniques, Third Edition, Elsevier, Morgan Kaufmann, 2011.
2. Tom White, “Hadoop: The Definitive Guide”, 3rd Edition, O’reilly, 2012.
3. Alberto Cordoba, “Understanding the Predictive Analytics Lifecycle”, Wiley, 2014.
4. Eric Siegel, Thomas H. Davenport, “Predictive Analytics: The Power to Predict Who WillClick, Buy, Lie, or Die”, Wiley, 2013.

Reference Books

1. Chuck Lam,Hadoop in Action, Manning, Second Edition, 2016.
2. Mark Gardener, Beginning R: The Statistical Programming Language, Wiley, 2013.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Professional Elective – I

20CSC402 INTERNET AND WEB PROGRAMMING

L	T	P	C
3	0	0	3

Pre-requisite 20CSE102, 20CSC106

Course Description:

This course aims to comprehend and analyze the basic concepts of web programming and internet protocols. It also aims to describe how the client-server model of Internet programming works. This course aims to demonstrate the uses of scripting languages and their limitations.

Course Objectives:

After successfully completing the course, the student should be able to
1. Differentiate web protocols and web architecture.
2. Make use of JavaScript, HTML and CSS effectively to create interactive and dynamic websites.
3. Implement client-side scripting and server-side script using PHP, JSP and Servlets.
4. Develop XML based web applications.
5. Improve the network and firewall security.

UNIT I INTRODUCTION TO INTERNET & WEB ESSENTIALS 9 hours

Overview of Internet- Networks - Web Protocols — Web Organization and Addressing - Web Browsers and Web Servers -Web System Architecture – URL - Domain Name – HTTP request message-response message.

UNIT II WEB DESIGNING & XML 9 hours

HTML5 – Form elements, Input types and Media elements, CSS3 - Selectors, Box Model, Backgrounds and Borders, Text Effects, Animations, Multiple Column Layout, User Interface- Anatomy of xml document - XML Markup-working with elements and attributes - creating valid documents-xml objects-XSL, XSLT, XML Schema-JSON, Case Study.

UNIT III CLIENT-SIDE & SERVER-SIDE SCRIPTING 9 hours

JavaScript- Introduction –Functions – Arrays – Operators – DOM, Built-in Objects, Regular Expression, Exceptions, Event handling, Validation- AJAX - JQuery.
Introduction to PHP – Operators – Conditionals – Looping – Functions – Arrays- Date and Time Functions – String functions - File Handling - File Uploading.

UNIT IV SESSION MANAGEMENT and DATABASE CONNECTIVITY 9 hours

Sessions-Cookies-MySQL Basics – Querying single and multiple MySQL Databases with JavaScript – JavaScript Data Objects.

UNIT V INTERNET SECURITY 9 hours

Introduction to Internet Security-Understanding Firewalls-Hackers-TCP/IP from a security view point – sockets and services-Encryption. Firewall Technology-packet filtering- Network Address Translation-application level proxies-VPN- ideal firewall.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Understand the fundamentals of Internet web protocols.
2. Develop the design thinking capability.
3. Design a component or a product applying all the relevant standards and with realistic constraints.
4. Infer a good working knowledge of HTML5 & CSS.
5. To apply the security fundamental in Internet and Web programming.

Text Books:

1. Paul Deitel, Harvey Deitel, Abbey Deitel, Internet & World Wide Web - How to Program, 5th edition, Pearson Education, 2012.
2. Thomas A.Powell, The Complete Reference Web design, Tata McGraw-Hill, 2000.

Reference Books:

1. Lindsay Bassett, Introduction to JavaScript Object Notation, 1st Edition, O'Reilly Media, 2015
2. Fritz Schneider, Thomas Powell , JavaScript – The Complete Reference, 3rd Edition, Mc-Graw Hill, 2017

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Professional Elective – I

20CSC403 DATABASE SECURITY AND PRIVACY

L	T	P	C
3	0	0	3

Pre-requisite

Course Description:
This course will help to explore database security and potential defense mechanism against common threat/vulnerabilities. The focus is to provide knowledge to implement polices for users and implement various database security model and data mining algorithm.

Course Objectives:

1. To understand the fundamentals of security, and how it relates to information systems.
2. To identify risks and vulnerabilities in operating systems from a database perspective.
3. To learn good password policies, and techniques to secure passwords in an organization.
4. To learn and implement administration policies for users.
5. To understand the various database security models and their advantages or disadvantages.
6. To learn to implement privacy preserving data mining algorithms

UNIT I SECURITY ARCHITECTURE & OPERATING SYSTEM SECURITY FUNDAMENTALS **9 hours**

Security Architecture: Introduction-Information Systems- Database Management Systems-Information Security Architecture- Database Security–Asset Types and value-Security Methods. Operating System Security Fundamentals: Introduction-Operating System Overview-Security Environment – Components- Authentication Methods-User Administration-Password Policies Vulnerabilities-E-mail Security

UNIT II ADMINISTRATION OF USERS & PROFILES, PASSWORD POLICIES, PRIVILEGES AND ROLES **9 hours**

Administration of Users: Introduction-Authentication-Creating Users, SQL Server User-Removing, Modifying Users-Default, Remote Users-Database Links-Linked Servers-Remote Servers-Practices for Administrators and Managers-Best Practices Profiles, Password Policies, Privileges and Roles: Introduction-Defining and Using Profiles-Designing and Implementing Password Policies-Granting and Revoking User Privileges-Creating, Assigning and Revoking User Roles-Best Practices

UNIT III DATABASE APPLICATION SECURITY MODELS & VIRTUAL PRIVATE DATABASES **9 hours**

Database Application Security Models: Introduction-Types of Users-Security Models- Application Types Application Security Models-Data Encryption Virtual Private Databases: Introduction-Overview of VPD-Implementation of VPD using Views, Application Context in Oracle-Implementing Oracle VPD-Viewing VPD Policies and Application contexts using Data Dictionary, Policy Manager Implementing Row and Column level Security with SQL Server

UNIT IV AUDITING DATABASE ACTIVITIES **9 hours**

Auditing Database Activities: Using Oracle Database Activities-Creating DLL Triggers with Oracle Auditing Database Activities with Oracle-Auditing Server Activity with SQL Server 2000-Security and Auditing Project Case Study.

UNIT V PRIVACY PRESERVING DATA MINING TECHNIQUES **9 hours**

Privacy Preserving Data Mining Techniques: Introduction- Privacy Preserving Data Mining Algorithms General Survey-Randomization Methods-Group Based Anonymization-Distributed Privacy Preserving Data Mining-Curse of Dimensionality-Application of Privacy Preserving Data Mining

Course Outcomes:

Upon successful completion of the course, students will be able to

1. To Understand the knowledge of information system and information security
2. Analyze the manage the security of information system
3. Design and develop the security model in database.
4. Implement VPD in various databases and audit the database activities.
5. Apply the security mechanism in PPDM using various algorithms

Text Book(s)

1. HassanA.Afyouni, Database Security and Auditing‖,Third Edition,CengageLearning,2009.
2. Ron Ben Natan, ImplementingDatabaseSecurityandAuditing‖,ElsevierDigitalPress,2005
3. Charu C. Aggarwal, Philip S Yu, ―Privacy Preserving Data Mining‖: Models and Algorithms, Kluwer Academic Publishers, 2008.

Reference Books

1. Ron Ben Natan,"Implementing Database Security and Auditing", Elsevier Digital Press, 2005.
2. Michael Gertz and Sushil Jajodia (Editors), Handbook of Database Security: Applications and Trends , ISBN-10: 0387485325. Springer, 2007

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Professional Elective – I

20CSC404 MATHEMATICAL MODELS FOR INTERNET

L	T	P	C
3	0	0	3

Pre-requisite

Course Description:

The mathematical models lead to discrete or continuous processes that may be deterministic or stochastic. Dimensional analysis and scaling are introduced to prepare a model for study. Analytic and computational tools from a broad range of applied mathematics will be used to obtain information about the models. The mathematical results will be compared to physical data to assess the usefulness of the models.

Course Objectives:

1. To introduce several Discrete Mathematical Structures (DMS) found to be serving as tools even today in the development of theoretical computer science.
2. To make the student to be able to transform a given problem into a combination of several simpler statements and arrive at a solution to the problem and be able to prove it logically.
3. To develop logical thinking and its application to computer science. To enhance the student's ability to reason and ability to present a coherent and mathematically accurate argument.
4. To develop the habit of thinking mathematically and introduce the student the theory of graphs.
5. To make the students to be able to apply the abstract concepts of graph theory in modeling and solving non-trivial problems in different fields of study.

UNIT I Mathematical Logic & Predicates 9 hours

Mathematical Logic: Statements and notations, Connectives, Well Formed Formulas, Truth tables, tautology, Equivalence implication, Normal forms, Quantifiers, Universal quantifiers. **Predicates:** Predicative logic, Free & Bound variables, Rules of inference, Consistency. Proof by contradiction, Automatic Theorem proving.

UNIT II Relations & Functions 9 hours

Relations: Properties of binary Relations, Equivalence, transitive closure, Compatibility & Partial ordering Relations, Lattices, Hasse Diagram. **Functions:** inverse function, composition of functions, Recursive functions, Lattice and its properties.

UNIT III Algebraic Structures & Elementary Combinatorics 9 hours

Algebraic Structures: Algebraic systems examples and general properties, Semi groups and monaids, Groups, Sub groups, Homomorphism & Isomorphism. **Elementary Combinatorics** :Basics of counting, combinations & permutations, With repetitions, constrained repetitions, Binomial

Coefficients, Binomial & Multinomial theorems, the principle of inclusion and exclusion. Pigeon hole principles and its application.

UNIT IV Recurrence relations 9 hours

Recurrence relations: Generating Functions, Functions of sequences, Calculating coefficient of generating function, Recurrence relations, solving recurrence relation by substitution and Generating function, Characteristics roots Solution of In homogeneous Recurrence Relation.

UNIT V Graph Theory & Applications 9 hours

Graph Theory: Representation of Graph, DFS, BFS, Spanning Trees, planar graphs.**Graph theory and applications**: Basic concepts Isomorphism and sub graphs, Multi graphs and Euler circuits, Hamiltonian graphs, Chromatic Numbers.

Course Outcomes:

After completion of the course, student should be able to:

1. Develop new models to represent and interpret the data.
2. Apply knowledge of mathematics, probability & statistics, graph theory and logic as it applies to the fields of computer software and hardware.
3. Interpret statements presented in disjunctive normal form and determine their validity by applying the rules and methods of propositional calculus
4. Reformulate statements from common language to formal logic using the rules of propositional and predicate calculus and assess the validity of arguments.
5. Explain the importance of consistency of design, usability and core messaging and Describe the current and emerging technologies relevant to the visual communications industry, from direct-to-plate and on-demand / electronic printing to Internet, multimedia, and digital video.

Text Books:

1. Discrete and combinatorial mathematics-An applied introduction-5th edition- Ralph P.Grimaldi, Pearson Education.
2. Discrete Mathematics for computer Scientists & Mathematicians, J.L. Mott. A. Kandel, T.P. Baker, Prentice Hall.

Reference Books:

1. Discrete mathematical structures with applications to Comp.Science-J.P.Tremblay and R.Manohar, Tata-McGraw-Hill publications.
2. Mathematical foundations of computer science-Dr S.Chandrasekharaiah-Prismbooks Prv.Lt.
3. Logic and Discrete Mathematics, Grass Mann & Trembley, Person Education.
4. Elements of DISCRETE MATHEMATICS – A computer oriented Approach – C L Liu, D P Mohapatra. Third Edition, Tata McGraw Hill

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Professional Elective – I

20CSC405 SCRIPTING LANGUAGE FOR INFORMATION SECURITY

L	T	P	C
3	0	0	3

Pre-requisite None

Course Description:`

This course includes both theoretical as well as practical knowledge of scripting language (client side & server side). So that students can develop more effective and efficient web based application packages.

Course Objectives:

1. To introduce the script programming paradigm.
2. To understand the differences between scripting and non- scripting languages.
3. To provide fundamental concepts of server side script programming and client side script programming.

UNIT I HTML 9 hours

Introduction to HTML, What is HTML, HTML Documents, Basic structure of an HTML document, Creating an HTML document, Mark up Tags, Heading-Paragraphs, Line Breaks, HTML Tags. Elements of HTML: Introduction to elements of HTML, Working with Text, Working with Lists, Tables and Frames, Working with Hyperlinks, Images and Multimedia.

UNIT II JAVA SCRIPT 9 hours

Introduction to JavaScript, Basic Syntax, Control Structures, Writing Functions, Working with Arrays, The Document Object Model, Events Handling, Client-side Validation, Form Validation & RegExps, ASP, Perl CGI, & Form Methods, SSI & Cookies.

UNIT III PHP 9 hours

PHP installation and Introduction, Loops String Functions in PHP, PHP Email Function, PHP Basics, Variables Arrays in PHP with Attributes Date & Time, Image, Uploading File handling in PHP Functions in PHP, Errors handling in PHP.

UNIT IV PYTHON **9 hours**

Introduction to Python, Python basics, Data Types and variables Operators, Looping & Control Structure List, Modules Dictionaries, String Regular Expressions, Functions and Functional Programming, Object Oriented Linux Scripting Environment – Classes, Objects and OOPS concepts, File and Directory Access, Permissions and Controls Socket, Libraries and Functionality Programming, Servers and Clients Web Servers and Client scripting.

UNIT V PERL & NODEJS **9 hours**

Introduction to Perl – Overview of Perl Features, Getting and Installing Perl, Accessing Documentation via perldoc, HTML-Format Reference Documentation, Perl Strengths and Limitations, Security Issues in Perl Scripts. Introduction to Node.js; Events; Streams; Modules; Express; Socket.io; Persisting Data.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Understand, analyze and build dynamic, interactive and secure web sites.
2. Understand current and evolving Web languages for integrating media and user interaction in both front end and back end elements of a Web site.
3. Analysis and reporting of web data and minimizing cyber risks.
4. Applying different testing and debugging techniques and analyzing the web site effectiveness.
5. Applying different cyber security tools and scripting languages to mitigate frequent Cyber-attacks.

Text Books:

1. Deitel, Deitel and Nieto, Internet and Worldwide Web - How to Program, 5th Edition, PHI, 2011.
2. Bai and Ekedhi, The Web Warrior Guide to Web Programming, 3rd Edition, Thomson, 2008.

Reference Books:

1. Computer Programming And Cyber Security for Beginners: Zack Codings (Python Machine Learning, SQL, Linux, Hacking with Kali Linux, Ethical Hacking).
2. Open Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP, J.Lee and B. Ware (Addison Wesley) Pearson Education.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Professional Elective – III

B. Tech Computer Science and Engineering (Cyber Security)

Professional Elective – III

20CSC406 INFORMATION SECURITY STANDARDS AND POLICIES

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

Course Description:

This course introduces students to the policy and management aspects of cybersecurity. It provides the cybersecurity management and policy at the organizational level, cybersecurity public policy at the national level, cyber conflict, policy and diplomacy at the transnational level.

Course Objectives:

This course enables students to

1. Understand the elements of Information Protection, write mechanics and the message.
2. Explain the laws and ethics in Information Security.
3. Learn about the development of Policies in Information Security.
4. Apply the knowledge of Standards and its writing procedures.
5. Gain knowledge on various types of Information Security and its management.

UNIT I INFORMATION PROTECTION & FUNDAMENTALS 9 hours

Elements of Information Protection – Roles and Responsibilities – Common Threats – Policies and Procedures – Risk Management – Typical Information Protection Program.

Writing Mechanics and the Message: Attention Spans – Key Concepts – Topic Sentence and Thesis Statement – The Message – Writing Don'ts.

UNIT II LEGAL, ETHICAL AND PROFESSIONAL ISSUES IN INFORMATION SECURITY 9 hours

Laws and Ethics in Information Security – Relevant U.S. laws – International laws and legal bodies – Ethics and Information Security – Codes of Ethics and Professional organization.

Planning for Security: Information Security Planning and Governance – Information Security Policy, Standards and Practices – Information Security Blueprint – Security Education training and awareness program.

UNIT III POLICY DEVELOPMENT 9 hours

Policy Definitions – Frequently asked questions – Policy key elements – Policy format and basic policy components – Policy content considerations – Program Policy Examples – Topic-specific policy Examples.

UNIT IV STANDARDS AND ITS WRITING PROCEDURES 9 hours

Standards – International Standards – Writing Procedures: Definitions – Writing Commandments – Key Elements in procedure writing – Procedure Checklist – Getting Started – Procedure Styles – Creating a Procedure.

UNIT V CODE OF PRACTICE FOR INFORMATION SECURITY MANAGEMENT 9 hours

Scope – Terms and Definitions – Information Security Policy – Organization Security – Asset Classification and Control – Personnel Security – Physical and Environmental Security – Communications and Operations Management – Access Control Policy – Systems Development and Maintenance – Compliance.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Identify the fundamentals of Information Protection.
2. Analyze the effects of Information Security laws and regulations.
3. Write an Information Security Policy for an organization.
4. Identify Information Security policy frameworks and standards.
5. Recognize the practice for various types of Information Security and its maintenance.

