RAMDEOBABA UNIVERSITY

[RBU]

NAGPUR – 440013

RBU

RAMDEOBABA UNIVERSITY, NAGPUR

Formerly Shri Ramdobaba College of Engineering & Management (RCOEM) Est. 1984

PROGRAMME SCHEME

B. Tech. Computer Science & Engineering

[Cyber Security]

2024-25

School of Computer Science & Engineering

Department Vision

To continually improve the education environment, in order to develop graduates with strong academic and technical background needed to achieve distinction in the discipline. The excellence is expected in various domains like workforce, higher studies or lifelong learning. To strengthen links between industry through partnership and collaborative development works.

Department Mission

To develop strong foundation of theory and practices of computer science amongst the students to enable them to develop into knowledgeable, responsible professionals, lifelong learners and implement the latest computing technologies for the betterment of the society.

Program Education Objectives

1. To develop the ability to adapt, participate and invent new technologies and systems in the key domains of Computer Science & Engineering and Cyber Security.
2. To produce skilled graduates to identify the security challenges in the real world and suggest suitable design solutions to cater to the industrial needs and excel in innovation and management fields.
3. To inculcate sound Computer Science practices and Cyber security fundamentals among the graduates to meet the dynamically changing technological needs.
4. To imbibe ethical and social responsibility, multidisciplinary team spirit, proficiency in soft skills, entrepreneurship skills and leadership qualities among the students for the betterment of the society.

Programme Outcomes

Engineering graduates will be able to:

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **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 the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **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.

6. **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.
7. **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
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and Team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with 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.
11. **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.
12. **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.

Programme Specific Outcomes (PSOs)

1. The ability to understand and apply the Computer Science and Cyber Security principles.
2. The ability to develop computational knowledge and project development skills using innovative tools and techniques to solve problems in the areas related to Cyber Security

B. Tech. Computer Science and Engineering (CYBER SECURITY) [2024-25]
Teaching & Evaluation Scheme [B. Tech. CSE-CYBER SECURITY]

Semester – I

Sr. No.	Course Type	Course Code	Course Name	Hours/ Week		Credits	Maximum marks			ESE Duration (Hrs)
				L	P		Continuous Assessment	End Sem Exam/ Internal Evaluation	Total	
1	ESC	24CS01TH0101	Fundamentals of Programming	3	0	3	50	50	100	3
2	ESC	24CS01PR0101	Fundamentals of Programming Lab	0	2	1	25	25	50	-
3	PCC	24EE01TH0107	Computer Architecture and Organization	3	0	3	50	50	100	3
4	VSEC	24CS01PR0103	Computer Workshop–I Lab	0	2	1	25	25	50	-
5	ESC	24CS01PR0104	Fundamentals of Linux OS	0	2	1	25	25	50	-
6	VEC	24CS01TH0105	Cyber Laws & Ethics in IT	2	0	2	50	50	100	2
7	BSC	24HS03TH0103	Probability and Statistics	3	0	3	50	50	100	3
8	BSC	24HS03PR0103	Computational Mathematics Lab for CSE	0	2	1	25	25	50	-
9	VEC	24HS02TH0104	Foundational Course in Universal Human Values	1	0	1	50	-	50	-
10	BSC	24HS05TH0102	Introduction to Quantum Computing	3	0	3	50	50	100	3
11	BSC	24HS05PR0102	Introduction to Quantum Computing Lab	0	2	1	25	25	50	-
			TOTAL	**15**	**10**	**20**	**-**	**-**	**800**	**-**

Semester – II

Sr. No.	Course Type	Course Code	Course Name	Hours/ Week		Credits	Maximum marks			ESE Duration (Hrs)
				L	P		Continuous Assessment	End Sem Exam/ Internal Evaluation	Total	
1	ESC	24CS01TH0201	Object Oriented Programming	3	0	3	50	50	100	3
2	ESC	24CS01PR0201	Object Oriented Programming Lab	0	2	1	25	25	50	-
3	PCC	24CS01TH0202	Data Structures	3	0	3	50	50	100	3
4	PCC	24CS01PR0202	Data Structures Lab	0	2	1	25	25	50	-
5	VSEC	24CS01PR0203	Computer Workshop–II Lab	0	2	1	25	25	50	-
6	PCC	24CS01TH0204	Operating Systems	3	0	3	50	50	100	3
7	PCC	24CS01PR0204	Operating Systems Lab	0	2	1	25	25	50	-
8	BSC	24HS03TH0214	Calculus and Linear Algebra	3	0	3	50	50	100	3
9	IKS	24HS02TH0203	Foundational Literature of Indian Civilization	1	0	1	50	-	50	-
10	BSC	24HS02PR0202	Professional Communication Lab	0	2	1	25	25	50	-
11	CCA	24HS04PR0201	Sports-Yoga-Recreation	0	2	1	25	25	50	-
12	VEC	24HS01TH0202	Environmental Science	1	0	1	50	-	50	-
13	VEC	24HS01PR0202	Environmental Science Lab	0	2	1	25	25	50	-
14	CCA	24HS02PR0206-1 to 16/24HS04PR0202-1 to 4/	Liberal/Performing Art	0	2	1	25	25	50	-
			TOTAL	**14**	**16**	**22**	**-**	**-**	**900**	**-**