Text Book(s)

1. Mark S. Merkow and James Breithaupt, "Information Security: Principles and Practices", 2021.

2. Sari Greene, "Security Policies and Procedures: Principles and Practices", 2020.

Reference Books

1. Thomas R.Peltier, Information Security Policies, Procedures and Standards, Auerbach Publications, 2001.

2. Michael E.Whitman, Herbert J.Mattord, Principles of Information Security, Course Technology, Fourth Edition, 2011.

3. Harold F. Tipton, Micki Krause, CISSP, Information Security Management Handbook, Auerbach Publications, Sixth Edition, Volume 2, 2008.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Professional Elective – III

20CSC407 CRYPTANALYSIS

L	T	P	C
3	0	0	3

Pre-requisite **20CSC114**

Course Description:

This course provides definitions and constructions of various cryptographic objects, such as pseudorandom generators, encryption schemes, digital signature schemes, message authentication codes, block ciphers.

Course Objectives:

This course enables students to

1. Understand the security and number theory methods in cryptography.
2. Learn about the overview and types of Cryptanalysis, its complexity in attacks.
3. Explain the algorithms used in Cryptanalysis.
4. Gain knowledge on stream and block ciphers.
5. Study the Symmetric and Asymmetric key systems.

UNIT I FOUNDATIONS OF CRYPTOGRAPHY 9 hours

Defining Security in Cryptography – Elementary Number Theory: Modular Arithmetic – Finite Fields – Vector Spaces and Linear Maps – RSA and Diffie-Hellman Cryptosystems – Introduction to Cryptanalysis.

UNIT II TYPES OF CRYPTANALYSIS 9 hours

Linear Cryptanalysis: Overview of Basic Attack – Piling-up principle – Cipher Components analysis – Complexity of Attack.

Differential Cryptanalysis: Overview of Basic Attack – Analysing Cipher Components – Constructing Differential Characteristics – Complexity of Attack.

UNIT III ALGORITRHMS IN CRYPTANALYSIS 9 hours

Linear Algebra: Introduction – Dense Matrix Multiplication – Strassen's algorithm, asymptotically fast Matrix Multiplication – Gaussian Elimination algorithm – Sparse Linear Algebra.

Sieve Algorithms: Eratosthenes's Sieve – Overview – Improvements – Finding primes faster: Atkin and Bernstein's sieve.

UNIT IV STREAM CIPHER AND BLOCK CIPHER 9 hours

Stream Ciphers: Introduction – Shift Registers – ORYX – RC4 – PKZIP.

Block Ciphers: Introduction – Block Cipher Modes – Feistel Cipher – Hellman's Time Memory Trade-Off – CMEA – Akelarre – FEAL.

Side Channel Attacks: Introduction – Types of Attacks – Working of Side Channel Attack - Prevention

UNIT V SYMMETRIC AND ASYMMETRIC KEY SYSTEMS 9 hours

Symmetric Key Systems: Introduction – Boomerang Attack – Integral Cryptanalysis – Davies' Attack – Man-in-the-middle Attack.

Asymmetric Key Systems: Introduction – Merkle-Hellman Knapsack -Arithmetic Key Exchange – RSA – Rabin Cipher – NTRU Cipher.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Explain the security and number theory methods in cryptography.
2. Gains knowledge in types of Cryptanalysis.
3. Analyse the algorithms in Cryptanalysis.
4. Appraise the concepts used in Stream and Block Ciphers.
5. Identify the Public Key Systems and its attacks in real time.

Text Book(s)

1. Christopher Swenson, "Modern Cryptanalysis: Techniques for Advanced Code Breaking", 2020.

2. Helen. F.Gaines, "Cryptanalysis: A Study of Ciphers and their Solutions", 2019.

Reference Books

1. Wade Trappe and Lawrence C.Washington, "Introduction to Cryptography with Coding Theory", 2019.

2. Albrecht Beutelspacher and Marc Batten, "Cryptanalysis: A Comprehensive Introduction to the Art of Breaking Ciphers", 2019.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Professional Elective – III

20CSC408 MULTIMEDIA SECURITY

L	T	P	C
3	0	0	3

Pre-requisite NIL

Course Description:
This course will provide a framework to conduct research and development using multimedia security techniques. It Impart the knowledge of implementation on digital watermarking and multimedia security techniques and design a customary multimedia security system to suit real world applications.

Course Objectives:
This course enables students to

1. Learn the basics of digital watermarking.
2. Study the digital authentication and authorization schemes to perform security issues related to electronic documents, image and video.
3. Discuss the various steganography techniques.
4. Understand the multimedia fingerprinting.
5. Examine the multimedia encryption technique.

UNIT I INTRODUCTION TO DIGITAL WATERMARKING 9 hours

Digital Watermarking Basics: Models of Watermarking, Basic Message Coding, Error Coding, Digital Watermarking Theoretic Aspects: Mutual information and Channel Capacity, Designing a good digital mark, Theoretical analysis of Digital watermarking.

UNIT II WATERMARKING SCHEMES 9 hours

Types of water marking - Spread Spectrum Watermarking, Transform Domain Watermarking, Quantization Watermarking Video Watermarking, Audio Watermarking, Binary Image Watermarking, Robustness to Temporal and Geometric Distortions, Affine resistant transformation.

UNIT III STEGANOGRAPHY 9 hours

Introduction- Conventional Cryptosystem vs Steganography - Digital Image formats- Modern Steganography, Steganography Channels, Steganography Goals, Image: Substitution, Bit Plane Coding, Transform Domain, Audio: Data Echo Hiding, Phase Coding, Video: Temporal technique, Spatial technique.

UNIT IV MULTIMEDIA FINGERPRINTING 9 hours

Multimedia fingerprinting: Fingerprinting basics, marking assumption, Collusion attack, Frame proof and anti-collusion codes, Combining fingerprint modulation with coding, Multicast fingerprinting problem, Efficient security architectures, Finger casting.

UNIT V MULTIMEDIA ENCRYPTION AND PRIVACY PRESERVING PROTOCOLS **9 hours**

Multimedia encryption: Introduction, Goals, Desired Characteristics, Performance metrics, Chaos based, Block based, Transform based techniques.

Privacy preserving protocols: Zero knowledge protocols, Anonymous fingerprinting, public key watermarking, non-perfect secret sharing constructions for anonymous fingerprinting with shared access control.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Discuss the basic idea of digital watermarking.
2. Analyse the watermarking schemes.
3. Acquire the concepts of steganography to access the sensitive information concealing of file, message, image, or video within another file.
4. Learn the multimedia fingerprinting execution.
5. Formulate the steps in multimedia encryption and privacy preserving protocols.

Text Book(s)

1. Shih, F. Y. Digital watermarking and steganography: fundamentals and techniques CRC press, 2017.

2. Singh, Amit Kumar, Mohan, Anand. Handbook of Multimedia Information Security: Techniques and Applications, Springer, Security and Cryptology, 2019.

Reference Books

1. Nematollahi, Mohammad Ali, Vorakulpipat, Chalee, Rosales, Hamurabi Gamboa (2017). Digital Watermarking: Techniques and Trends, Springer, Signals and Communication.

2. Pande, Amit, Zambreno, Joseph (2013). Embedded Multimedia Security Systems, Springer, Image Processing.

3. W. Zeng, H. Yu and C. Lin, Multimedia Security Technologies for Digital Rights Management, Elsevier, UK, 2006.

4. Yi, Xun, Paulet, Russell, Bertino, Elisa (2014). Homomorphic Encryption and Applications, Springer, Security and Cryptology.

5. Cox, I., Miller, M., Bloom, J., Fridrich, J., Kalker, T. (2007). Digital watermarking and steganography. Morgan kaufmann.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Professional Elective – III

20CSC409 INTRODUCTION TO CYBER PHYSICAL SYSTEMS

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

Course Description:

The goal of this course is to introduce students to understand the Cyber Physical Systems(CPS) modelling, analysis, and design and obtain cyber physical systems fundamentals and principles knowledge as building blocks to promote further design and implementation of more complex real time systems. Gain overall understand of the cyber physical systems from that its suit practical, engineering and industrial needs.

Course Objectives:

This course enables students to

1. Understand the cyber physical systems modeling, design and analysis.
2. Familiarize with the basic requirements of CPS
3. Comprehend the cyber physical systems design and implementation in dynamical models.
4. Facilitate to understand the CPS foundations.
5. Equip with essential tools to implement CPS.

UNIT I INTRODUCTION **9 hours**

Introduction: Overview of Continuous, Discrete, and Hybrid Models, Types of IoT, Analysis of Things, Cyber Physical Systems in the real world, Basic principles of design and validation of CPS. Industry 4.0, AutoSAR, IIOT implications, Building Automation, Medical CPS.

UNIT II CPS REQUIREMENTS **9 hours**

Safety Specifications: Specifications, Verifying Invariants, Enumerative Search, Symbolic Search
Liveness Requirements: Temporal Logic, Model Checking, Proving Liveness.

UNIT III CPS IMPLEMENTATION **9 hours**

CPS implementation: From features to software components, Mapping software components to ECUs, CPS Performance Analysis - effect of scheduling, bus latency, sense and actuation faults on control performance, network congestion.

UNIT IV CPS FOUNDATIONS **9 hours**

Symbolic Synthesis for CPS- Security in CPS-Synchronization of CPS-Real-Time Scheduling for CPS

UNIT V APPLICATIONS AND PLATFORMS 9 hours

Medical CPS- CPS Built on Wireless Sensor Networks- CyberSim User Interface- iClebo Kobuki - iRobot Create- myRIO- Cybersim- Matlab toolboxes - Simulink.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Understand the basics of cyber physical systems.
2. Discuss the requirements of CPS.
3. Identify the components implementation, performance, and scheduling.
4. Describe the foundations of CPS.
5. Use the various platforms to implement the CPS.

Text Book(s)

1. Raj Rajkumar, Dionisio De Niz , and Mark Klein, Cyber-Physical Systems, Addison Wesley Professional, 2016.

2. E. A. Lee and S. A. Seshia, "Introduction to Embedded Systems: A Cyber-Physical Systems Approach", 2011.

3. R. Alur, "Principles of Cyber-Physical Systems," MIT Press, 2015.

Reference Books

1. Constance Heitmeyer and Dino Mandrioli, "Formal methods for real-time computing", Wiley publisher, 1996.

2. Jean J. Labrosse, Embedded Systems Building Blocks: Complete and Ready-To-Use Modules in C, The publisher, Paul Temme, 2011.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Professional Elective – III

20CSC410 NETWORK SECURITY AND SECURE CODING

L	T	P	C
3	0	0	3

Pre-requisite NIL

Course Description:

This course provides knowledge of various security attacks and to recognize and remove common coding errors that lead to vulnerabilities. It gives an outline of the techniques for developing a secure application.

Course Objectives:

This course enables students to

1. Introduce the different types of malwares and their behaviors.
2. Know the working mechanism of Intrusion Detection System and Intrusion Prevention System in networks.
3. Learn about Secure Software Development Lifecycle (SDLC) methodologies.
4. Gain knowledge on various vulnerability assessment methodologies and techniques.
5. Understand the importance of secure coding in cyber security.

UNIT I INTRODUCTION TO NETWORK SECURITY 9 hours

Introduction – Security, Attacks, Security Mechanisms, Information Technology Act, Program Security, Program Errors, Malicious Codes, Virus, Trapdoors, Spyware, Malware, Salami Attacks, Threats, Covert Channels, Control against Program, Program Security issues, Protecting Programs.

UNIT II SECURITY IN NETWORKS 9 hours

Introduction – Threats in Networks – Security Controls – Firewalls – Next Generation Firewalls – Intrusion Detection Systems – Intrusion Prevention Systems - Secure E-mails – Administrating Security – Security Planning – Risk Analysis – Organizational Security Policy – Physical Security.

UNIT III SECURE SOFTWARE DEVELOPMENT LIFECYCLE (SDLC) 9 hours

Introduction – Secure Design Principles – Threat Modelling and Risk Assessment – Secure Coding practices – Secure Testing in SDLC – Secure Deployment and Maintenance – Compliance and Regulatory Requirements.

UNIT IV VULNERABILITY ASSESSMENT 9 hours

Introduction – Types of Vulnerabilities – Methodologies in Vulnerability Assessment – Scanning Tools – Assessment Process – Remediation.

UNIT V SECURE CODING IN C, C++ AND PYTHON 9 hours

Introduction – Common Coding Vulnerabilities – Principles and Best Practices – Programming Languages(C, C++, Python) – Secure Error Handling and Logging – Secure Coding in Web Applications – Testing and Verification – Standards and Frameworks.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Explain the various security measures and its act.
2. Identify the intrusion detection techniques and various policies to make an information secure.
3. Recognize the procedure of secure software development lifecycle.
4. Understand the role of vulnerability assessment in the overall security posture of an organisation.
5. Analyze the procedure of writing secure code in different programming languages.

Text Book(s)

1. Ross J.Anderson, "Security Engineering: A Guide to Building Dependable Distributed Systems", 2020.

2. Bryan Sullivan and Vincent Liu, "Web Application Security: A Beginner's Guide", 2020.

3. Robert C.Seacord, "Secure Coding in C and C++", 2013.

Reference Books

1. Robert C. Seacord, "Secure Coding in Java: Developing Defensible Applications", 2017.

2. Michael Zalewski, "The Tangled Web: A Guide to Securing Modern Web Applications", 2011.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Professional Elective – IV

20CSC411 INTRODUCTION TO DIGITAL FORENSICS

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

Course Description:

This course gives overview on application of forensic science principles and practices for collecting, examining, analyzing and presenting digital evidence. It deals with the extraction, preservation, and inspection of storage memory and basic computing power.

Course Objectives:

This course enables students to

1. Understand the need for investigation and the ethics of investigation.
2. Classify the evidence and understand quality control procedures.
3. Understand about Image, Audio and Video forensics
4. Gain knowledge on Network forensic analysis and perform email investigation
5. Identify the forensic tools and perform various tasks.

UNIT I INTRODUCTION 9 hours

Introduction to Forensics-Elements of crime, Knowledge base needed for cyber forensics, The law and Cyber forensics, The Investigative Process-Code of Ethics, Ethics of Investigations, The Evidence, Evidence Management-Collection, Transport, Storage, access control, disposition.

UNIT II FORENSIC SCIENCE 9 hours

Principles and Methods: Scientific approach to Forensics, Identification and Classification of Evidence, Location of Evidence: Storage Media, Hard drives, Hardware Interfaces, Recovering Data, Media File Forensic Steps-Forensic Analysis: Planning, Case Notes and Reports, Quality Control.

UNIT III IMAGE, AUDIO AND VIDEO FORENSICS 9 hours

Standards for video transmission, Acoustic Parameters of Sound, Methods of tampering for digital audio, image/video, Forensic authentication of digital audio, digital image/video, Enhancement of digital image/video, Specific Frame Analysis, Scope & it's Forensic Application in the Field of Security, DVR Examination.

UNIT IV NETWORK FORENSICS 9 hours

Network forensics overview – Securing a Network – Developing procedures for network forensics – Investigating virtual networks – Examining Honeynet projects – E-mail Investigations: Role of client and server in E-mail, Investigating E-mail crimes and violations, E-mail Servers, E-mail Forensic tools.

UNIT V FORENSICS TOOLS **9 hours**

Evaluating Forensics Tool Needs- Tasks performed by forensics tools- Forensics Software Tools: Command-line forensic tools, Linux forensic tools- Forensics Hardware Tools: Forensic workstation, Write-Blocker-Validating and Testing Forensics Software, Mobile Forensic-identification, collection and preservation of mobile evidences,

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Understand basic legal principles regarding digital forensics.
2. Identify the digital evidence through which analyze quality control.
3. Understand various applications with respect to different types of forensics
4. Conduct forensic analysis of both disk images and network data
5. Understand command line forensic tool for recovery and preservation of digital evidence.

Text Book(s)

1. Chuck Eastom, "Certified Cyber Forensics Professional Certification, McGraw Hill, July, 2017.

2. Aboul Ella Hassanien, Mohamed Mostafa Fouad, Azizah Abdul Manaf, Mazdak Zamani, Rabiah Ahmad, Janusz Kacprzyk "Multimedia Forensics and Security Foundations, Innovations, and Applications". Springer 2018.

3. Bill Nelson, Amelia Phillips and Chris Steuart, "Guide to Computer Forensics and Investigations", Cengage Learning, 6th edition, 2019.

Reference Books

1. Marjie T.Britz, "Computer Forensics and Cyber Crime": An Introduction", 3rd Edition, Prentice Hall, 2013.

2. Albert J.Marcella, Jr.Frederic Guillossou "Cyber Forensics": From Data to Digital evidence, Wiley Corporate F&A,2012

3. Anthony T. S. Ho (Editor), Shujun Li, "Handbook of Digital Forensics of Multimedia Data and Devices ", Wiley-IEEE Press 2015.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Professional Elective – IV

20CSC412 CLOUD SECURITY

L	T	P	C
3	0	0	3

Pre-requisite **20CSC113**

Course Description:
This course describes Security aspects of cloud computing. It provides an understanding of the cloud architecture and methods to secure them.

Course Objectives:
This course enables students to

1. Explain about Securing the cloud environment.
2. Know about the various cloud security practices.
3. Demonstrate the security concepts as services.
4. Emphasis the multi tenancy issues in the cyber world.
5. Elaborate the security management to protect the cloud environment.

UNIT I SECURING THE CLOUD **9 hours**

Cloud platforms and architectures - Security issues from the cloud providers perspective, users' perspective - Understanding security and privacy - Cloud Computing risk issues - Security challenges Security requirements for the architecture - Securing private and public clouds Security patterns Cloud security architecture Infrastructure security.

UNIT II SECURITY PROTOCOLS, STANDARDS, STRATEGIES AND PRACTICES **9 hours**

Host security, Compromise response, Security standards Message Level Security (MLS), Transport Level Security, OAuth, OpenID, eXtensible Access Control Markup Language (XACML), and Security Assertion Markup Language (SAML) - Strategies and best practices Security controls: limits, best practices, monitoring Security criteria - assessing risk factors in Clouds.

UNIT III SECURITY CONCEPTS IN CLOUD **9 hours**

Confidentiality, privacy, integrity, authentication, non-repudiation, availability, access control, defence in depth, least privilege- how these concepts apply in the cloud and their importance in PaaS, IaaS and SaaS.

UNIT IV MULTI-TENANCY ISSUES **9 hours**

Isolation of users/VMs from each other- How the cloud provider can provide this- Virtualization System Security Issues: e.g., ESX and ESXi Security, ESX file system security- storage considerations, backup and recovery- Virtualization System Vulnerabilities.

UNIT V SECURITY MANAGEMENT 9 hours

Security management in the cloud – security management standards- SaaS, PaaS, IaaS availability management- access control- Data security and storage in cloud.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Discuss the various concepts of securing the cloud.
2. Understand the utility of different cloud security practices.
3. Demonstrate the cloud security concepts to handle threats.
4. Discuss various multi tenancy issues in the cloud environment.
5. Expose the security management system available to protect the data.

Text Book(s)

1. GautamShroff, Enterprise Cloud Computing Technology Architecture Applications, 2010 [ISBN: 978-0521137355].

2. Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing, A Practical Approach, 2009 [ISBN: 0071626948].

Reference Books

1. Tim Mather, SubraKumaraswamy, ShahedLatif, Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance [ISBN: 0596802765]

2. Ronald L. Krutz , Russell Dean Vines, Cloud Security: A Comprehensive Guide to Secure Cloud computing, Wiley 2010.

3. Securing the Cloud: Cloud Computer Security Techniques and Tactics, by Vic (J.R) Winkler, Elseiver 2011.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Professional Elective – IV

20CSC413 MOBILE AND WIRELESS SECURITY

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

Course Description:

The aim of this course is to study technologies and research problems in the internet, wireless ad hoc and sensor networks, with concentration in security related issues.

Course Objectives:

This course enables students to

1. Gain general knowledge about the concepts of wireless and mobile communication.
2. Learn the different security mechanism and know the adaptation of various physical mediums.
3. Understand current wireless networks and security applications on various networks.
4. Understand the MANET and various protocol algorithms for security.
5. Learn cloud computing challenges and various security mechanism for protection of cloud network.

UNIT I INTRODUCTION **9 hours**

Mobility of bits and bytes, Beginning of wireless, Mobile computing, Dialogue control, Networks, Middleware and gateway, Security Issues in Mobile Communication Security – Wired Vs Wireless, Security Issues in Wireless and Mobile Communications, Security Requirements in Wireless and Mobile Communications.

UNIT II WIRELESS TECHNOLOGIES& LEVELS OF SECURITY **9 hours**

Security of Device, Network, and Server Levels: Mobile Devices Security Requirements, Mobile Wireless network level Security, Server Level Security. Application Level Security in Wireless Networks: Application of WLANs, Wireless Threats, Some Vulnerabilities and Attach Methods over WLANs, Bluetooth, RFID, WIMAX, Mobile IP, GSM,GPRS,CDMA, 3G,4G and 5G networks.

UNIT III WIRELESS LAN & SECURITY **9 hours**

Introduction-Advantages, IEEE 802.11 standards, Architecture, Mobility, Deploying wireless LAN, Mobile Ad hoc and Sensor network. Application Level Security in Cellular Networks: Generations of Cellular Networks, Security Issues and attacks in cellular networks, GSM Security for applications, GPRS Security for applications.

UNIT IV MANET- ROUTING ALGORITHMS **9 hours**

Routing in MANETs - Criteria for classification, Taxonomy of MANET routing algorithms, Topology based routing algorithms - Proactive: DSDV; Reactive: DSR, AODV; Hybrid: ZRP; Position-based

routing algorithms - Location Services-DREAM, Quorum-based; Forwarding Strategies: Greedy Packet, Restricted Directional Flooding-DREAM, LAR. Security in ad-hoc wireless networks, key management, secure routing cooperation in MANETs, instruction detection system.

UNIT V MOBILE OS AND COMPUTING ENVIRONMENT 9 hours

Smart Client Architecture, The Client: User Interface, Data Storage, Performance, Data Synchronization, Messaging. The Server: Data Synchronization, Enterprise Data Source, Messaging. Mobile Operating Systems: WinCE, Palm OS, Symbian OS, Linux, Proprietary OS Client Development: The development process, Need analysis phase, Design phase, Implementation and Testing phase, Deployment phase, Development Tools, Device Emulators

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Familiarize with the issues and technologies involved in designing a wireless and mobile system that is robust against various attacks.
2. Gain knowledge on wireless network attacks and trade-offs in protecting networks.
3. Understand the problems in wireless and mobile security.
4. Learn various security issues involved in MANET.
5. Learn various security issues related to cloud computing.

Text Book(s)

1. W. Osterhage, Wireless Network Security, CRC Press, 2nd edition, 2018, ISBN-10: 1138093793, ISBN-13: 978-1138093799.
2. Ashok Talukder, Hasan Ahmed and Roopa R yavagal ―Mobile Computing Technology, Application and service creation‖, Second edition, McGraw Hill, 2010.
3. Martyn Mallik: Mobile and Wireless Design Essentials, Wiley India, 2003.

Reference Books

1. Randall k. Nichols, Panos C. Lekkas : "Wireless Security Models, Threats and Solutions", 1st Edition, Tata McGraw Hill, 2006.
2. Bruce Potter and Bob Fleck : "802.11 Security" , 1st Edition, SPD

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Professional Elective – IV

20CSC414 MALWARE ANALYSIS

L	T	P	C
3	0	0	3

Pre-requisite NIL

Course Description:

This course introduces the fundamentals of malware and set up static and dynamic protection for malware. It provides various malware behaviour monitoring tools and actionable detection signatures from malware indicators.

Course Objectives:

This course enables students to

1. Understand about the nature of malware and its types.
2. Learn the tools and methodologies used in static analysis.
3. Gain knowledge on tools and methodologies used in dynamic analysis.
4. Study the functioning of malware.
5. Learn the techniques used to detect malware.

UNIT I INTRODUCTION 9 hours

Introduction to Malware - OS Security concepts - Malware threats - Evolution of Malware - Malware types: Viruses – Worms – Rootkits – Trojans – Bots – Spyware – Adware - Logic bombs - Malware Analysis: Static Malware Analysis - Dynamic Malware Analysis.

UNIT II STATIC ANALYSIS 9 hours

X86 Architecture- Main Memory – Instructions - Opcodes and Endianness – Operands – Registers - Simple Instructions - The Stack – Conditionals – Branching - Rep Instructions - C Main Method and Offsets - Antivirus Scanning - Fingerprint for Malware - Portable Executable File Format - The PE File Headers and Sections - The Structure of a Virtual Machine - Reverse Engineering - x86 Architecture - Recognizing C code constructs in Assembly - C++ analysis - Analysing Windows programs - Anti-static analysis techniques – Obfuscation – Packing – Metamorphism - Polymorphism.

UNIT III DYNAMIC ANALYSIS 9 hours

Live malware analysis - Dead Malware Analysis - Analysing traces of Malware – System Calls – API calls – Registries - Network Activities - Anti-dynamic Analysis techniques - Anti-VM, Runtime - Evasion techniques - Malware Sandbox - Monitoring with Process Monitor - Packet Sniffing with Wireshark - Kernel vs. User-Mode Debugging – OllyDbg – Breakpoints – Tracing - Exception Handling - Patching.

UNIT IV MALWARE FUNCTIONALITY 9 hours

Downloader – Backdoors - Credential Stealers - Persistence Mechanisms - Privilege Escalation - Covert malware launching – Launchers - Process Injection - Process Replacement - Hook Injection – Detours - APC injection

UNIT V MALWARE DETECTION TECHNIQUES 9 hours

Signature-based techniques: Malware Signatures - Packed Malware Signature - Metamorphic and Polymorphic - Malware Signature.

Non-Signature-based techniques: Similarity-based techniques, Machine-Learning methods, Invariant inferences.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Analyze the nature of malware and its capabilities.
2. Understand the tools and methodologies for protecting static malware environment.
3. Define the tools and methodologies for protecting dynamic malware environment.
4. Identify the techniques involved in the functioning of malware.
5. Analyze the techniques to detect the malware.

Text Book(s)

1. Michael Sikorski, Andrew Honig and Chris Eagle, “Practical Malware Analysis for IT Security: Dissecting Malicious Software”, 2020.

2. Victoria Rodriquez and Craig Schiller, “Malware Analysis: An Introduction”, 2018.

Reference Books

1. Joshua Saxe and Hillary Sanders, “Malware Data Science: Attack Detection and Attribution”, 2018.

2. Michael Hale Ligh, Andrew Case, Jamie Lavy and Aaron Walters, “The Art of Memory Forensics: Detecting Malware and Threats in Windows, Linux and Mac Memory”, 2014.

3. Michael Sikorski and Andrew Honig, “Practical Malware Analysis: The Hands-on Guide to dissecting Malicious Software”, 2012.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Professional Elective – IV

20CSC415 IoT SECURITY

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

Course Description:

The aim of this course is to strengthen knowledge about the Internet of Things (IoT) and the security platforms. Identifies the privacy and safety concerns related to the implementation of an IoT infrastructure.

Course Objectives:

This course enables students to

1. Understand the concepts of Internet of Things.
2. Gain knowledge on Security requirements in IoT.
3. Understand the cryptographic fundamentals for IoT.
4. Learn the privacy protection and Trust management.
5. Study the Internet of Things (IoT) Security protocols and Security framework.

UNIT I OVERVIEW OF INTERNET OF THINGS 9 hours

Internet of Things, IoT Conceptual Framework, IoT Architecture View, Technology behind IoT, Sources of IoT, M2M Communication, IoT/M2M Systems Layers and Design Standardization, Communication Technologies, Data Enrichment, Data Consolidation and Device Management at Gateway, Ease of Design and Affordability.

UNIT II SECURITY IN IoT 9 hours

Introduction to IoT privacy and security, Vulnerabilities, Security requirements and threat analysis, IoT Security Tomography and layered attacker model. Insufficient Authentication/Authorization, Insecure Access Control, Threats to Access Control, Privacy, and Availability , Attacks Specific to IoT.

UNIT III CRYPTOGRAPHIC FUNDAMENTALS FOR IoT 9 hours

Fundamentals of cryptography, Secrecy and Secret-Key Capacity, Authentication/Authorization for Smart Devices, Transport Encryption, Secure Cloud/Web Interface, Secure Software/Firmware, Physical Layer Security.

UNIT IV PRIVACY PRESERVATION AND TRUST MODELS FOR IoT 9 hours

Concerns in data dissemination – Lightweight and robust schemes for Privacy protection – Trust and Trust models for IoT – self-organizing Things - Preventing unauthorized access.

UNIT V SECURITY PROTOCOLS FOR IoT ACCESS NETWORKS 9 hours

Time Based Secure Key Generation -Security Access Algorithm: Unidirectional, Bidirectional Transmission - Cognitive Security - IoT Security Framework - Secure IoT Layers - Secure Communication Links in IoT - Secure Resource Management, Secure IoT Databases.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Describe the basics of securing Internet of Things.
2. Understand the main threats and attacks in IoT Environment.
3. Describe the authentication mechanisms for IoT security and privacy.
4. Analyze the need for Privacy and security models for the Internet of Things.
5. Learn various security issues related to IoT access network.

Text Book(s)

1. Orchestrating and Automating Security for the Internet of Things: Delivering Advanced Security Capabilities from Edge to Cloud for IoT, by Anthony Sabella, Rik IronsMclean, Marcelo Yannuzzi, Publisher: Cisco Press, Release Date: June 2018,ISBN:9780134756936.

2. Securing the Internet of Things, Shancang Li Li Da Xu, Syngress, 2017, Elsevier,ISBN: 978-0-12-804458-2.

Reference Books

1. Fei Hu, "Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations ", ISBN: 9781498723183, CRC Press, 2016. 6.

2. Aditya Gupta, "The IoT Hacker‟s Handbook: A Practical Guide to Hacking the Internet of Things", ISBN: 1484242998, Apress publisher, 2019.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Professional Elective – V

20CSC416 CYBER SECURITY FRAMEWORK

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

Course Description:

This course discusses about the cybersecurity framework which is emerging the current digital era. It provides knowledge on information and network security, security management, prevention of intrusion, improving VPN security, system security and application security. It also describes the cybersecurity framework.

Course Objectives:

This course enables students to

1. Describe the information and network security concepts.
2. Learn the security management techniques in the cyber world.
3. Understand the intrusion detection and security for VPN.
4. Emphasis various system and application security services.
5. Demonstrate the cybersecurity framework with international standards.

UNIT I INFORMATION AND NETWORK SECURITY 9 hours

Information security – Types of Attacks – Goal for security- E-commerce security – Computer Forensics – Steganography – Security threats – Weak/Strong passwords and Passwords Cracking – Insecure Network Connections.

UNIT II CYBER SECURITY FRAMEWORK OVERVIEW 9 hours

Framework Introduction – Overview – Risk Management and Cybersecurity Framework – Framework Core – Framework Implementation Tiers – Framework Profile – Coordination of Framework Implementation – Establishing/Improving Cybersecurity – Communicating with stakeholders – Buying Decisions – Identifying New Opportunities – Self-Assessing Cybersecurity Risk with the Framework.

UNIT III SECURITY MANAGEMENT 9 hours

Overview of Security Management – Information Classification process – Security policy – Risk Management – Security Policy – Risk Management – Security Procedure and Guidelines – Business Continuity and Disaster Recovery.

UNIT IV INTRUSION DETECTION AND SECURITY FOR VPN 9 hours

Identification and Authorization – Intrusion Detection System – Intrusion Prevention System – Firewalls – Types of Firewalls – Features of Firewalls – VPN Security – Security in Multimedia Networks – HPC – Cluster and Computing Grids – Virtualization and Cloud Technology.

UNIT V SYSTEM AND APPLICATION SECURITY 9 hours

Designing Secure Operation Systems – Controls to enforce security services – Information Security models -Desktop Security – Database Security – Email Security – Web Security – OS security.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Explain the various information and network security concepts.
2. Understand the security management techniques.
3. Demonstrate the intrusion detection and security for VPN.
4. Discuss various system and application security in the cloud environment.
5. Expose the cybersecurity framework in the digital world.

Text Book(s)

1. Pfleeger, C.P., Security in Computing 5th Edition, Prentice Hall, Copyright 2010 ISBN 0-13-239077-9.

2. Dr. Jeetendra Pande, Introduction to Cyber Security, Uttarakhand Open University, 2017. ISBN: 978-93-84813-96-3

Reference Books

1. Schneier, Bruce. Applied Cryptography, Second Edition, John Wiley & Sons, 1996.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Professional Elective – V

20CSC417 DATA SCIENCE

L	T	P	C
3	0	0	3

Pre-requisite **20MAT111**

Course Description:

This course will introduce students to this rapidly growing field Data Science and equip them with some of its basic principles. Students will learn concepts and techniques they need to deal with various facets of data science practice, including data collection and integration, Exploratory Data Analysis, Predictive modeling, descriptive modeling and Forecasting concepts.

Course Objectives:

This course enables students to

1. Understand Exploratory Data Analysis.
2. Illustrate Unsupervised Learning concepts.
3. Explain Supervised Learning concepts.
4. Explain Forecasting methods.
5. Apply Text Mining methods.

UNIT I INTRODUCTION **9 hours**

Why Data Science, Exploring business objectives, Work flow from data to deployment, Measuresof Central Tendency, Measures of Variability, Data Visualization plots and graphs, skewness, Kurtosis, Probability, Random Variable, Confidence Intervals, Hypothesis Testing, Z and t Statistic, Data transformation.

UNIT II UNSUPERVISED LEARNING **9 hours**

Association Rules-Support, Confidence and Lift measures, Apriori Algorithm, Generation of Association rules, Principal Component Analysis, Clustering- K-means, Hierarchical clustering methods

UNIT III SUPERVISED LEARNING **9 hours**

Regression - Simple Linear Regression, Multiple Linear Regression Classification- Logistic Regression, Decision Tree, Overfitting, Under fitting, Complexity of Model, Classifier accuracy measures, Ensemble methods -Bagging, Boosting, Stacking, Random Forest, **KNN** Classifier.