- **Courses Highlighted in Yellow [05 credits] will be swapped between Group-1 and Group-2 sections**

Liberal/ Performing Art Bucket

Sr. No.	Course Code	Course Title	L	P	Credits	Continuous Evaluation	End Sem Exam/ Internal Evaluation	Total	ESE Duration
1	24HS02PR0206-01	Fundamentals of Indian Classical Dance: Bharatnatayam	0	2	1	25	25	50	-
2	24HS02PR0206-02	Fundamentals of Indian Classical Dance: Kathak	0	2	1	25	25	50	-
3	24HS02PR0206-03	Introduction to Digital Photography	0	2	1	25	25	50	-
4	24HS02PR0206-04	Introduction to Basic Japanese Language	0	2	1	25	25	50	-
5	24HS02PR0206-05	Art of Theatre	0	2	1	25	25	50	-
6	24HS02PR0206-06	Introduction to French Language	0	2	1	25	25	50	-
7	24HS02PR0206-07	Introduction to Spanish Language	0	2	1	25	25	50	-
8	24HS02PR0206-08	Art of Painting	0	2	1	25	25	50	-
9	24HS02PR0206-09	Art of Drawing	0	2	1	25	25	50	-
10	24HS02PR0206-10	Nature Camp	0	2	1	25	25	50	-
11	24HS02PR0206-11	Developing Self-awareness	0	2	1	25	25	50	-
12	24HS02PR0206-12	Art of Poetry	0	2	1	25	25	50	-
13	24HS02PR0206-13	Creative and content writing	0	2	1	25	25	50	-
14	24HS02PR0206-14	Science of life through Bhagwad Gita	0	2	1	25	25	50	-
15	24HS02PR0105-15	Sanskrit Sambhashan Spoken Sanskrit	0	2	1	25	25	50	-
16	24HS02PR0105-16	Kirtan Kala	0	2	1	25	25	50	-
17	24HS04PR0202-1	Adventure Sports	0	2	1	25	25	50	-
18	24HS04PR0202-2	Introduction to Defense Forces & Obstacle Training	0	2	1	25	25	50	-
19	24HS04PR0202-3	Self Defense and Indian Martial Arts	0	2	1	25	25	50	-
20	24HS04PR0202-4	Basic Nutritional Course	0	2	1	25	25	50	-

B. Tech. Computer Science and Engineering (CYBER SECURITY) [2024-25]
Teaching & Evaluation Scheme [B. Tech. CSE-CYBER SECURITY]

Semester – III

Sr. No.	Course Type	Course Code	Course Name	Hours/ Week		Credits	Maximum marks			ESE Duration (Hrs)
				L	P		Continuous Assessment	ESE/ Internal Evaluation	Total	
1	PCC	24CS08TH0301	Theory of Computation	3	0	3	50	50	100	3
2	PCC	24CS08TH0302	Database Management System	3	0	3	50	50	100	3
3	PCC	24CS08PR0302	Database Management System Lab	0	2	1	25	25	50	-
4	VSEC	24CS08PR0303	Data Handling and Visualization Lab	0	4	2	25	25	50	-
5	PCC	24CS08TH0304	Computer Networks	3	0	3	50	50	100	3
6	PCC	24CS08PR0304	Computer Networks Lab	0	2	1	25	25	50	-
7	BSC	24HS03TH0301	Discrete Mathematics	3	0	3	50	50	100	3
8	OE	24CSOEC01TH 0305	Open Elective-I	2	0	2	50	50	100	2
9	MDM	24CS08TH0305	MDM-I	3	0	3	50	50	100	3
10	INC	INC	INCENTIVES	-	-	-	-	-	-	-
			Total	**17**	**8**	**21**	**-**	**-**	**750**	

Semester – IV

Sr. No.	Course Type	Course Code	Course Name	Hours/ Week		Credits	Maximum marks			ESE Duration (Hrs)
				L	P		Continuous Assessment	ESE/ Internal Evaluation	Total	
1	PCC	24CS08TH0401	Cryptography	3	0	3	50	50	100	3
2	PCC	24CS08TH0402	Design & Analysis of Algorithms	3	0	3	50	50	100	3
3	PCC	24CS08PR0402	Design & Analysis of Algorithms Lab	0	2	1	25	25	50	-
4	PCC	24CS08TH0403	Fundamentals of Blockchain	3	0	3	50	50	100	3
5	PCC	24CS08PR0403	Fundamentals of Blockchain Lab	0	2	1	25	25	50	-
6	PCC	24CS08PR0404	Software Lab	0	4	2	25	25	50	-
7	OE	24CSOEC01TH0405	Open Elective - II	2	0	2	50	50	100	2
8	CEP	24CS08PR0405	Community Engagement Project	0	4	2	25	25	50	
9	VEC	24CS08TH0406	Creativity, Innovation & Design Thinking	2	0	2	50	-	50	-
10	AEC	24CS08PR0407	Basic competitive coding	0	2	1	50	-	50	-
11	MDM	24CS08TH0408	MDM-II	3	0	3	50	50	100	3
			Total	**16**	**14**	**23**	**-**	**-**	**800**	**-**