UNIT IV FORECASTING METHODS 9 hours

Forecasting – Forecasting Analytics, Time Plot, Lag plot, ACF plot, Aspect Ratio, Time Series Components (Trend, Seasonal, Irregular), Model based methods- Naïve, Simple Average, Moving Average, Weighted Moving Average. Data driven methods -Simple Exponential Smoothing, Holt's method, Winter's method. AR(p) model, MA(q) model, ARMA(p,q) model, Box Jenkins ARIMA model building.

UNIT V NEURAL NETWORKS AND TEXT MINING 9 hours

Neural Networks – Perceptron, Multi-Layer Perceptron using Back Propagation method. Text Mining - Applications, Complexity of Unstructured Text, Text Mining methods- Bag of words, Vector Source Model, Emotion Mining.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Examine Exploratory Data Analysis for given data set.
2. Implement Unsupervised Learning algorithms for the given data set.
3. Apply Supervised Learning algorithms for the given data set.
4. Design Forecasting methods.
5. Illustrate MLP using Back Propagation method and Text Mining methods.

Text Book(s)

1. Aurelien Geron, Hands on Machine Learning with Scikit -Learn , Keras and Tensor Flow Concepts, Tools and Techniques to build intelligent Systems,2nd Edition by O'Reilly Media Publishers,2019.

2. Laura Igual Santi Seguí, Introduction to Data Science, A Python approach to concepts andApplications, Springer-2017.

Reference Books

1. Cathy O'Neil and Rachel Schutt ,Doing Data Science, Straight Talk From The Frontline, O'Reilly. 2014

2. Joel Grus, Data Science from Scratch: First Principles with Python, O'Reilly Media, 2019.

3. Amir Aczel, Jayavel Souder Pandian, P. Saravanan, Complete Business Statistics, Mc Graw Hill publishers,2012.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Professional Elective – V

20CSC418 BLOCKCHAIN TECHNOLOGY

L	T	P	C
3	0	0	3

Pre-requisite **20CSC111**

Course Description:

This course is designed for the understanding of block chain technology and cryptocurrencies. Students will able to develop secure applications using block chain concepts, design and develop automated smart contracts, implementation of industry-specificblock chain models and frameworks.

Course Objectives:

This course enables students to

1. Introduce the concept of block chain.
2. Explain the architecture of block chain.
3. Introduce the concept of bitcoin.
4. Understand bitcoin network, payments, clients, and APIs.
5. Introduce the concept of Ethereum.

UNIT I INTRODUCTION TO BLOCK CHAIN 9 hours

Introduction to Block chain, How Block chain works, Block chain vs Bitcoin, Practical applications,public and private key basics, pros and cons of Block chain, Myths about Bitcoin.

UNIT II BLOCK CHAIN ARCHITECTURE 9 hours

Architecture, versions, variants, use cases, Life use cases of block chain, Block chain vs sharedDatabase, Introduction to cryptocurrencies, Types, Applications.

UNIT III CONCEPT OF DOUBLE SPENDING 9 hours

Concept of Double Spending, Hashing, Mining, Proof of work. Introduction to Merkel tree, Privacy, payment verification, Resolving Conflicts, Creation of Blocks.

UNIT IV INTRODUCTION TO BITCOIN 9 hours

Bot coin introduction, key concepts of Bitcoin, Merits and De Merits Fork and Segwits, Sending and Receiving bitcoins, choosing bitcoin wallet, Converting Bitcoins to Fiat Currency.

UNIT V INTRODUCTION TO ETHEREUM 9 hours

Introduction to Ethereum, Advantages and Disadvantages, Ethereum vs Bitcoin, Introduction to Smart contracts, usage, application, working principle, Law and Regulations. Case Study.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Demonstrate the basics of Block chain concepts using modern tools/technologies.
2. Analyze the application of specific block chain architecture for a given problem.
3. Evaluate the usage of Block chain implementation/features for the given problem.
4. Exemplify the usage of bitcoins and its impact on the economy.
5. Understand the basic concepts of Ethereum and its regulations.

Text Book(s)

1. Beginning Block Chain: A Beginner's Guide to Building Block chain Solutions by Arshdeep Bikramaditya Signal, Gautam Dhameja PriyansuSekhar Panda., APress,2018

2. Block Chain Applications: A Hands-On Approach by Bahga, Vijay Madisetti,2017

3. Block chain by Melanie Swan, OReilly,2015

Reference Books

1. Bitcoin and Cryptocurrency Technologies by Aravind Narayan. Joseph Bonneau, princton,2016

2. Bitcoin and Block Chain Basics: A non-technical introduction for beginners by Arthu.T Books,2019

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Professional Elective – V

20CSC419 PUBLIC KEY INFRASTRUCTURE AND TRUST MANAGEMENT

L	T	P	C
3	0	0	3

Pre-requisite 20CSC114

Course Description:

The goal of this course is to understand the public key infrastructure in wireless networks which can perform Identity Management Process ,key infrastructure and the basic of Trust Management.

Course Objectives:

This course enables students to

1. Understand the concept of public key infrastructure.
2. Explain the need for a rigorous identity management process and its role in a public key infrastructure.
3. Differentiate the necessary components of a certificate policy and practices statement.
4. Understand the implementation of public key infrastructure which includes the technology, policy, standards and long-term maintenance considerations.
5. Understand different secure mechanisms of cryptography.

UNIT I PUBLIC KEY INFRASTRUCTURE(PKI) CONCEPTS 9 hours

Pervasive security services, Building a comprehensive security model Uses of cryptography, devil and Alice concept. Principle of Cryptography. Block cipher modes of operation and data transformation for asymmetrical algorithms, Cryptographic Protocols, Protocol properties, Attributes of cryptographic protocols.

UNIT II PKI MANAGEMENTS 9 hours

Crypto Hardware and software, Smart cards, Universal Crypto interface, Real world attacks, Evaluation and certification, Public Key Infrastructure, PKI Works.

UNIT III COMPONENTS OF PKI 9 hours

Directory service, Requesting certificate revocation information, Practical Aspects Of PKI Construction- The course of construction of PKI, Basic questions about PKI construction, The most important PKI suppliers.

UNIT IV PKI STANDARDS AND TRUST MANAGEMENT 9 hours

The internet and the OSI model The OSI model, Crypto standards for OSI Layers 1 and 2-Crypto extensions for ISDN (Layer 1), Cryptography in the GSM standard (Layer 1), Crypto extensions for PPP (Layer 2), Virtual private networks.

UNIT V SECURE CRYPTO PROTOCOLS 9 hours

IPsec and IKE, IPsec, IKE, SKIP, Critical assessment of IPsec, Virtual private network with IPsec, SSL, TLS and WTLS (Layer 4)-SSL working method, SSL protocol operation, Successful SSL, Technical comparison between IPsec and SSL, WTLS.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Distinguish between public key technology and a public key infrastructure.
2. Understand the relationship of identity management to PKI
3. Learn the components of a public key infrastructure.
4. Analyze the issues related to Trust management mechanisms.
5. Understand Secure Crypto protocols like SSL and so on.

Text Book(s)

1. Johannes A. Buchmann, Evangelos Karatsiolis, Alexander Wiesmaier,"Introduction to Public Key Infrastructures", Springer Berlin Heidelberg,2013

2. Bruce Scheneir: "Applied Cryptography", 2/E, John Wiley, 1996.

3. Klaus schmeh:"Cryptography and public key infrastructure on the internet", 1st Edition, Allied Publishers, 2004.

Reference Books

1. Philip. Robinson, Harald. Vogt, Waleed. Wagealla ,"Privacy, Security, and Trust Within the Context of Pervasive Computing", 1/E, Springer, 2004.

2. Menezes, Oorschot, Vanstone: "Handbook of Applied Cryptography", CRC Press, 1996.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Professional Elective – V

20CSC420 INFORMATION RETRIEVAL AND SEARCH ENGINE

L	T	P	C
3	0	0	3

Pre-requisite 20CSC403

Course Description:

This course will help the learner to identify and develop secured information storage systems, implement data anonymity for secured data retrieval and optimized utilization of search engines.

Course Objectives:

This course enables students to

1. Understand the overview of the information retrieval system.
2. Learn the models and evaluation methods in the retrieval system.
3. Examine the text classification process and clustering techniques.
4. Know how the search engine and its architecture works.
5. Analyze the recommender system available.

UNIT I INTRODUCTION 9 hours

Information Retrieval – Early Developments – The IR Problem – The User Task – Information versus Data Retrieval - The IR System – The Software Architecture of the IR System – The Retrieval and Ranking Processes.

UNIT II MODELS AND EVALUATION 9 hours

Basic IR Models - Boolean Model - TF-IDF (Term Frequency/Inverse Document Frequency) Weighting - Vector Model – Probabilistic Model – Latent Semantic Indexing Model – Neural Network Model – Retrieval Evaluation – Retrieval Metrics — Reference Collection – User-based Evaluation.

UNIT III CLUSTERING AND TEXT MINING 9 hours

Unsupervised Algorithms: Clustering – K-means, K-medoids, Supervised Algorithms: Multi-Layer Perceptron (MLP), Support Vector and Support Vector Machine (SVM), Confusion matrix - Precision and Recall - Text mining Overview.

UNIT IV SEARCH ENGINE 9 hours

Basics of Search Engine - The Web – Search Engine Architectures – Cluster based Architecture – Distributed Architectures – Search Engine Ranking –Search Engine User Interaction – Browsing – Applications of a Web Crawler – Taxonomy – Architecture and Implementation – Scheduling Algorithms – Evaluation.

UNIT V RECOMMENDER SYSTEM 9 hours

Recommender Systems Functions – Data and Knowledge Sources – Recommendation Techniques – Basics of Content-based Recommender Systems – High Level Architecture – Advantages and Drawbacks of Content-based Filtering.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Understand the retrieval system in the digital world.
2. Analyze the models and evaluation of the retrieval system.
3. Execute the various text classification and clustering techniques.
4. Learn how the search engine works.
5. Exhibit the recommender systems for the data retrieval process.

Text Book(s)

1. Introduction to Information Retrieval by Christopher Manning, Prabhakar Raghavan, and Hinrich Schütze, Cambridge University

2. Modern Information Retrieval: The Concepts and Technology behind Search by Ricardo Baeza-Yates and Ribeiro-Neto, 2010.

Reference Books

1. Search Engines: Information Retrieval in Practice by Croft, Metzler and Strohman, 2010.

2. Information Retrieval – Implementing and Evaluating Search Engines by Büttcher, Clarke and Cormack, MIT Press, 2010.

3. EMC Corporation, Information Storage and Management, Wiley India, 2009.

4. Balaji Raghunathan, "The Complete Book of Data Anonymization – from Planning to Implementation", CRC Press, 2013

5. Robert Spalding, "Storage Networks: The Complete Reference", Tata McGraw Hill, Osbome, 2003.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Skill Oriented Courses

B. Tech Computer Science and Engineering (Cyber Security)

Skill Oriented Course - I

20CSC601 WEB SCRIPTING

L	T	P	C
1	0	2	2

Pre-requisite **NIL**

Course Description:

This course will expose students to the techniques used in programming web pages for interactive content. The course begins by reviewing basic web technologies (HTML, CSS style sheets, XML, JavaScript (Node and Angular) and jQuery and exploring the use of event-driven programming in JavaScript to add interactive elements such as buttons and text fields to web pages. This course provides the knowledge necessary to design and develop dynamic, database-driven web pages using PHP. Students also learn how to configure PHP and Web Servers like Apache, IIS, WAMP and XAMPP.

Course Objectives:

1. To build web applications using HTML, CSS and PHP with client side validations.
2. To build XML documents with DTD, Schemas and style sheets.
3. To maintain session management tracking using cookies & HTTP Sessions.
4. To develop a web application with database interaction using Node JavaScript and Angular JavaScript
5. To build jQuery enabled web applications.

UNIT I HTML & CSS **6 hours**

Introduction to HTML, HTML5 New Features, Structural, Content, Application-focused tags. History of CSS, The Power of CSS, Selectors and Pseudo Classes, Fonts and Text Effects, Colors.

1. Creation College Website using HTML.
2. Design a website using style sheets so that the pages have uniform style.

UNIT II INTRODUCTION TO JAVASCRIPT **6 hours**

Introduction to JavaScript, Comments, Variables, Exploring JavaScript Data Types, Popup Boxes, Objects, Functions, Conditions, Loops, Form Validation.

3. Design a form and validate all the controls placed on the form using Java Script.
4. Write a JavaScript program to measure the time taken by a function to execute.

UNIT III JQUERY WITH HTML **6 hours**

Introduction to jQuery, Installation, Selectors, Events, Effects, Callbacks, jQuery and HTML, jQuery

5. Working on Blink text using jQuery.
6. Using jQuery right click to toggle background color.

UNIT IV INTRODUCTION TO XML AND PHP DATABASE **6 hours**

Introduction to XML, Creating XML Documents, XSL, PHP Concepts: Sessions, authenticating users Database Access: Database Concepts, MYSQL database connectivity and operations.

7. Display Library information using XML.
8. Write a PHP program to store page views count in SESSION, to increment the count on each refresh, and to show the count on web page,
9. Write a PHP program to connect to that database and extract data from the tables and

display them. Experiment with various SQL queries.

UNIT V NODEJS AND ANGULAR JS **6 hours**

Introduction to Node JS, Advantage of Node JS, File System: Using file operation. Data base Connectivity: Connecting strings and configuring. Database operations on create table data -Angular JS forms.

10. Working on file write, read and delete using Node.js
11. Write a Node JavaScript program to connect to that database and extract data from the tables and display them.
12. Using AngularJS to read input value from text box and will be displayed it.
13. Using AngularJS to demonstrate Arithmetic operations of two numbers.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Design pages with HTML and CSS attributes.
2. Design and develop web applications with the support of client side validations.
3. Use well-formed XML documents and develop PHP scripts with may support of object oriented features.
4. Manage the session in web browser through Cookies & Sessions and able to communicate with other web pages through form GET and POST methods.
5. Design and develop web applications with the database interactions (thorough SQL queries) and apply Node JavaScript and Angular JavaScript for faster performance.

Text Books:

1. PHP 5 Recipes A problem Solution Approach Lee Babin, Nathan A Good, Frank M.Kromann and Jon Stephens.
2. Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP, J.Leeand B.Ware(Addison Wesley) Pearson Education.
3. Professional Angular JS, Valeri Karpov and Diego Netto, John Willey Edition.
4. Beginning Node.JS by Basarat Syed, 2014.

Reference Books:

1. HTML & CSS:The Complete Reference ,Thomas.A Powel “Fifth Edition”Kindle Edition,2017
2. Marty Hall and Larry Brown,”Core Web Programming” Second Edition, Volume I andII, Pearson Education, 2001. Learning jQuery, Jonathan Chaffer, Karl Swedberg, Third Edition, Packt Publishing Ltd
3. HTML & CSS:The Complete Reference ,Thomas.A Powel “Fifth Edition”Kindle Edition,2017
4. Marty Hall and Larry Brown,”Core Web Programming” Second Edition, Volume I andII, Pearson Education, 2001. Learning jQuery, Jonathan Chaffer, Karl Swedberg, Third Edition, Packt Publishing Ltd

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Skill Oriented Course - I

20CSC602 ANDROID APPLICATION DEVELOPMENT

L	T	P	C
1	0	2	2

Pre-requisite **NIL**

Course Description:
This course is concerned with the development of applications on Android platform. Android is used as a basis for the development of mobile applications. This course starts with the basic concepts of Java, history of android and architecture. It also covers the development of applications using widgets, events, networking. It provides ideas on sensors, their types and writing programs based on sensor classes for application development. They will design and develop Mobile applications with the use of J2ME, like SMS, MMS, Gaming, Multimedia, JavaFX & Android.

Course Objectives:

This course enables students to

1. Understand Android history and its fundamentals and know the building blocks of android
2. Get idea on the creation of android user interface and its testing mechanisms
3. Identify the usage of threads, broadcast receivers, indents, services and their working methodology
4. Know about the storage mechanism in android using SQLite and the usage of content providers

5.Recognize the usage of android widgets and sensors in android based applications

UNIT I **INTRODUCTION AND INSTALLATION OF ANDROID TOOLS** **6 hours**

Installation and Use of Android Tools: Installing the Android SDK - Anatomy of an Android Project Drawable Resources – XML Introduction - Creating user interface using XML – Overview of Android Building Blocks.