Semester – V

Sr. No.	Course Type	Course Code	Course Name	Hours/ Week		Credits	Maximum marks			ESE Duration (Hrs)
				L	P		Continuous Assessment	End Sem Exam/ Internal Evaluation	Total	
1	PCC	24CS08TH0501	Artificial Intelligence and Cyber Security	3	0	3	50	50	100	3
2	PCC	24CS08PR0501	Artificial Intelligence and Cyber Security Lab	0	2	1	25	25	50	-
3	PCC	24CS08TH0502	Software Engineering and Project Management	3	0	3	50	50	100	3
4	PCC	24CS08PR0502	Software Engineering and Project Management Lab	0	2	1	25	25	50	-
5	PCC	24CS08TH0503	Computer Security	3	0	3	50	50	100	3
6	PCC	24CS08TH0504	Basics of Ethical Hacking	3	0	3	50	50	100	3
7	EEM	24CS08PR0505	Idea Lab	0	2	1	50	50	100	2
8	PEC	24CS08TH0506	Program Elective-I	3	0	3	50	50	100	3
9	OE	24CSOEC01TH 0505	Open Elective - III	2	0	2	50	50	100	2
10	MDM	24CS08TH0507	MDM-III	3	0	3	50	50	100	3
			Total	**20**	**6**	**23**	**-**	**-**	**900**	**-**

Semester – VI

Sr. No.	Course Type	Course Code	Course Name	Hours/ Week		Credits	Maximum marks			ESE Duration (Hrs)
				L	P		Continuous Assessment	End Sem Exam/ Internal Evaluation	Total	
1	PCC	24CS08TH0601	Introduction to Cloud Security	3	0	3	50	50	100	3
2	PCC	24CS08PR0601	Introduction to Cloud Security Lab	0	2	1	25	25	50	-
3	PCC	24CS08TH0602	IoT Security	3	0	3	50	50	100	3
4	PEC	24CS08PR0602	Network Defender Lab	0	2	1	25	25	50	-
6	PEC	24CS08TH0603	Program Elective-II	3	0	3	50	50	100	3
7	PEC	24CS08TH0604	Program Elective-III	3	0	3	50	50	100	3
8	AEC	24CS08PR0605	Comprehensive Viva	0	2	1	50	-	50	-
9	AEC	24HS02TH0601	Business Communication	1	0	1	50	-	50	-
10	AEC	24HS02PR0601	Business Communication Lab	0	2	1	25	25	50	-
11	VSEC	24CS08PR0606	Mini Project	0	4	2	50	-	50	-
12	AEC	24CS08PR0607	Advanced Competitive Coding	0	2	1	50	-	50	-
13	MDM	24CS08TH0608	MDM-IV	3	0	3	50	50	100	3
			Total	**16**	**14**	**23**	**-**	**-**	**850**	

Semester – VII/VIII

Sr. No.	Course Type	Course Code	Course Name	Hours/ Week		Credits	Maximum marks			ESE Duration (Hrs)
				L	P		Continuous Assessment	ESE/ Internal Evaluation	Total	
1	PCC	24CS08TH0701	Network Security Administration	3	0	3	50	50	100	3
2	PCC	24CS08PR0701	Network Security Administration Lab	0	2	1	25	25	50	-
3	PCC	24CS08TH0702	Secure Coding	3	0	3	50	50	100	3
4	PEC	24CS08TH0703	Program Elective - IV	3	0	3	50	50	100	3
5	PCC	24CS08TH0704	Vulnerability Assessment and Penetration Testing	3	0	3	50	50	100	3
6	PRJ	24CS08PR0705	Major Project - I	0	8	4	50	50	100	-
8	AEC	24CS08PR0706	Participative Learning	0	2	1	50	-	50	-
9	Internship	24CS08PR0707	Industry Internship Evaluation [Min 6 Weeks]	-	-	-	-	-	-	-
			Total	**12**	**12**	**18**	**-**	**-**	**600**	

Semester – VIII/VII

Sr. No	Course Type	Course Code	Course Name	Hours/ Week		Credits	Maximum marks			ESE Duration (Hrs)
				L	P		Continuous Assessment	ESE/ Internal Evaluation	Total	
1	PEC	24CS08TH0801	Program Elective - V/ NPTEL/ SWAYAM	3	0	3	50	50	100	3
2	PEC	24CS08TH0802	Program Elective - VI/ NPTEL/ SWAYAM	3	0	3	50	50	100	3
3	PRJ	24CS08PR0803	Major Project - II	0	12	6	50	50	100	-
			Total	**6**	**12**	**12**	**150**	**150**	**300**	

OR

Sr. No.	Course Type	Course Code	Course Name	Hours/ Week		Credits	Maximum marks			ESE Duration (Hrs)
				L	P		Continuous Assessment	End Sem Exam/ Internal Evaluation	Total	
1	Internship	24CS08PR0804	Industry Internship/Research Internship/TBI	0	24	12	150	150	300	-
			Total	**0**	**24**	**12**	**150**	**150**	**300**	

Electives Basket

Micro Specialization	Elective-I (T) [V Sem]	Elective-II (T) [VI Sem]	Elective-III (T) [VI Sem]	Elective-IV (T) [VII Sem]	Elective-V (T) [VIII Sem]	Elective-VI (T) [VIII Sem]
Security	Incident Handling and Response	Application Security	Auditing IT Infrastructure for Compliance	Digital Forensic	Cyber Risk Assessment & Management	SIEM
Information Management	Information Retrieval	Business and Web Analytics	Time Series Analytics	Healthcare Analytics	Multi-variate Techniques for Data Analytics	Human Computer Interaction
AIML	Information Retrieval	Computer Vision	Robotics and Automation	Deep Learning	Natural Language Processing	Generative -AI
Image Processing and NLP	Image Analytics	Computer Vision	Natural Language Processing	Automatic Speech Recognition	Generative Deep Learning	Optimization for Data Science
General	Enterprise web application	Mobile Application on Development	DevOps	Micro Service based Applications	Bio-inspired Computing	Applied Social Network Analysis

SEM	I	II	III	IV	V	VI	VII	VIII	Total
Credits	20	22	21	23	23	23	18	12	**162**

Syllabus for Semester I, B. Tech. Computer Science & Engineering
[Cyber Security]

Course Code: 24CS01TH0101 **Course: Fundamentals of Programming**
L: 3Hrs, T: 0 Hr, P: 0Hr, Per Week **Total Credits: 3**

Course Objectives:
The objective of this course is to develop logical thinking and problem-solving techniques.

Unit I: Algorithm and Flowchart for problem-solving, Introduction to C language: Keywords, Constant, Variable, Data types, Operators, Types of Statements, Decision Control Statement- if and Conditional operators.

Unit II: Switch case statement, Loops, Pre-processor Directives

Unit III: Concept of functions, User defined and Library Functions, parameter passing, Recursion, Storage class, Pointers.

Unit IV: Arrays: 1-D, 2-D, Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Pointers to the array, Command line arguments, User Defined Data Types: Structures, enum, union

Unit V: File handling Streams in C, Types of Files, File Input/ Output Operations: Modes of file opening, Reading and writing the file, Closing the files, using fflush().

Course Outcomes
On successful completion of the course, student shall be able to
1. Design logic for simple problem statements using flowchart and algorithm.
2. Develop solution for problem statements involving decision-making and loops.
3. Apply the concept of functions for modular programming
4. Implement solution for problem statements using arrays and structures
5. Perform file operations

Text Books:

1. The C Programming Language: B. W. Kernighan and D. M. Ritchie, Second Edition, Pearson, June 2015
2. Programming in ANSI C: E. Balguruswami McGraw Hill

Reference Books

1. Mastering C: K. R. Venugopal and S. R. Prasad, Tata McGraw Hill

Syllabus for Semester I, B. Tech. Computer Science & Engineering [Cyber Security]

Course Code: 24CS01PR0101 **Course: Fundamentals of Programming Lab**

L: 0Hrs, T: 0 Hr, P: 2Hr, Per Week **Total Credits: 1**

- Practical's will be conducted based on Syllabus of Fundamentals of Programming [**24CS01TH0101]**

Course Outcomes

On successful completion of the course, student shall be able to

1. Design logic for simple problem statements using flowchart and algorithm.
2. Develop solution for problem statements involving decision-making and loops.
3. Apply the concept of functions for modular programming.
4. Implement solution for problem statements using arrays and structures.
5. Perform file operations.

Text Books:

1. The C Programming Language: B. W. Kernighan and D. M. Ritchie, Second Edition, Pearson, June 2015
2. Programming in ANSI C: E. Balguruswami McGraw Hill

Reference Books

1. Mastering C: K. R. Venugopal and S. R. Prasad, Tata McGraw Hill

Syllabus for Semester I, B. Tech. Computer Science & Engineering [Cyber Security]

Course Code: 24EE01TH0107 **Course: Computer Architecture and Organization**

L: 3 Hrs, P: 0Hr, Per Week **Total Credits: 3**

Course Outcomes:

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

1. Explain the basic structure and operation of a computer system.
2. Analyze Instruction Set Architecture and Arithmetic Operations
3. Evaluate Memory Hierarchy and Management
4. Demonstrate I/O organization, data transfer methods, and interrupt handling.
5. Apply the knowledge of computer architecture principle to comprehend advance computing architectures

SYLLABUS

UNIT I: Fundamentals of Computer Architecture:

Number Systems and their operations, Floating Point number representation, Basics of Computer Architecture and Organization, Evolution of Computing System, Performance Metrics (MIPS, FLOPS, CPI, IPC, Execution time).