1. Develop an android application to display a simple text in the emulator
2. Develop an android application to display the internal keyboard in the emulator

UNIT II **RECON AND HIJACKI USER INTERACTION** **6 hours**

Input Components – Text View – Image View – List View and Alert Dialogues – Menus: Popup, Options and Context Menus – Screen Navigation through App Bar – Recycler View – Material Design – Testing the User Interface

3. a) Write an android program to display a message in the toast
   b) Write an android program to input a text through a text and the same must be displayed in the toast when a button is clicked on the screen
4. a) Develop an application to perform 5 arithmetic operations: Addition, Subtraction, Multiplication, Division and Modulo operation with necessary user interface creation
   b) Develop an android application to process a student mark list by creating proper UI using

UNIT III THREADS, LOADERS AND ASYNCTASK LOADER, SERVICES **6 hours**

Threading in Android – AsyncTask – Loaders – AsyncTask Loader -Alarms and system services – Examples on alarms and services – Services: Services Life Cycle – Intent Service – Implementing Intent Service – Notifications.

5. Write an android application to create a calculator
6. Create an android UI that consists of Different Departments of a company namely Production, Finance, Marketing and HR. If the user clicks on any department, it should show details of that department. Use indents.

UNIT IV SAVING, RETRIEVING AND LOADING DATA **6 hours**

Android File systems and Files, Databases on Android - SQLite - Status Contract Class, Update Refresh Service – Cursors – Backups - Content Providers: Overview – Role of Content Providers, Content Resolver.

7. Design an android application to display a list of items on the android screen. If the user clicks any one of the lists items a dialogue box should show that the user has clicked that particular item (Use array adopters)
8. Develop an android application to show some categories such as education, entertainment, health, provisions etc., If the user clicks on any one of the items it should show the sub categories of the category and if is again clicked it should the details of those items. (Use indents and lists)
9. Design an android application to create a service that shows the service is running in the background in the form of a toast

UNIT V APPLICATIONS WIDGETS, INTERACTION AND SENSORS **6 hours**

App Widgets: Creation of Application Widgets - Interaction and Animation- Sensors: Sensor API in Android - Motion Sensor, Position Sensor, Sensor Values, Sensor Manager Class, Sensor Event class, Sensor Event Listener.

10. Develop an android application to demonstrate the concept of Fragments in Android
11. Develop an android application to demonstrate the database connectivity with the SQLite database to post and retrieve data through the User Interface (Example: Student mark list processing, Email Registration and Login, Products and sales)
12. Demonstrate the usage of Sensors in android by developing proper application.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Work on android basic components and Install android
2. Create User Interfaces with various Layouts and views using android building blocks
3. Work with Broadcast Receivers and Services
4. Create Database in Android, Store and Retrieve data using SQLite and Content Providers
5. Develop widgets, Wall papers for an android application and write programs based on Sensors

Text Book(s)

1.Android Programming-The Big Nerd Ranch Guide, Bill Philips, Christ Stewart, Kristin Mariscano, Big Nerd Ranch publishers, 3rd Edition,2017.
2.Android Programming for Beginners, John Horton, PACKT publishers,2018.

Reference Books

1. Android application Development-Black Book, Pradeep Kothari, dreamtech,2014.
2. Android System Programming, Roger Ye, PACKT publishers,2017.

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Skill Oriented Course - II

20ENG601 CORPORATE COMMUNICATION

L	T	P	C
1	0	2	2

Pre-requisite: **20ENG201**

Course Description:

English is practical and it is a must for any institution to provide students with opportunities to indulge in actively applying their language skills. Thus the Communication Skills Lab facilitates students with adequate opportunities to put their communication skills in use. It also accommodates peer learning by engaging students in various interactive sessions. This lab will be accompanied by a practical lab component.

Course Objectives:

This course enables the students to –

1. Focus on their interactive skills
2. Develop their communicative competency
3. Fortify their employability skills
4. Empower their confidence and overcome their shyness
5. Become effective in their overall performance in the industry

UNIT I LISTENING SKILLS **8 hours**

Listening/watching interviews, conversations, documentaries, etc.; Listening to lectures, discussions from TV/Radio/Podcast.

UNIT II SPEAKING **10 hours**

Articulation of sounds; Intonation.; Conversational skills (Formal and Informal); Group Discussion; Making effective Oral presentations**:** Role play.

UNIT III READING SKILLS **8 hours**

Reading for main ideas; Applying background knowledge to predict content; Skimming; Scanning; Making inferences; Reading different genres of texts ranging from newspapers to creative writing; Reading Comprehension.

UNIT IV WRITING SKILLS **9 hours**

Writing an introduction; Essay structure; Descriptive paragraphs; Writing a conclusion.
Writing job applications and resume; Emails; Letters; Memorandum; Reports; Writing abstracts and summaries; Interpreting visual texts.

UNIT V INTERVIEW SKILLS 10 hours

Different types of interviews: Answering questions and offering information; Mock interviews; Body Language.

Course Outcomes:

At the end of the course, learners will be able to—

1. Read articles from magazines and newspapers
2. Participate effectively in informal conversations
3. Introduce themselves and their friends and express opinions in English
4. Comprehend conversations and short talks delivered in English
5. Write short essays of a general kind, draft Reports and personal letters and emails in English.

Text Books:

1. Sanjay Kumar and Pushp Lata; Communication Skills; Oxford University Press, 2012.
2. Sabina Pillai and Agna Fernandez; Soft Skills and Employability Skills; Cambridge University Press, 2018.
3. S.P. Dhanavel; English and Communication Skills for Students of Science and Engineering; Orient Blackswan, 2009.
4. M. Ashraf Rizvi; Effective Technical Communication; Tata Mc Graw Hill Co. ltd, 2005.

Reference:

1. Dr. M.Adithan; Study Skills for Professional Students in Higher Education; S.Chand & Co. Pvt., 2014.
2. Guy Brook Hart & Vanessa Jakeman; Complete IELTS: Cambridge University Press, 2014.
3. Vanessa Jakeman & Clare Mcdowell; Action Plan for IELTS: Cambridge University Press, 2006.
4. Guy Brook Hart; Instant IELTS; Cambridge University Press, 2004.
5. S.P.Bakshi & Richa Sharma; Descriptive General English; Arihant Publications, 2012.
6. Charles Browne, Brent Culligan 7 Joseph Phillips; In Focus (level 2); Cambridge University Press.
7. Steven Gershon; Present Yourself 2 (second edition); Cambridge University Press.
8. Leo Jones; Let's Talk 3 (second edition); Cambridge University Press.
9. Nutall J. C.; Reading Comprehension; Orient Blackswan.
10. www.cambridgeenglish.org/in/
11. https://learnenglish.britishcouncil.org/en/english-grammar
12. https://www.rong-chang.com/

Mode of Evaluation: Continuous Internal Evaluation, Practical Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Skill Oriented Course - III

20CSC603 WEB AND DATABASE SECURITY

L	T	P	C
1	0	2	2

Pre-requisite NIL

Course Description:

This course introduces fundamental concepts of database security. This also discusses implementation security in web and database application development by including various intrusion detection and security audit mechanism.

Course Objectives:

This course enables students to

1. Understand various access control mechanism for web & database application.
2. Be exposed to identify various vulnerabilities of we application development.
3. Be familiar with different types of intrusion detection mechanism.
4. To utilize different types security audit methods
5. To understand forgery attacks on web sites

UNIT I INTRODUCTION TO DATABASES AND SQL 6 hours

Understanding relational databases - Basics of SQL - Web Application Security - SQL Injection Attacks - Preventing SQL Injection - Web Application Firewall (WAF) - Database Security and Access Control - Discretionary Access Control (DAC) and Tools - Securing Web Application Interfaces.

1. Creation and manipulation of database using SQL scripts and graphical interfaces.
2. Implementing DAC: Implementation of database security policies using DAC in oracle10g/SQL server

UNIT II MANDATORY ACCESS CONTROL (MAC) 6 hours

MAC - Principles - Implementation - Comparison of MAC and DAC - Trojan Horse Attacks and MAC Mitigation - Data Labelling and Classification - Virtual Private Database (VPD) – Implementation in Oracle 10g - Fine-Grained Access Control in Web Applications.

3. . Implementing of MAC to ensure confidentiality and control information flow using either Oracle 10g or SQL server. This provides exposure to understand the concepts of MAC andTrojan horse
4. Implementation of Virtual Private Database using View using Oracle 10g or SQL server

UNIT III HTML INJECTIONS AND CROSS-SITE SCRIPTING (XSS) 6 hours

HTML injection - Types of HTML injection attacks - Cross-Site Scripting (XSS) vulnerabilities - Types of XSS attacks: Stored XSS, Reflected XSS, DOM-based XSS - Securing Web Applications Against HTML Injections and XSS - Content Security Policy (CSP)

5. Design a method to simulate the HTML injections and cross-site scripting (XSS) to exploitthe attackers.
6. Determine HTML injection bugs and possible measures to prevent HTML injection exploits.

UNIT IV BUFFER OVERFLOW AND HEAP ATTACKS 6 hours

Consequences of buffer overflow and heap-based vulnerabilities - Anatomy of Buffer Overflow Attacks - Static Analysis and Code Reviews - Secure APIs and Defensive Programming - Real-World Examples - Common Authentication Vulnerabilities - real-world case studies of authentication breaches

7. Implement Secure coding for buffer flow heap attacks
8. Implementation of Design methods to break authentication schemes

UNIT V CROSS-SITE REQUEST FORGERY (CSRF) 6 Hours

Identifying and Analyzing Design Deficiencies - Best Practices for Secure Web Application Design - Impact of CSRF attacks - Techniques for preventing CSRF vulnerabilities - Tools for Identifying CSRF Vulnerabilities

9. Implementation of methods for abusing Design Deficiencies against web sites
10. To demonstrate and understand the risks and impact of Cross-Site Request Forgery (CSRF) attacks on a web application.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Design of access control methods for secure web & database application development Deploy and test exploits over targeting operating systems and services
2. Analyse and classify the vulnerabilities in the Web and Database applications.
3. Design & implementation various methods for web & database intrusion detection.
4. Design and Implementation security audit methods.
5. Implementation of methods to avoid forgery attacks on web applications

Text Book(s)

1. Mike Shema, Hacking Web Apps Detecting and Preventing Web Application Security Problems, Syngress publications- Elsevier, 2012

2. Osama Mustafa, Robert P. Lockard , Oracle Database Application Security: With Oracle Internet Directory, Oracle Access Manager, and Oracle Identity Manager , Apress, 2019.

Reference Books

1. M. Gertz, S. Jajodia, Handbook of Database Security, Springer, 2010.

2. Ben-Natan, R. B, Implementing Database Security and Auditing: Includes Examples for Oracle, SQL Server, Db2 Udb, Sybase, Digital Press, 2005.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Skill Oriented Course - III

20CSC604 R PROGRAMMING

L	T	P	C
1	0	2	2

Pre-requisite **20MAT111**

Course Description:

This course describes how to use R for effective data analysis. This course covers practical issues in statistical computing which includes programming in R, reading data into R, accessing R packages, writing R functions, performing data visualization using R.

Course Objectives:

This course enables students to

1. Understand the R Programming Language.
2. Learn the concepts of lists, matrices and. data frames in R.
3. Calculate the descriptive statistics values for the given data set.
4. Learn about data visualization using various types of charts in R.
5. Know the regression concepts using R.

UNIT I **6 hours**

INTRODUCTION

Installing R and R Studio, Introduction to R, R script, variable, data types, vectors, factors and control structures

1) Implement R script to show the usage of various operators available in R language.
2) Implement R script to read person‘s age from keyboard and display whether he is eligible for voting or not.
3) Implement R script to check the given year is leap year or not.
4) perform various operations on vectors.

UNIT II LISTS, MATRICES AND DATA FRAMES **6 hours**

Creating lists, Manipulating the list elements, Merging the lists, Converting lists to vectors, Creating matrices, Accessing elements of a matrix, Operations on matrices, Creating data frames, Accessing data frames, Various operations on data frames

5. (i) Create a list containing strings, numbers, vectors and logical values.
   (ii)Write a R program to create a matrix taking a given vector of numbers as input and define
   the column and row names. Display the matrix

6. (i) Write a R program to create two 2x3 matrix and add, subtract, multiply and divide the matrixes.
   (ii) Write a R program to convert a matrix to one dimensional array.
   (iii) Create list containing a vector, a matrix and a list and give names to the elements in the list
7. (i) Write a R program to create a list of data frames and access each of those data frames from the list.
   (ii) Write a R program to manipulate data from data frame.

UNIT III DESCRIPTIVE STATISTICS USING R 6 hours

Data Summarization – Measures of Central Tendency, Measures of Dispersion (quartiles, five number summary, variance, standard deviation)

8) Write an R script to find basic descriptive statistics using summary, str functions on mtcars dataset.
9) Write an R script to find subset of dataset by using subset (), aggregate () functions on iris dataset
10) Implement R Script to calculate mean, median, mode, range, summary, variance, standard deviation, correlation.

UNIT IV DATA VISUALIZATION 6 hours

Data visualization, Bar chart, Histogram, pie chart, Box and whisker plot

11)Reading Excel data sheet in R.
12)Reading csv data sheet in R.

13)Implement R Script to draw Histogram, Pie chart, Bar Chart.

14) Implement R Script to draw scatter plot and Box plot.

UNIT V REGRESSION USING R 6 hours

Simple linear Regression, Multiple linear regression, performance evaluation
15)Implement Simple Linear Regression using R.
16)Implement Multiple Linear Regression using R.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Execute the simple programs using R.
2. Implement operations on lists, matrices and data frames.
3. Analyze the various descriptive statistics value for the given data.
4. Perform data visualization using various types of charts and graphs.
5. Implement linear regression concepts.

Text Book(s)

1. "The Art of R Programming, A Tour of Statistical Soft Ware Design", Norman Matloff
2. "Hands-On Programming with R", Garrett Grolemund, O'Reilly Media, Inc.,

Reference Books

1. "Exploratory Data Analysis with R", Roger D Peng.
2. "Data Visualization: A practical introduction", by Kieran Healy.

Mode of Evaluation: Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Skill Oriented Course–III

20CSC605 SELENIUM WITH JAVA

L	T	P	C
1	0	2	2

Pre-requisite 20CSC108

Course Description:

Selenium with Java is a free automation testing tool for web applications. It is able to work with different browsers like Chrome, Firefox, IE, Opera and simulate human like behavior. Selenium is able to interact with all the different elements in a webpage. It can click on them, input text, extract text and much more. By covering all the different functionalities on your website with Selenium tests, you will be able to quickly catch new and reappearing old bugs. This will save your time and money, we can run our test cases on various environments using selenium grid and we can integrate with project management tools for managing the projects.

Course Objectives:

1. Understand basic concepts in Selenium-IDE
2. Understand Selenium RCand Commands.
3. Understand Selenium Webdriver And Locators,Scripting using WebDriver.
4. Understand Interactions techniques, Keyboard Actions, Multi Select Action in practical problems.
5. Understand variety of Data Driven using Excel, Parameterization.

UNIT I INTRODUCTION TO SELENIUM AND SELENIUM IDE 6 hours

Introduction to Selenium-Advantages and disadvantages of Selenium, Selenium-IDE, Installing and opening the IDE, IDE Features, Script debugging.

1. Install and check the features of Selenium IDE.
2. Create a simple Selenium IDE Script and run it.
3. Create a simple Selenium IDE Script and use “Execute this command” option.
4. Create a simple Selenium IDE Script and use break point and starting point options.

UNIT II SELENIUM RC AND COMMANDS 6 hours

Introduction to Selenium RC, RC Architecture, RC-Scripting. SELENSE Commands-Actions, Accessors, Assertions.

5. Create a Selenium IDE script using actions commands.
6. Create a Selenium IDE script using accessors commands.
7. Create a Selenium IDE script using assertions commands.
8. Write a sample Selenium RC script for login page.

UNIT III SELENIUM WEBDRIVER AND LOCATORS 6 hours

Introduction to Selenium web-driver, webdriver Architecture, Selenium RC Vs WebDriver, Scripting using WebDriver, Most Used Commands, LOCATORS, Locators Usage-ID, Name, Class Name, Tag Name, Link Text , Partial Link Text.

9. Install Selenium webdriver and write java code to access google chrome browser.
10. Develop a java code with ID, Name and Class locators by using Selenium web-driver.

11. Develop a java code to locate web elements with LinkText, PartialLinkText and TagName locators by using Selenium web-driver.
12. Write a java code by using CssSelector and XPath locators.

UNIT IV INTERACTIONS AND SYNCHRONIZATION 6 hours

INTERACTIONS-Introduction ,User Interactions, Text Box Interaction, Radio Button Interaction, Check Box Interaction, Dropdown Interaction, Synchronization, Drag & Drop, Keyboard Actions, Multi Select Action.

13. Write a Java code to type in textbox using Selenium WebDriver.
14. Write a Java code to select Radio Button and Check Box using Selenium WebDriver.
15. Write a Java code to select Drop-Down and Multi Select using Selenium WebDriver.
16. Develop a Java code to implement Keyboard Actions by using Actions class in Selenium.

UNIT V TEST DESIGN TECHNIQUES 6 hours

TEST DESIGN TECHNIQUES- Introduction, Page Object Model, POM Flow Diagram, Data Driven using Excel, TestNG framework.