UNIT II: Instruction Set Architecture and Arithmetic Operations:

Instruction Execution cycle, Instruction Set Architecture, addressing modes, Instruction set classification, Pipelining Architecture, Multiplication: Booth's Algorithm, Bit-pair recoding, Integer Division: Restoring and non-restoring division.

UNIT III: Memory Hierarchy and Management:

Memory hierarchy, Types of memory in Computer System and their Characteristics, Cache memory: Mapping functions, Replacement policies, Virtual Memory: Paging and Segmentations, Memory interleaving

UNIT IV: Input/output Organization:

Introduction to I/O systems: I/O interface and bus systems, Modes of data Transfer: Program I/O, Interrupt driven I/O and Direct Memory access (DMA), I/O addressing Techniques, Interrupts: Interrupts and interrupt handling mechanisms.

UNIT V: Advanced Computer Architectures and Parallel Processing:

Pipelining and Super Scalar Execution, Parallel processing and Multicore Architecture, Flynn's Taxonomy for parallel architectures, GPUs and their role in modern computing.

Text Books

1. V.C. Hamacher, Z.G. Vranesic and S.G. Zaky; Computer Organization; 5th edition; McGrawHill,2002.
2. W. Stallings; Computer Organization & Architecture; PHI publication; 2001.

Reference Books

1. M Mano; Computer System and Architecture; PHI publication; 1993. A.S. Tanenbaum; Structured Computer Organization; Prentice
2. J. P. Hayes; Computer Architecture & Organization; 3rdedition; McGraw-Hill; 1998.

Syllabus for Semester I, B. Tech. Computer Science & Engineering
[Cyber Security]

Course Code : 24CS01PR0103 **Course : Computer Workshop-I Lab**
L: 0 Hrs, P: 2 Hrs, Per Week **Total Credits: 1**

Course Outcomes

On successful completion of the course, students will be able to:

1. Perform Data Analysis using MS Excel.
2. Design static web pages using HTML.
3. Demonstrate proficiency in web page styling using CSS and Bootstrap.
4. Develop websites using MS Excel, HTML and CSS

MS Excel

Complex formulas: INDEX-MATCH and array formulas, Pivot tables for comprehensive data analysis, Advanced charting for dynamic data visualization, Conditional formatting for data insights, Automating tasks with macros, Data validation for error-free data entry

HTML

Creation of headers, paragraphs, links, importing of images, tables, designing of forms, and document structure of HTML.

HTML-5

Navigation in Webpage, Multimedia based tags- audio, video, iframe, Creating Animations.

CSS & Bootstrap

Introduction to Cascading Style Sheets, Features, Core syntax, Style Sheets and HTML StyleRule, Text Properties

Text Books

1. Microsoft Excel 2019: Data analysis and Business Modelling, Wayne Winston, Microsoft Press, 6th edition 2019.
2. HTML & CSS: The Complete Reference, Thomas Powell, MGH, 5th edition, 2017.
3. Bootstrap 5 Foundations, Daniel Charles Foreman, Independently published, 2021.

Reference Books

1. Mastering Advanced Excel, Ritu Arora, BPB Publications, 2023.
2. HTML and CSS: Design and Build Webs, Jon Duckett, Wiley, 1st edition, 2011.
3. Web Design: A Beginner's Guide, Wendy Willard, MGH, 2nd edition, 2010.

Syllabus for Semester I, B. Tech. Computer Science & Engineering [Cyber Security]

Course Code: 24CS01PR0104 **Course: Fundamentals of Linux OS Lab**

L: 0 Hrs, P: 2 Hr, Per Week **Total Credits: 1**

Course Objectives:

The course on Open-Source Software Tools aims to provide a comprehensive understanding and practical skills in open-source software. Students will explore the history, principles, and significance of open source. The course covers hands-on experience with popular open-source operating system and software tools. Through this course, students will gain the knowledge and skills to effectively utilize and contribute to the open-source ecosystem.

Course Outcomes

Upon completion of the course, students will be able to

1. Understand the architecture and use of Linux operating system.
2. Effectively use different services provided by Linux operating system.
3. Automate tasks and write simple programs using shell scripts.
4. Use popular IDEs for program development.

Linux Operating System:

- Introduction and history of Linux OS
- Basic commands
- File system and file handling commands
- User, Group management commands
- Process handling commands
- Package management
- Shell and shell script
- Introduction to popular IDEs, Git

Text Book

1. Linux Pocket guide- Daniel J. Barrett, O'Reilly Media
2. Linux: The Complete Reference, Sixth Edition- Richard Petersen, McGraw Hill Education

Reference Books

1. Linux Administration: A Beginner's Guide – Wale Soyinka, McGraw Hill Publication
2. Linux Command Line and Shell Scripting Bible- Richard Blum, Wiley

Syllabus for Semester I, B. Tech. Computer Science & Engineering [Cyber Security]

Course Code: 24CS01TH0105 **Course: Cyber Laws & Ethics in IT**

L: 2 Hrs, P: 0 Hr, Per Week **Total Credits: 2**

Course Outcomes

On successful completion, of course student will able to learn:

1. To analyze the role of ethics in IT organization.
2. To identify various cyber laws with respect to legal dilemmas in the Information Technology field.
3. To interpret various intellectual property rights, Privacy, Protection issues in Information Technology field.
4. To describe the ways of precaution and prevention of Cyber Crime as well as Human Rights.

Syllabus:

UNIT I

Ethics in business world & IT professional malpractices, Introduction to firewalls, IDS System, Distortion and fabrication of information

UNIT II

Ethics of IT Organization: Contingent Workers H- IB Workers, Whistle- blowing, Protection for Whistle-Blowers, Handling Whistle- blowing situation, Digital divide.

UNIT III

Intellectual Property: Copyrights, Patents, Trade Secret Laws, Key Intellectual property issues, Plagiarism, Privacy: The right of Privacy, Protection, Key Privacy and K- Anonymity issues, Identity Theft, Consumer Profiling,

UNIT IV

Cyber laws and rights in today's digital age, Emergence of Cyberspace, Cyber Jurisprudence, Cyber Crimes against Individuals, Institution and State, Hacking, Digital Forgery, Cyber Stalking/Harassment, Cyber terrorism, cyber tort, Cyber Defamation & hate speech, Competitive Intelligence, Cybersquatting, The Indian Information Technology Act 2000 IT Act.

Text Books:

1. George Reynolds, “Ethics in information Technology”,5th edition, Cengage Learning
2. Hon C Graff, Cryptography and E-Commerce - A Wiley Tech Brief, Wiley Computer Publisher, 2001.

Reference Books:

1. Michael Cross, Norris L Johnson, Tony Piltzecker, Security, Shroff Publishers and Distributors Ltd.
2. Debora Johnson,” Computer Ethic s”,3/e Pearson Education.
3. Sara Baase, “A Gift of Fire: Social, Legal and Ethical Issues, for Computing and the Internet,” PHI Public at ions.
4. Chris Reed & John Angel, Computer Law, OUP, New York, (2007).
5. Dr Pramod Kr.Singh, “Laws on Cyber Crimes [Along with IT Act and Relevant Rules]” Book Enclave Jaipur India.

Syllabus for Semester I, B. Tech. Computer Science & Engineering [Cyber Security]

Course Code: 24HS03TH0103 Course: Probability and statistics

L: 3 Hrs, T: 0 Hr, P: 0Hrs, Per Week Total Credits: 3

Course Pre-requisite:

Basics of Probability and Statistics**.**

Course Objective:

The objective of this course is to expose student to understand the basic importance fundamental principles of probability, including probability distributions, random variables, basic statistical methods used for data analysis, inferential statistics, hypothesis testing, confidence intervals, and regression analysis in computer science and Information technology.

Course Outcomes

On successful completion of the course, student shall be able to

1. Grasp the meaning of discrete and continuous random variables, probability distribution. Interpret the meaning of probabilities derived from distributions. This involves understanding what the calculated probabilities represent in practical terms and drawing conclusions from the results.
2. To analyze and interpret stochastic models, including calculating probabilities, transition probabilities, and steady-state probabilities within stochastic systems.
3. Grasp the fundamental concepts of curve fitting like regression techniques, model selection, and the use of different types of curves or functions to approximate data.
4. Understand the fundamental concept of hypothesis testing, including the null hypothesis (H0) and alternative hypothesis (H1), significance levels, p-values, and the basic logic behind hypothesis testing.
5. To apply MLE to various statistical models, such as linear regression, exponential distribution, etc. They should understand how to formulate likelihood functions and derive estimators for unknown parameters.

Syllabus

Unit I (8 hours)

Measure of central tendency, quartile, inter quartile range and outliers**,** Probability spaces, conditional probability, independence, Discrete random variables, Binomial distribution, Poisson distribution, Normal distribution and their applications.

Unit II: (8 Lectures)

Joint probability function, Introduction to stochastic process, random walk, stationary and auto regressive process, transition probability Matrix, Discrete time Markov chain and its applications in queueing problems.

Unit III: (8 hours)

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves, correlation and regression – Rank correlation, Multiple regression and correlation and its application in analysis of data.