17. Write a java code to implement POM(Page Object Model).
18. Write a java code to read data from a Excel file.
19. Develop a java code to automate the testing process by using TestNG framework.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Students able to identify difference between Manual and Automation Testing, features of Selenium IDE.
2. Utilize the Selenium IDE commands in testing.
3. Implement java script to identify and work with different WebElements.
4. Analyze different user interactions on a webpage.
5. Implement and analyze different test models and frameworks to automate the testing process.

Text Book(s)

1. Boni Garcia, " Hands-On Selenium WebDriver with Java " O'RE ILLY publications 2022.
2. Pallavi Sharma, "Selenium with Java – A Beginner's Guide: Web Browser Automation for Testing using Selenium with Java" English Edition 2022

Reference Books

1. Navneesh Garg, "Test Automation using Selenium WebDriver with Java" 2014.
2. Unmesh Gundecha, Carl Cocchiaro, " Learn Selenium " by Packt Publishing 2019.

B. Tech Computer Science and Engineering (Cyber Security)

Skill Oriented Course – IV

20CSC606 ETHICAL HACKING

L	T	P	C
1	0	2	2

Pre-requisite NIL

Course Description:
Ethical hacking is a subject that has become very important in present-day context, and can help individuals and organizations to adopt safe practices and usage of their IT infrastructure. Starting from the basic topics like networking, network security and cryptography, the course will cover various attacks and vulnerabilities and ways to secure them. There will be hands-on demonstrations that will be helpful to the participants.

Course Objectives:
This course enables students to

1. To describe the legal and ethical requirements related to ethical hacking.
2. To examine the tools for conducting ethical hacking.
3. To Plan, organize and perform penetration testing on a simple network.
4. To Execute a penetration test using standard hacking tools in an ethical manner.
5. To Report on the strengths and vulnerabilities of the tested network.

UNIT I FOOT PRINTING AND NETWORK SCANNING 6 hours

Foot printing – Using Google Hacking – Website information – information from the archived website – to extract content from the website- to trace any received emails. Network Scanning: social media – Social Engineering – Internal Sniffing and Scanning.

1. Apply concept of Foot printing.
2. Implementation of Network scanning.

UNIT II STEGANOGRAPHY AND PRIVILEGE ESCALATION 6 hours

Introduction- Conventional Cryptosystem vs Steganography - Digital Image formats- Modern Steganography, Steganography Channels, Steganography Goals, Image: Substitution, Bit Plane Coding, Transform Domain, Audio: Data Echo Hiding, Phase Coding, Video: Temporal technique, Spatial technique.

3. Implementation of Steganography under various objects.
4. Apply the concept of Privilege escalation.

UNIT III MALWARE THREATS AND PACK SNIFFING 6 hours

Malware Threats: Worms, viruses, Trojans – Use password cracking – Dictionary attack – Encrypt and Decrypt password. Sniffing and Scanning – De-Authentication of Attacks – Detection Mechanism - Session Hijacking: Blind and Non-Blind Spoofing - Detection and Prevention Mechanisms.

5. Apply the concept in Building a trojan and virus creation in a batch file.
6. Implement Packet sniffing through Wireshark.

UNIT IV SQL INJECTIONS AND ARP POISONING 6 hours

Databases – Testing Database Vulnerability – Securing SQL Server – Detecting Database Attacks – Protection Against Database Attacks. ARP Poisoning: ARP poisoning in Windows – Ifconfig – ping – Netstat – traceroute – Steganography Tools.

7. Implement SQL injections.
8. Implement Arp poisoning.

UNIT V WIRELESS HACKING AND KEY LOGGERS 6 hours

Wireless Network Hacking – Cloud computing security – Cryptography – Using Cryptools to encrypt and decrypt password – implement encrypting and decryption using Ceaser cipher. Key Loggers: Creating simple Key loggers in python – create a sample virus – encounter the detection – Creating a trojan

9. Implement Wireless/wifi hacking.
10. Apply concept of Keyloggers.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Plan a vulnerability assessment and penetration test for a network.
2. Execute a penetration test using standard hacking tools in an ethical manner.
3. Report on the strengths and vulnerabilities of the tested network.
4. Identify legal and ethical issues related to vulnerability and penetration testing.
5. Analyze different approaches to secure the data against attacks.

Text Book(s)

1. Phillip L. Wylie, Kim Crawley, "The Pentester BluePrint: Starting a Career as an Ethical Hacker",2020, Wiley, United States.

2. Sabih, Zaid, "Learn Ethical Hacking from Scratch: Your stepping stone to penetration testing", 2018 Packt Publishing Ltd, United Kingdom.

Reference Books

1. Diogenes, Yuri, and Erdal Ozkaya, "Cybersecurity Attack and Defense Strategies: Infrastructure security with Red Team and Blue Team tactics", 2018, Packt Publishing Ltd, United Kingdom.

2. Andrew Whitaker, and Daniel P. Newman. "Penetration Testing and Network Defense", 2005, Cisco Press, New Jersey.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Skill Oriented Course – IV

20CSC607 MIDDLEWARE TECHNOLOGIES

L	T	P	C
1	0	2	2

Pre-requisite 20CSC108, 20CSC111

Course Description:
This course provides students with practical knowledge and skills in designing, implementing, and managing middleware systems. Students will gain hands-on experience with various middleware technologies and tools commonly used in enterprise applications. The course focuses on the practical aspects of middleware, including configuration, integration, and troubleshooting.

Course Objectives:
1. Understand the basic concepts and configuration of a message queue system.
2. Design and implement a service-oriented architecture using web services.
3. Gain hands-on experience in building an enterprise service bus for message routing and transformation.
4. Explore security mechanisms and authentication in middleware systems.
5. Learn how to monitor and optimize the performance of middleware systems.

UNIT I Introduction To Message Queue Systems 6 hours

Introduction to Apache Kafka & RabbitMQ, architecture and components of Apache Kafka, Producers and Consumers Implementation.

Experiment 1: Setting up a Message Queue System

a. Set up a message queue system such as Apache Kafka or RabbitMQ.
b. Configure the necessary components, including producers and consumers.
c. Write a program that sends messages to the message queue.

UNIT II Introduction to Service-Oriented Architecture (SOA) 6 hours

Overview of SOA principles and concepts, benefits and challenges of SOA, service interfaces and operations using WSDL, Implementing SOAP-based web services

Experiment 2: Implementing a Service-Oriented Architecture (SOA)

a. Identify a specific scenario where a service-oriented architecture can be applied.
b. Design the service interfaces and define the operations and data formats using WSDL.
c. Implement the services using a programming language (e.g., Java, C#, or Python).

UNIT III Introduction to Enterprise Service Bus (ESB) 6 hours

Architecture, key features and capabilities of an ESB, Message trasformation and routing in ESB

Experiment 3: Building an Enterprise Service Bus (ESB)

a. Select an ESB platform such as Apache Camel, MuleSoft, or IBM Integration Bus.

b. Set up the ESB environment and configure the necessary components.
c. Define integration routes for different services using the ESB's routing capabilities.

UNIT IV Middleware Security and Authentication 6 hours

Potential security risks and vulnerabilities in distributed environments, authentication and authorization in middleware systems, Transport Layer Security (TLS) and Secure Communication.

Experiment 4: Middleware Security and Authentication

a. Implement secure communication between middleware components using SSL/TLS.
b. Configure authentication and authorization mechanisms in the middleware system.
c. Experiment with different authentication methods such as username/password, tokens, or certificates.

UNIT V Performance Monitoring and Management 6 hours

Performance measuring metrics, Performance monitoring tools for middleware systems, Load Testing and Stress Testing

Experiment 5: Middleware Performance Monitoring and Management

a. Set up a performance monitoring tool such as JMX or Prometheus.
b. Monitor the key performance metrics of the middleware components in real-time.
c. Generate a load on the middleware system and observe the impact on performance.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Implement message passing system.
2. Design and implement service interfaces using WSDL
3. Develop an enterprise service bus for message routing and transformation.
4. Analyzes various security mechanisms and authentication in middleware systems.
5. Interpret various performance metrics of middleware systems.

Text Book(s)

1. Etzkorn Letha Hughes - " Introduction to Middleware " 1st Edition, CRC Press, 2017

2. Myerson Judith M " The Complete Book of Middleware" 1st Edition, CRC Press, 2017.

Reference Books

1. Shankarmani Radha " Middleware & Enterprise Integration Technologies" Wiley India Pvt. Ltd 2009
2. Serain Daniel "Middleware and Enterprise Application Integration", Springer; 2nd edition 2002

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Skill Oriented Course - IV

20CSC608 SECURITY AND NETWORK FORENSICS

L	T	P	C
1	0	2	2

Pre-requisite NIL

Course Description:

The knowledge of computer and network forensics has become essential in securing today's network centric computing environment. This new course will give the students both the fundamental knowledge and hands-on practice on computer and network forensics. The added exposure to forensics will enhance the marketability of our students and serve the students who carry the skills and knowledge forward into their future careers.

Course Objectives:

This course enables students to

1. To learn the basics of digital forensics
2. To learn about the different digital forensic systems and services
3. To learn about file recovery using various tools
4. To learn about processing the crime scene and preserving digital evidence.
5. To learn about the basics of digital forensics and its application in investigating cybercrimes, data breaches, and network intrusions.

UNIT I INTRODUCTION TO LEGAL ASPECTS OF DIGITAL FORENSICS 6 hours

Introduction to Legal Aspects of Digital Forensics – Legal Framework and Jurisdiction – Introduction to Expert Testimony in Legal Proceedings – Qualifications and Selection of Expert Witnesses.

1. Study the adversarial nature of the legal system by preparing arguments on both sides of a case. Legal Aspects of Digital Forensics.
2. Expert testimony, preparing an expert report, expert depositions, and getting experts' testimony admitted.

UNIT II INTRODUCTION TO DIGITAL FORENSICS 6 hours

Introduction to Digital Forensics – The Sleuth Kit (TSK) – Overview and Installation -- File System Analysis with TSK -- Introduction to NTFS File System -- NTFS File System Analysis Tools.

3. Introduction to The Sleuth Kit (TSK) and Autopsy.
4. Implement NTFS analysis.

UNIT III INTRODUCTION TO FILE CARVING 6 hours

Introduction to File Carving – File Carving Tools and Techniques – File Headers and Footers – Fragmented File Carving - Introduction to Deleted File Recovery -- Data Storage Fundamentals -Deleted File Recovery Tools and Technique.

6. Apply concept of File carving.
7. Implement Deleted file recovery.

UNIT IV INTRODUCTION TO WINDOWS APPLICATION ANALYSIS 6 hours

Dynamic Analysis of Windows Applications – Static Analysis of Windows Applications – Identifying Malicious Behavior –Introduction to Cyber Offenders and Profiling.

8. Apply concept of Windows application analysis.
9. To Develop a psychological profile of cyber offenders.

UNIT V INTRODUCTION TO PACKET CAPTURE AND ANALYSIS 6 hours

Introduction to Packet Capture and Analysis – Packet Capture Tools and Techniques – Analyzing Captured Packets - Introduction to Evidence Acquisition – Legal and Ethical Considerations.

10. Implementation of Packet capture and protocol analysis
11. To apply the concept of Evidence acquisition.

Course Outcomes:

Upon successful completion of the course, students will be able to

1 Upon successful completion of the course, students will be able to
2. Describe what a digital investigation is, the sources of digital evidence, and the limitations of forensics
3. Describe the legal requirements for use of seized data
4. Conduct data collection on backup drives and Recover data based on a given search term from an imaged system
5. Capture and interpret network traffic and Handle the challenges associated with mobile device forensics

Text Book(s)

1. John R. Vacca, Computer Forensics: Computer Crime Scene Investigation, Second Edition, Charles River Media,2005.

2. Cory Altheide, Harlan Carvey, Digital Forensics with Open Source Tools, British Library Cataloguing-in-Publication Data,2011.

3. Sathish Bommisetty, Rohit Tamma, Heather Mahalik, Practical Mobile Forensics, Kindle Edition, 2014..

Reference Books

1. David Lilburn Watson, Andrew Jones, Digital Forensics Processing and Procedures, Syngress,2013.

2. Bill Nelson, Amelia Philips, Christopher Steuart, Guide to Computer Forensics and Investigations, Fifth Edition, Cengage Learning,2016.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Skill Oriented Course – V

20CSC609 NoSQL

L	T	P	C
1	0	2	2

Pre-requisite **NIL**

Course Description:

This course provides the technical hands-on knowledge of NoSQL databases and Database-as-a-Service (DaaS) offerings Explore the origins of NoSQL databases and the characteristics that distinguish them from traditional relational database management systems. Understand the basic architecture and data models of a NoSQL database (key-value stores, document databases, column-family stores, graph databases).Discuss the criteria that decision makers should consider when choosing between relational and non-relational databases and techniques for selecting the NoSQL database that best addresses specific use cases.

Course Objectives:

This course enables students to

1. Learn and work with NoSQL databases
2. Understand the basic storage architecture of distributed file systems
3. Discuss about the various tools available such as MongoDB, Cassandra.
4. Know about CRUD operations (create, read, update and delete) on data in NoSQL Environment.
5. Explain an Application with Graph Data model

UNIT I INTRODUCTION TO NOSQL **6 hours**

Overview and History of NoSQL Databases. Definition of the Four Types of NoSQL Database, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch. Application and Integration of Databases, Attack of the Clusters, The Emergence of NoSQL. Benefits of using NoSQL DB. Backend Management, Deployment, Front-End Development, Open Source, Drawbacks of Using NoSQL DB, NoSQL vs. SQL

1. Installation and setup of MongoDB client and server
2. Create a database and collection using MongoDB environment. For example, a document collection meant for analyzing Restaurant records can have fields like restaurant_id, restaurant_name, customer_name, locality, date, cuisine, grade, comments. Etc.,
3. Create database using INSERT, UPDATE, UPSERTS, DELETE and INDEX.
4. Practice writing simple MongoDB queries such as displaying all the records, display selected records with conditions

UNIT II NOSQL DEVELOPMENT 6 hours

Schemaless Development, Data Models, Distribution Models, Consistency. Categories of NoSQL: Key-Value Stores, Wide-Column Family Stores, Document Databases, Graph Databases, Object-Oriented Databases, and Others, NoSQL Scalability, Searching.

Wide-Column NoSQL Databases - NoSQL Databases: Cassandra, Bigtable, MapReduce, and Others.

5. Practice exercise on element, array based and evaluation query operators -$exists, $type, $mod, $regex
6. Exercise on MongoDB shell commands and user management

UNIT III AN OPEN-SOURCE NOSQL DATABASE 6 hours

Various open source NoSQL Databases: MongoDB, CouchDB, Apache Casandra, Neo4J, Redis, Apache HBase, RavenDB – Pros and cons, Applications of open source databases.
Indexing and Ordering Data Sets: Essential Concepts Behind a Database Index, Indexing and Ordering In Mongodb, Creating and using Indexes In Mongodb, Indexing And Ordering In Couchdb, Indexing In Apache Cassandra.

7. Installation and configuration of Cassandra. Find out two use cases where Cassandra is preferred over MongoDB
8. Create database in Casandra using – Create, Alter and Drop. Add records using Inset, Update, Delete and Truncate.
9. Exercise based on Cassandra Query Language i.e. selecting records, select records with specific conditions

UNIT IV NOSQL OPERATIONS 6 hours

The set of essential operations – CRUD - Create, Read, Update and Delete operations in the context of a NoSQL database environment. Practical experience of CRUD operations for document databases using MongoDB. Queries using MongoDB

10. Experiment with MongoDB comparison and logical query operators - $gt, $gte, $lt, $lte, $in, #nin, $ne, $and, $or, $not

UNIT V DATA MODELING WITH GRAPH & CASE STUDIES 6 hours

Building Graph Model, Edges, Nodes, Relationships, Example NoSQL Databases: Neo4J, InfoGrid. Graph NoSQL databases using Neo4, NoSQL database development tools and programming languages, Graph Databases, Graph Database Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases. Connected Data, Routing, Dispatch, and Location-Based Services, Recommendation Engines, When Not to Use. Case Study: Optimizing Transportation Routes

11. Mini-project

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Discuss various types of NoSQL Databases
2. Define, compare and use the different types of NoSQL Databases
3. Execute different types of NoSQL Databases
4. Apply NoSQL Development tools
5. Build graph model and performance tuning of Graph NoSQL databases

Text Book(s)

1. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications,1st Edition ,2019

Reference Books

1. Dan Sullivan, "NoSQL For Mere Mortals", 1st Edition, Pearson Education India, 2015. (ISBN-13: 978-9332557338)

2. Dan McCreary and Ann Kelly, "Making Sense of NoSQL: A guide for Managers and the Rest of us", 1st Edition, Manning Publication/Dreamtech Press, 2013. (ISBN-13: 978-9351192022)

3. Kristina Chodorow, "Mongodb: The Definitive Guide- Powerful and Scalable Data Storage", 2nd Edition, O'Reilly Publications, 2013. (ISBN-13: 978-9351102694)

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examination.

Skill Oriented Course – V

20CSC610 INTRUSION DETECTION SYSTEMS

L	T	P	C
1	0	2	2

Pre-requisite NIL

Course Description:

This course provides the knowledge of intrusion detection technologies, various types of network behavior analysis. It also provides practical knowledge for dealing with intrusions in real world applications.

Course Objectives:

This course enables students to

1. Identify the basics of setting up an Intrusion Detection System environment
2. Explain the analysis of network traffic in Intrusion Detection System.
3. Understand the working procedure of Signature based IDS.
4. Identify the techniques involved in Anomaly based IDS.
5. Recognize the evaluation and testing process of IDS.

UNIT I SETTING UP AN IDS ENVIRONMENT 6 hours

Introduction to IDS – IDS Architecture and Components – IDS Deployment Strategies – IDS tools and technologies – IDS Event analysis and Alert Handling.

1. Configure a virtual network using tools like VirtualBox or VMware.
2. Deploy an IDS System such as Snort or Suricata, within the virtual network.

UNIT II NETWORK TRAFFIC ANALYSIS 6 hours

Introduction – Network Traffic capture tools and techniques – Protocol Analysis – Flow Analysis – Traffic Behaviour Analysis – Malware Analysis in Network Traffic.

3. Setup a test network using virtual machines or physical devices.
4. Use WireShark or tcpdump to capture network traffic on the test network.
5. Analyse captured packets to identify protocols, extract information from headers and identify any anomalies or suspicious activity.

UNIT III SIGNATURE BASED IDS 6 hours

Fundamentals of Signature based IDS – Signature Generation and Management – Signature Database and updates – Deploying Signature based IDS.

6. Write a program that reads network traffic data or log files.
7. Implement a program to manage a signature database.

UNIT IV ANOMALY BASED IDS 6 hours

Introduction – Data Collection and Pre-processing – Statistical Anomaly Detection – Time Series Anomaly Detection – Unsupervised Anomaly Detection.

8. Remove outliers from a dataset using z-score or modified z-score and perform feature scaling and normalization on a dataset.
9. Apply moving average or exponential smoothing techniques to detect anomalies in a time series dataset.

UNIT V IDS EVALUATION AND TESTING 6 hours

Introduction – Evaluation metrics and criteria – Testbed Setup and Data Collection – Performance Testing – Detection Testing – False Positive and False Negative Analysis.

10. Measure the IDS response time under different traffic loads and analyze the performance metrics.
11. Analyze the IDS alerts generated during detection testing to identify false positives.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Explain the basic technologies to set up an Intrusion Detection System (IDS) environment
2. Analyze the network traffic in Intrusion Detection System.
3. Learn about the working procedure of Signature based IDS.
4. Apply the knowledge of Anomaly-based IDS.
5. Gain knowledge on working procedure of testing and evaluation in IDS.

Text Book(s)

1. S. Kami Makki, Xinyu Zhang, “Intrusion Detection in Wireless Ad-Hoc Networks”, 2021.

2. Zahri Yunos and Abdul Hanan Abdullah, “Intrusion Detection Systems: Concepts and Techniques”, 2019.

Reference Books

1. Chris Sanders, Jason Smith and Jake Reynolds, "Apply Network Security monitoring: Collection, Detection and Analysis", 2018.

2. Rebecca Gurley Bace and Peter Mell, "Intrusion Detection Systems", 2018.

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examination.

HONORS

B. Tech Computer Science and Engineering (Cyber Security)

Honors

20HDCSC101 RESEARCH METHODS FOR THE STUDY OF EVOLUTION

L	T	P	C
3	0	0	3

Pre-requisite Nil

Course Description:

This course deals with basics of research and explores multifaceted possibilities in the discipline of research and provide participants the opportunity to practically, theoretically, critically and creatively think through methodological issues in their research and the research of others.

Course Objectives:

1. To explore multifaceted possibilities and pathways of translation and dialogue across knowledge, discipline, community and social borders
2. To further multifaceted possibilities and pathways of translation and dialogue across knowledge, discipline, community and social borders.
3. To provide participants the opportunity to practically, theoretically, critically and creatively think through methodological issues in their research and the research of others.
4. To engage in participatory interdisciplinary learning and exchange.

UNIT I INTRODUCTION TO RESEACH METHOLOGIES 9 hours

Survey of Research Methodologies- Rationalism, Idealism, Positivism, Post Positivism, Introduction to major binaries, Subjectivity vs Objectivity, Realism vs Anti –realism, True vs False, Scientific evolution vs Scientific Revolutions, Continuity vs Discontinuity, Deterministic vs Probabilistic, Linearity vs Non –Linearity, Beyond the binaries

UNIT II TYPES OF RESEARCH METHODS 9 hours

T Methods: Epistemology, Ontology, Deduction, Induction, Hypothetical Deductive method, Explanation and Prediction, General and Particular, Cause and Effect.

UNIT III QUANTITATIVE TECHNIQUES 9 hours

Techniques-Quantitative Techniques, Techniques of generating data, Techniques of classification, Techniques of measures, Central Tendency and Dispersion, Measures of Correspondence/Correlation, Measures of Causal relations/Regression, Techniques of Explanation ANOVA, Time Series Analysis-ARMA Adaptive Estimation Procedures (Kalman Filters) Techniques of inference.

UNIT IV STATISTICAL METHODS 9 hours

Advanced Techniques- Advanced Statistical Methods for data Analysis, Structural, quantitative, statistical approaches for the analysis of data.

UNIT V CLASSIFICATION AND APPLICATION 9 hours

Advances in classification, clustering and pattern recognition methods, Strategies for modelling complex data and mining large data sets, Chaos analysis and its measurement, Methods for the extraction of knowledge from whatever type of data, and Application of advanced methods in specific domains of practice.

B. Tech Computer Science and Engineering (Cyber Security)

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Discuss the various research component and binaries.
2. Understand the guidelines for research methods.
3. Understand the various types of quantitative techniques and statistical methods.
4. Apply the various classification technique in advanced applications

Text Book(s)

1. Abraham Kaplan, 1964, Conduct of Inquiry, Chander Publishing Company, California.
2. Ann Majchrzak, 1984, Methods for Policy Research, Sage London
3. Thomas S Khun, 1970, The Structure of Scientific Revolution, University of Chicago Press, Chicago

Reference Books

1. Carl G Hempel "The Covering Law Analysis of Scientific Explanation" in Leonard I Krimerman (ed)
2. Catheriner Marsh, 1988, Exploring Data, Polity Press, Cambridge
3. Cohen and Ernest Nagel (ed) 1978, An Introduction to Logic and Scientific Method, Allied, New Delhi.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Honors

20HDCSC102 NATURAL LANGUAGE PROCESSING

L	T	P	C
3	**0**	**0**	3

Pre-requisite Nil

Course Description:

This course covers the basics of text processing including basic pre-processing, spelling correction, language modeling, Part-of Speech tagging, Constituency and Dependency Parsing, Lexical Semantics, distributional Semantics and topic models.

Course Objectives:

1. To learn the fundamentals of natural language processing.
2. To appreciate the use of CFG and PCFG in NLP.
3. To understand the role of semantics and pragmatics.

UNIT I INTRODUCTION **9 hours**

Words - Regular Expressions and Automata - Words and Transducers - N-grams - Part-of-Speech – Tagging - Hidden Markov and Maximum Entropy Models.

UNIT II SPEECH **9 hours**

Speech – Phonetics - Speech Synthesis - Automatic Speech Recognition - Speech Recognition: - Advanced Topics - Computational Phonology

UNIT III SYNTAX **9 hours**

Formal Grammars of English - Syntactic Parsing - Statistical Parsing - Features and Unification - Language and Complexity.

UNIT IV SEMANTICS AND PRAGMATICS **9 hours**

The Representation of Meaning - Computational Semantics - Lexical Semantics - Computational Lexical Semantics - Computational Discourse

UNIT V APPLICATIONS **9 hours**

Information Extraction - Question Answering and Summarization - Dialogue and Conversational Agents - Machine Translation

Course Outcomes:

Upon completion of the course, the students will be able to:

1. To tag a given text with basic Language features
2. To design an innovative application using NLP components
3. To implement a rule based system to tackle morphology/syntax of a language
4. To design a tag set to be used for statistical processing for real-time applications
5. To compare and contrast use of different statistical approaches for different types of NLP applications.

Text Book(s)

1. Daniel Jurafsky, ―Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, ―Natural Language Processing with Python, First Edition, O'Reilly Media, 2009.

Reference Books

1. Breck Baldwin, ―Language Processing with Java and LingPipe Cookbook‖, Atlantic Publisher, 2015.
2. Richard M Reese, ―Natural Language Processing with Java‖, O'Reilly Media, 2015.
3. Nitin Indurkhya and Fred J. Damerau, ―Handbook of Natural Language Processing‖, Second Edition, Chapman and Hall/CRC Press, 2010.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Honors

20HDCSC103 INTRODUCTION TO GAME THEORY

L	T	P	C
3	0	0	3

Pre-requisite Nil

Course Description:

This course covers the basics of text processing including basic pre-processing, spelling correction, language modeling, Part-of Speech tagging, Constituency and Dependency Parsing, Lexical Semantics, distributional Semantics and topic models.

Course Objectives:

1. Provide an in-depth introduction to technologies and techniques used in the game Theory.
2. To familiarize with the process of game design and development
3. To learn the processes, mechanics, issues in game design
4. To understand the architecture of game programming
5. To know about game engine development, modeling, techniques and frameworks

UNIT I INTRODUCTION 9 hours

Elements of Game Play – Artificial Intelligence – Getting Input from the Player – Sprite Programming – Sprite Animation - Multithreading – Importance of Game Design – Game Loop

UNIT II 3D GRAPHICS FOR GAME PROGRAMMING 9 hours

Coordinate Systems, Ray Tracing, Modeling in Game Production, Vertex Processing, Rasterization, Fragment Processing and Output Merging, Illumination and Shaders, Parametric Curves and Surfaces.

UNIT III GAME DESIGN PRINCIPLES 9 hours

Character Development, Story Telling, Narration, Game Balancing, Core mechanics, Principles of level design, Genres of Games, Collision Detection, Game Logic, Game AI, Path Finding, Case study: Tetris.

UNIT IV GAMING ENGINE DESIGN 9 hours

Renderers, Software Rendering, Hardware Rendering, and Controller Based Animation, Spatial Sorting, Level of Detail, Collision Detection, Standard Objects, and Physics, Case study : The Sims.

UNIT V GAME DEVELOPMENT 9 hours

Information Extraction - Question Answering and Summarization - Dialogue and Conversational Agents - Machine Translation

Course Outcomes:

Upon completion of the course, the students will be able to:

1. Understand the basic working of gaming.
2. Design an innovative 3D model for gaming.
3. Apply the basic principles of designing in game development.
4. Create interactive game via game engine.
5. Develop the 2D/3D interactive game using openGL.

Text Book(s)

1. David H. Eberly, ―3D Game Engine Design: A Practical Approach to Real-Time Computer Graphics‖, Second Edition, Morgan Kaufmann, 2010.
2. Jung Hyun Han, ―3D Graphics for Game Programming‖, First Edition, Chapman and Hall/CRC, 2011.

Reference Books

1. Ernest Adams and Andrew Rollings, ―Fundamentals of Game Design‖, Third Edition, Pearson Education, 2014.
2. Jim Thompson, Barnaby Berbank-Green, and Nic Cusworth, ―Game Design: Principles, Practice, and Techniques - The Ultimate Guide for the Aspiring Game Designer‖, First Edition, Wiley, 2008.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Honors

20HDCSC104 HIGH PERFORMANCE COMPUTING

L	T	P	C
3	0	0	3

Pre-requisite 20CST108

Course Description:

The course aims to give an introductory overview of High Performance Computing (HPC) in general, and of the facilities of the High Performance Computing Service (HPCS) in particular. Practical examples of using the HPCS clusters will be used throughout, although it is hoped that much of the content will have applicability to systems elsewhere.

Course Objectives:

1. Provide systematic and comprehensive treatment of the hardware and the software high performance techniques involved in current day computing.
2. Introduce the fundamentals of high-performance computing with the graphics processing units and many integrated cores using their architectures and corresponding programming environments.
3. Introduce the learner to fundamental and advanced parallel algorithms through the GPU and MIC programming environments.
4. Provide systematic and comprehensive treatment of the components in the pipeline that extract instruction level parallelism.
5. Provide a strong foundation on memory hierarchy design and tradeoffs in both uniprocessor and multiprocessors.
6. Illustrate the cache coherence and consistency problems in multiprocessors, and their existing solutions.

UNIT I GRAPHICS PROCESSING UNITS 9 hours

Introduction to Heterogeneous Parallel Computing. GPU architecture. Thread hierarchy. GPU Memory Hierarchy.

UNIT II GPGPU PROGRAMMING 9 hours

Vector Addition, Matrix Multiplication algorithms. 1D, 2D, and 3D Stencil Operations. Image Processing algorithms – Image Blur, Grayscaling. Histogramming, Convolution, Scan, Reduction techniques.

UNIT III MANY INTEGRATED CORES 9 hours

Introduction to Many Integrated Cores. MIC, Xeon Phi architecture. Thread hierarchy. Memory Hierarchy. Memory Bandwidth and performance considerations

UNIT IV XEON PHI PROGRAMMING 9 hours

Vector Addition, Matrix Multiplication algorithms. 1D, 2D, and 3D Stencil Operations. Image Processing algorithms – Image Blur, Grayscaling. Histogramming, Convolution, Scan, Reduction techniques

UNIT V SHARED MEMORY PARALLEL PROGRAMMING & MESSAGE PASSING INTERFACE **9 hours**

Symmetric and Distributed architectures. OpenMP Introduction. Thread creation, Parallel regions. Work sharing, Synchronization. MPI Introduction. Collective communication. Data grouping for communication.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. The learner will be able to design, formulate, solve and implement high performance versions of standard single threaded algorithms
2. The learner will know and will be able to demonstrate the architectural features in the GPU and MIC hardware accelarators.
3. The learner will be able to design programs to extract maximum performance in a multicore, shared memory execution environment processor.
4. The learner will be able to design and deploy large scale parallel programs on tightly coupled parallel systems using the message passing paradigm.

Text Book(s)

1. Wen-Mei W Hwu, David B Kirk, Programming Massively Parallel Processors A Hands-on Approach, Morgann Kaufmann, 3e.

Reference Books

1. Rezaur Rahman, Intel Xeon Phi Coprocessor Architecture and Tools, Apress Open, 2013.
2. Barbara Chapman, Gabriele Jost, Ruud van der Pas, Using OpenMP, MIT Press, 2008.
3. Gropp, Lusk, Skjellum, Using MPI, Using MPI, 2014.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Homors

20HDCSC105 ADVANCED COMPUTER NETWORKS AND COMMUNICATIONS

L	T	P	C
3	0	0	3

Pre-requisite Nil

Course Description:

This course involves multiple players, including academia, research and development centers, service providers and industry, illustrating a clear trend toward services integration in a single communication platform, where the Internet Protocol is seen as the convergence technology layer. In this scenario, strong efforts have been made to adapt and improve TCP/IP networks with enhanced service models, protocols, control and management facilities, in order to accommodate the integration of applications and services with distinct quality requirements.

Course Objectives:

1. To study the problematic of service integration in TCP/IP networks focusing on protocol design, implementation and performance issues.
2. To debate the current trends and leading research in the computer networking area.

UNIT I INTRODUCTION AND IPV6 9 hours

Introduction: Course organization and objectives, Next generation networking: Motivation and Challenges. IPv6 Internetworking and Mobility, Internetworking with IPv6; IPv6 extensions and functionality. Routing advances. Mobile IP networking. Micro and macro mobility.

UNIT II IP CONVERGENCE AND QOS 9 hours

Service integration and Quality of Service (QoS) in IP networks. Service contracts. Services specification, configuration and management. Service-oriented architectures (SOA) - services in SOA-based networks; technologies for the support and development of services, technologies and APIs for SOA; Web Services and associated technologies.

UNIT III ADVANCED TRANSPORT ISSUES AND SIGNALLING 9 hours

Reliable and unreliable transport services for the support of QoS and real-time. Signalling for Multiconstrained Services and Applications. Case studies: Video over IP and VoIP.

UNIT IV MANAGING TCP/IP NETWORKS 9 hours

Management models and functions. Autonomic management. Internet measurement and monitoring.

UNIT V SELF-ORGANIZING NETWORKS 9 hours

Ad-hoc, sensors and mesh networks; applications; communication support: information dissemination, medium access mechanisms, routing mechanisms, transport protocols, quality of service and security; self-organizing concepts in infrastructure networks.

Course Outcomes:

1. To understand the principles and functionality of mobile IP, explaining its concretization in IPv6; to understand the needs of optimization of the mobility mechanisms and description of some extensions that aim to reduce handover latency and requirements from terminals.
2. To understand and explain the design issues in transport services in face of applications and services requirements;
3. To understand theoretical and practical concepts behind the design of multi-constrained applications and services;
4. To discuss relevant management issues and devise adequate network management solutions;
5. To identify and assess possible research opportunities and difficulties within the course scope.

Text Book(s)

1. Silvia Hagen, "IPv6 Essentials", OReilly, 2002.

2. Z. Wang, "Internet QoS: Architectures and Mechanisms for Quality of Service", The Morgan Kaufmann Series in Networking, 2001.