Unit IV: (8 Lectures)

Sampling Distributions, Point and Interval Estimations, Testing of Hypothesis for single mean and proportion.

Unit V: (7 Lectures):

Testing of Hypothesis for difference of mean and proportion, Test for ratio of variances - Chi-square test for

goodness of fit and independence of attributes, maximum likelihood estimation

Text Books:

1. M R. Spiegal , Theory and Problems of probability and statistics :,2nded :,Schaum series
2. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.

Reference Books:

1. Maurtis Kaptein, Statistics for data science, An introduction to probability, statistics and Data Analysis, Springer 2022.
2. Jay L Devore, Probability and Statistics for Engineering and sciences, 8th edition, Cenage learning.

Syllabus for Semester I, B. Tech. Computer Science & Engineering [Cyber Security]

Course Code: 24HS03PR0101 **Course: Computational Mathematics Lab for CSE**

L: 0 Hrs, T: 0 Hr, P: 2Hr, Per Week **Total Credits: 1**

Course Objectives: The computational Mathematics Lab course will consist of experiments demonstrating the principles of Mathematics relevant to the study of Science and Engineering. Students will show that they have learnt Laboratory skills that will enable them to properly acquire and analyze the data in the lab and draw valid conclusions. On successful completion of the course students shall be able to:

Course Outcomes:

By using open source software Students will be able to

CO1: Utilize mathematical software as an advanced calculator to create and manipulate 2D and 3D plots in SageMath, enabling effective visualization and interpretation of data

CO2 Recognizing, solving, and applying recurrence relations to a wide range of computational problems

CO3: Use partial derivatives and gradients for optimizing multivariable functions

CO4 :Apply linear algebra concepts, including matrix representations and Singular Value Decomposition (SVD), for image processing and dimensionality reduction.

CO5 Understand different curve fitting techniques, such as linear, polynomial, and exponential fitting and learn how to choose the appropriate curve fitting method based on the data characteristics.

CO6 Understand and articulate the fundamental concepts and purposes of hypothesis testing in data analysis.

Mapping of Course outcomes (COs) with Experiments

Exp. No.	Name of Experiments	Mapped COs
1	To use mathematical software as an advance calculator and for visualization of data	CO1
2	2D - 3D Plotting and data visualization	CO1
3	Exploring Recurrence Relations in Computational Algorithms	CO2
4	Applied optimization (Maxima, minima and Gradient descent method)	CO3
5	Application of Matrices in image processing	CO4
6	Linear Algebra with Various applications (computer Graphix, cryptography ,stochastic process)	CO4
7	Curve Fitting to identify trends and patterns within dataset .	CO5
8	Validating Hypotheses in Data Analysis	CO6

Reference:

1. Paul Zimmermann, Computational Mathematics with Sagemath , siam publisher.

Syllabus for Semester I, B. Tech. Computer Science & Engineering [Cyber Security]

Course Code :24HS02TH0104 Course: Foundation course in Universal Human Values

L: 1 Hr, P: 0 Hrs, Per Week Total Credits: 1

Course Objectives:

1. To help the student see the need for developing a holistic perspective of life
2. To sensitize the student about the scope of life – individual, family (inter-personal relationship), society and nature/existence
3. To strengthen self-reflection
4. To develop more confidence and commitment to understand, learn and act accordingly

Course outcome:

On completion of course, students will be able to achieve the following:

CO1: Develop a holistic perspective of life

CO2: Better understanding of inter-personal relationships and relationship with society and nature.

CO3: An ability to strengthen self-reflection

Syllabus

Unit 1:- Aspirations and concerns 5 hours

Need for Value Education: Guidelines and content of value education.

Exploring our aspirations and concerns: Knowing yourself, Basic human aspirations Need for a holistic perspective, Role of UHV; Self-Management: harmony in human being

Unit 2:- Health 4 hours

Harmony of the Self and Body, Mental and physical health; Health for family, friends and society.

Unit 3:- Relationships and Society 5 hours

Harmony in relationships, Foundational values: Trust, Respect, Reverence for excellence, Gratitude and love; harmony in society; harmony with nature.

Text book

1. R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics, Excel books, New Delhi, 2010, ISBN 978-8-174-46781-2

Reference books:

1. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.
2. PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
5. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, limits to Growth, Club of Rome's Report, Universe Books.
6. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.
7. A Nagraj, 1998, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
8. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
9. A.N. Tripathy, 2003, Human Values, New Age International Publishers.