Reference Books

1. Michael Welzl, "Network Congestion Control: Managing Internet Traffic", John Wiley & Sons, 2005
2. Colin Perkins, "RTP: Audio and Video for the Internet", Addison-Wesley Professional, 2003.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Honors

20HDCSC106 GAME DESIGN STUDIO

L	T	P	C
3	0	0	3

Pre-requisite Nil

Course Description:

This course deals with basics of game design development, processes, mechanics and issues in Game Design and exposed to the Core architectures of Game Programming.

Course Objectives:

1. Understand the concepts of Game design and development.
2. Learn the processes, mechanics and issues in Game Design.
3. Be exposed to the Core architectures of Game Programming.
4. Know about Game programming platforms, frame works and engines. Learn to develop games.

UNIT I 3D GRAPHICS FOR GAME PROGRAMMING 9 hours

3D Transformations, Quaternions, 3D Modeling and Rendering, Ray Tracing, Shader Models, Lighting, Color, Texturing, Camera and Projections, Culling and Clipping, Character Animation, Physics-based Simulation, Scene Graphs.

UNIT II GAME ENGINE DESIGN 9 hours

Game engine architecture, Engine support systems, Resources and File systems, Game loop and real-time simulation, Human Interface devices, Collision and rigid body dynamics, Game profiling.

UNIT III GAME PROGRAMMING 9 hours

Application layer, Game logic, Game views, managing memory, controlling the main loop, loading and caching game data, User Interface management, Game event management.

UNIT IV GAMING PLATFORMS AND FRAMEWORKS 9 hours

2D and 3D Game development using Flash, DirectX, Java, Python, Game engines - Unity. DX Studio.

UNIT V GAME DEVELOPMENT 9 hours

Developing 2D and 3D interactive games using DirectX or Python – Isometric and Tile Based Games, Puzzle games, Single Player games and Multi-Player games.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Understand the concepts of Game design and development.
2. Understand the processes, mechanics and issues in Game Design.
3. Understand exposed to the Core architectures of Game Programming.
4. Understand about Game programming platforms, frame works and engines and develop games.

Text Book(s)

1. Mike Mc Shaffrfy and David Graham, "Game Coding Complete", Fourth Edition, Cengage Learning, PTR, 2012.
2. Jason Gregory, "Game Engine Architecture", CRC Press / A K Peters, 2009.

Reference Books

1. Ernest Adams and Andrew Rollings, "Fundamentals of Game Design", 2nd Edition Prentice Hall / New Riders, 2009.
2. Eric Lengyel, "Mathematics for 3D Game Programming and Computer Graphics", 3rd Edition, Course Technology PTR, 2011.
3. Jesse Schell, The Art of Game Design: A book of lenses, 1 st Edition, CRC Press, 2008.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Honors

20HDCSC107 EVOLUTIONARY COMPUTING

L	T	P	C
3	0	0	3

Pre-requisite None

Course Description:
Evolutionary Computation (EC), is a sub-field of Computational/Artificial Intelligence, deals about the study of Evolutionary Algorithms (EAs) for search and optimization. EA is effective for solving ill-defined complex optimization problems encountered in Engineering, Science, Finance etc.

Course Objectives:

This course enables students to

1. Understand Evolutionary Algorithms in the context of meta-heuristics and their important parametric components
2. Learn about various representation used for EC
3. Learn various Genetic Algorithms for achieving optimized solutions.
4. Develop some familiarity with methodological issues and Swarm Optimization.
5. Gain knowledge about evolutionary machine learning and its applications.

UNIT I INTRODUCTION 9 hours

The Origins, The Main Evolutionary Computing Metaphor, Brief History. The Inspiration from Biology, Darwinian Evolution, Genetics. Components of Evolutionary Algorithms, An Evolutionary Cycle by Hand, Example Applications, The Operation of an Evolutionary Algorithm, Natural Versus Artificial Evolution, Evolutionary Computing, Global Optimisation, and Other Search Algorithms.

UNIT II REPRESENTATION AND RECOMBINATION 9 hours

Representation and the Roles of Variation Operators, Binary Representation, Integer Representation, Real-Valued or Floating-Point Representation, Permutation Representation, Tree Representation.

UNIT III EVOLUTIONARY ALGORITHM VARIANTS 9 hours

Genetic Algorithms(GA), Genetic Algorithm Cycle Applications, Evolution Strategies, Evolutionary Programming, Classical GA, Micro GA, Linkage Learning GA, Learning Classifier Systems, Applications

UNIT IV SWARM OPTIMIZATION AND FIREFLY ALGORITHM 9 hours

Swarm intelligence - PSO algorithm - accelerated PSO - implementation - convergence analysis - binary PSO - The Firefly algorithm - algorithm analysis – implementation - Ant colony optimization toward feature selection.

UNIT V EML AND APPLICATIONS 9 hours

Evolutionary Machine Learning – Surrogate Assisted Optimization – Neuro Evolution –Quality Diversity Algorithms – Open Ended Evolution. Applications of Evolutionary Algorithms.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Gain Knowledge of evolutionary computing (EC), descriptions of popular evolutionary algorithm
2. Formulate a given problem amenable for evolutionary optimization/search
3. Apply appropriate Genetic Algorithms for a given problem
4. Apply swarm intelligence to solve realistic problems.
5. Analyze the EML and understand its applications.

Text Book(s)

1. A.E. Eiben J.E. Smith, “Introduction to Evolutionary Computing”, Second Edition, Natural Computing Series, Springer, 2015.

2. Evolutionary Optimization Algorithms: Biologically-Inspired and Population-Based Approaches to Computer Intelligence, John Wiley & Sons, 2013.

3. Hitoshi Iba, “Evolutionary Approach to Machine Learning and Deep Neural Networks: Neuro-Evolution and Gene Regulatory Networks”, Springer, 2018.

Reference Books

1. Helio J.C. Barbosa, "Ant Colony Optimization - Techniques and Applications", Intech 2013

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Honors

20HDCSC108 ADVANCED SOFTWARE ENGINEERING

L	T	P	C
3	0	0	3

Pre-requisite **20CSC112**

Course Description:
This course is designed to provide students with an in-depth understanding of advanced concepts, methodologies and practices in software engineering. Students will learn advanced software development techniques, project management approaches and software quality assurance.

Course Objectives:

This course enables students to

1. Understand the rationale for software development process models.
2. Gain knowledge in the architectural design of software.
3. Learn the dimensions of system dependability.
4. Study the basic notions of a service-oriented architecture.
5. Acquire the knowledge in different stages of testing.

UNIT I SOFTWARE PROCESS AND MODELLING 9 hours

Prescriptive Process Models – Agility and Process – Scrum – XP – Kanban – DevOps – Prototype Construction – Prototype Evaluation – Prototype Evolution – Modelling – Principles – Requirements Engineering – Scenario-based Modelling – Class-based Modelling – Functional Modelling – Behavioural Modelling.

UNIT II SOFTWARE DESIGN 9 hours

Design Concepts – Design Model – Software Architecture – Architectural Styles – Architectural Design – Component-Level Design – User Experience Design – Design for Mobility – Pattern-Based Design.

UNIT III SYSTEM DEPENDABILITY 9 hours

Dependable Systems – Dependability Properties – Sociotechnical Systems – Redundancy and Diversity – Dependable Processes – Formal Methods and Dependability – Reliability Engineering – Availability and Reliability – Reliability Requirements – Fault-tolerant Architectures – Programming for Reliability – Reliability Measurement.

UNIT IV SERVICE-ORIENTED SOFTWARE ENGINEERING, SYSTEMS ENGINEERING AND REAL-TIME SOFTWARE ENGINEERING **9 hours**

Service-oriented Architecture – RESTful Services – Service Engineering – Service Composition – Systems Engineering – Sociotechnical Systems – Conceptual Design – System Procurement – System Development – System Operation and Evolution – Real-time Software Engineering – Embedded System Design – Architectural Patterns for Real-time Software – Timing Analysis – Real-time Operating Systems.

UNIT V SOFTWARE TESTING AND SOFTWARE CONFIGURATION MANAGEMENT **9 hours**

Software Testing Strategy – Unit Testing – Integration Testing – Validation Testing – System Testing – Debugging – White-Box Testing – Basis Path Testing – Control Structure Testing – Black-Box Testing – Software Configuration Management (SCM) – SCM Repository – SCM Process – Configuration Management for Web and Mobile Apps.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Identify software models based on the project requirements.
2. Understand the importance of Software Architecture.
3. Analyze the important dimensions of system dependability.
4. Identify the basic notions of a web service, web service standards and service-oriented architecture.
5. Recognize the various levels of software testing.

Text Book(s)

1. Roger Pressman and Bruce Maxim, "Software Engineering: A Practitioner's Approach", 9th Edition, McGraw-Hill, 2019.

2. Len Bass, Paul Clements and Rick Kazman, "Software Architecture In Practice", 3 rd Edition, Pearson India, 2018.

Reference Books

1. Pankaj Jalote, Narosa, "An Integrated Approach to Software Engineering", 3rd Edition, Publishing House, 2018.

2. Rajib Mall, "Fundamentals of Software Engineering", 5th Edition, PHI Learning Private Ltd., 2018.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Honors

20HDCSC109 NATURE INSPIRED COMPUTING

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

Course Description:
This course establishes basic knowledge in NP hard problems and understand the need for approximation algorithms, design algorithms for non-trivial problems, utilize the collective intelligence of simple organisms and implement artificial neural network for non-trivial problems.

Course Objectives:

This course enables students to

1. Explain the fundamental concepts of NP-hardness and computational complexity.
2. Understand the various evolutionary systems.
3. Learn the collective systems and artificial neural networks in computing.
4. Emphasis the behavioral systems in the digital world.
5. Elaborates the DNA computing.

UNIT I INTRODUCTION TO COMPUTATIONAL PROBLEMS 9 hours

Computational Problems, Decision Problem, Optimization Problem, Hardness in Optimization Problems, NP class, NP-Hard, examples for NP-Hard problems, tackling NP-Hard problems, Rationale for seeking inspiration from nature.

UNIT II EVOLUTIONARY SYSTEMS 9 hours

Pillars of Evolutionary Theory, The Genotype, Artificial Evolution, Genetic representations, Initial Population, Fitness Functions, Selection and Reproduction, Genetic Operators, Evolutionary Measures, Types of Evolutionary Algorithms.

UNIT III COLLECTIVE SYSTEMS AND ARTIFICIAL NEURAL NETWORKS 9 hours

Collective Systems: Particle Swarm Optimization Algorithm, Hybrid PSO algorithms, Ant Colony Optimization, Artificial Bee Colony, Firefly Algorithm.

Artificial Neural Networks: History, Mathematical model of neuron, ANN architectures, learning rules Backpropagation network, Backpropagation learning and its applications, Variants of BPA.

UNIT IV BEHAVIORAL SYSTEMS 9 hours

Behavior in Cognitive Science, Behavior in Artificial Intelligence, Behavior-Based Robotics, Biological Inspiration for Robots, Robots as Biological Models, Robot Learning, Evolution of Behavioral Systems Evolution and Learning in Behavioral Systems, Evolution and Neural Development in Behavioral Systems.

UNIT V DNA COMPUTING 9 hours

DNA Computing: Motivation, DNA Molecule, Adleman's experiment, Test tube programming language, Universal DNA Computers, PAM Model, Splicing Systems, Lipton's Solution to SAT Problem, Scope of DNA Computing, From Classical to DNA Computing.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Explain the various fundamental concepts of NP-hardness and computational complexity.
2. Analyze the utility of different evolutionary systems.
3. Demonstrate the collective systems and artificial neural networks in computing.
4. Discuss various behavioral systems in the digital world.
5. Expose the DNA computing to manage the data.

Text Book(s)

1. Xin-She Yang, “Nature-Inspired Computation and Swarm Intelligence Algorithms, Theory and Applications”, Elsevier, Academic Press, 2020.

2. Licheng Jiao, Ronghua Shang, Fang Liu, Weitong Zhang, Brain and Nature-Inspired Learning, Computation and Recognition, Elsevier, 2020.

Reference Books

1. Leandro Nunes de Castro, "Fundamentals of Natural Computing, Basic Concepts, Algorithms and Applications", Chapman & Hall/ CRC, Taylor and Francis Group, 2007.

2. Floreano D. and Mattiussi C., "Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies", MIT Press, Cambridge, MA, 2008.

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examination.

B. Tech Computer Science and Engineering (Cyber Security)

Honors

20HDCSC601 PENETRATION TESTING

L	T	P	C
1	0	2	2

Pre-requisite NIL

Course Description:

This course introduces series of processes and techniques that simulate real cyber-attack. The ultimate goal is to identify security vulnerabilities in an organization's databases, networks, and devices.

Course Objectives:

This course enables students to

1. Understand importance of pentesting.
2. Identify security weaknesses in a network, machine and in software.
3. Familiarise with cyber kill-chains.
4. Classify the web attacks.
5. Understand the vulnerability of Databases.

UNIT I PENTESTING AND INFORMATION SECURITY 6 hours

Pentester – Types of Hackers – Pentest Methodology – Pentest Types – Vulnerability Scanning – Vulnerability Assessments – Pentest Target and Specializations - Asset Management: CIA Triad – Security Controls – Access Controls – Incident Responses – Malware – Advanced Persistent Threats – Cyber Kill Chain – Air-gapped Machines – Dark Web.

1. Port Scanning: Use a tool like Nmap to scan a target system for open ports and identify the services running on those ports. This experiment helps to understand which ports are vulnerable to attacks.
2. Vulnerability Assessment: Conduct a vulnerability scan using tools like OpenVAS or Nessus to identify known vulnerabilities in a target system. This experiment helps to identify weaknesses that could be exploited.

UNIT II RECON AND HIJACKING 6 hours

Reconnaissance – External ¬ Dumpster Diving – Social Media – Social Engineering - Internal – Sniffing and Scanning – De-Authentication of Attacks – Detection Mechanism - Session Hijacking: Blind and Non-Blind Spoofing - Detection and Prevention Mechanisms.

6. Use tools like John the Ripper or Hashcat to crack passwords from a password file or database. This experiment helps you assess the strength of password policies and the effectiveness of password hashing algorithms.
7. Extract password hashes from Windows XP/NT machine. Use a password extractiontool, using word list, single crack or external mode to recover the password. Increase the complexity of the password and determine the point at which the cracking tool fails.

UNIT III NETWORK AND WIRELESS MAYHEM 6 hours

WEP Theory – SSID - WPA – WPS -.MAC Filtering – Port Security – IPsec - War Diving: Basic Web Cracking – Detecting Wireless Attacks - Fake Authentication – Handshake Theory -Bypassing Firewalls – Evading Intruder Detection System - Securing Network from Attacks.

1.Perform necessary steps for Analysis of WEP flaws

2. Set up a wireless network and experiment with different attacks like capturing network traffic, cracking WEP/WPA keys, or conducting rogue access point attacks. This experiment helps you evaluate the security of wireless networks.

UNIT IV WEB SERVER ATTACKS 6 hours

Understanding Web Languages - Web Architecture - Webpage Spoofing – Information Gathering from Target Websites – Finding Subdomains – OWASP Vulnerabilities : Broken Authentication - Broken Access Control - Security Misconfiguration - WebPage Attacks – Attack Detection – Protection Against Web Page Attacks – MITMF Code Injection.

1. Experiment with Cross site scripting
2. Choose a vulnerable web application (such as OWASP Juice Shop) and perform various attacks, including SQL injection, cross-site scripting (XSS), and command injection. This experiment helps you understand common web application vulnerabilities and their exploitation techniques

UNIT V INJECTION VULNERABILITY 6 hours

Databases – Testing Database Vulnerability – Securing SQL Server – Detecting Database Attacks –Protection Against Database Attacks - File Upload Vulnerability – Inclusion Vulnerability - Code Execution– Local File – Remote File – Mitigation Strategies.

1. Experiments on SQL injections
2. Perform a simulated phishing attack on employees by crafting convincing phishing emails or conducting phone calls. This experiment helps assess the awareness and susceptibility of employees to social engineering attacks.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Perform pentest on target and generate a report based on the test and determine security threats and vulnerabilities in computer networks.
2. Deploy and test exploits over targeting operating systems and services
3. Identify wireless threats and securing the networks.
4. Implement modern techniques to handle web attacks.
5. Analyze different approaches to secure the databases against attacks.

Text Book(s)

1. Phillip L. Wylie, Kim Crawley, “The Pentester BluePrint: Starting a Career as an Ethical Hacker”,2020, Wiley, United States.

2. Sabih, Zaid, “Learn Ethical Hacking from Scratch: Your stepping stone to penetration testing”, 2018 Packt Publishing Ltd, United Kingdom.

Reference Books

1. Diogenes, Yuri, and Erdal Ozkaya, "Cybersecurity Attack and Defense Strategies: Infrastructure security with Red Team and Blue Team tactics", 2018, Packt Publishing Ltd, United Kingdom.
2. Andrew Whitaker, and Daniel P. Newman. "Penetration Testing and Network Defense", 2005, Cisco Press, New Jersey.

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examination.