Syllabus for Semester I, B. Tech. Computer Science & Engineering
[Cyber Security]

Course Code:24HS05TH0102 **Course: Introduction to Quantum Computing**
L: 3 Hrs, P: 0Hr, Per Week **Total Credits: 3**

Course Objectives

1. To introduce the fundamentals of quantum computing to students
2. The problem-solving approach using finite dimensional mathematics

Course Outcomes

After successful completion of the course, the students will be able to -

1. Use the basic quantum theory relating to the probabilistic behaviour of an electron in an atom.
2. Utilize the knowledge of complex vector space in the domain of quantum theory.
3. Analyse classical and quantum approach towards the quantum computation.
4. Classify deterministic and probabilistic systems and analyse quantum observations and quantum measurements.
5. Use quantum gates in building architecture and quantum algorithms.

Unit I: Basic Quantum Theory

Brief introduction about Quantum Computers and Quantum mechanics, Wave nature of Particles, Bohr's quantization condition, Heisenberg's Uncertainty principle, Wave function, probability, Schrodinger's wave equation, Operators, Electron in an infinite potential well, Eigen value and Eigen functions.

Unit II: Complex Vector Spaces

Algebra and Geometry of Complex numbers, Real and Complex Vector Spaces, definitions, properties, Abelian group, Euler's formula, Dr Moivre's formula, Matrix properties.

Unit III: Linear Algebra in Quantum Computing

Basis and Dimensions, Inner products, Hilbert Spaces, Eigenvalues and Eigenvectors, Hermitian and Unitary Matrices, Tensor Product, Applications of linear algebra in computer graphics.

Unit IV: Classical and Quantum Systems

Deterministic and Probabilistic Systems, Quantum Systems, Stochastic billiard ball, Probabilistic double slit experiment with bullet and photon, Superposition of states, assembling systems, Entangled states.

Unit V: Quantum representation of systems

Dirac notations, Stern-Gerlach experiment, transition amplitude, norm of the ket, Bloch Sphere, Observables, Spin matrices, commutator operator, expectation values, variance, standard deviation, Heisenberg's uncertainty principle in matrix mechanics, measuring, dynamics, observations.

Unit VI: Architecture and Algorithms

Bits and Qubits, Classical Gates and their equivalent quantum representation, Reversible Gates: CNOT, Toffoli, Fredkin, gates, outline of Pauli X, Y, Z gates, Hadamard gates, Deutsch Gate.

Quantum Algorithms: Deutsch's algorithm, Grover's search algorithm.

Applications of quantum computing in Cryptography, Quantum teleportation, Cybersecurity, banking, finance, advance manufacturing and artificial intelligence.

Text Book

1. Quantum computing for computer scientists, Noson S. Yanofsky, Mirco A. Mannucci, Cambridge University Press 2008
2. Introduction to Quantum Mechanics, 2nd Edition, David J. Griffiths, Prentice Hall New Jersey 1995

Reference Books

1. Quantum computing explained, David McMahon, Wiley-interscience, John Wiley & Sons, Inc. Publication 2008
2. Quantum computation and quantum information, Michael A. Nielsen and Isaac Chuang, Cambridge University Press 2010

Syllabus for Semester I, B. Tech. Computer Science & Engineering
[Cyber Security]

Course Code:24HS05PR0102 **Course: Introduction to Quantum Computing Lab**
L: 0 Hrs, P: 2Hr, Per Week **Total Credits: 1**

Course Outcomes:

The physics laboratory will consist of experiments and programming exercises illustrating the principles of physics relevant to the study of computer science and engineering.

On completion of the course, the students will be able to

1. Utilize Mathematica software for graph plotting and for least squares fitting of the experimental data.
2. Explore the quantum systems.
3. Compare the properties of real and complex matrices with reference to their use in quantum system.
4. Apply the computational methods to solve eigenvalues and eigenfunctions, tensor products.
5. Simulate classical and Quantum gates and design programmes on IBM Quantum Computers.

The laboratory will consist of general computational physics practical.

1. Linear and Nonlinear data fitting and Error analysis by LLSF method .
2. Analysing the complex behavior of Wave packets
3. Understanding the Eigen values, Eigen functions of 1-D Quantum Well.
4. Working with Vectors.
5. Working with Matrices: Real and Complex numbers.
6. Properties of Unitary and Hermitian Matrices, Inner Product, Tensor Product etc.
7. Simulation of Classical gates by Quantum representation of the gates and inputs.
8. Introduction to IBM quantum computer.
9. Simulation of Quantum gates: CNOT gate, Toffoli gate, Fredkin gate, Hadamard gate on IBM quantum computer.
10. Arithmetic operations using IBM Quantum computer.
11. Quantum Half adder and Full adders.

Reference Books

1. Quantum Computing explained, David Mcmohan, Wiley-Interscience, John Wiley & Sons, Inc publication 2008
2. Quantum Computation and Quantum Information, Michael A. Nielson and Isaac L. Chuang, Cambridge University, Press 2010

Syllabus for Semester II, B. Tech. Computer Science & Engineering [Cyber Security]

Course Code: 24CS01TH0201 **Course: Object Oriented Programming**

L: 3 Hrs, P: 0Hr, Per Week **Total Credits: 3**

Course Objectives

1. To make students understand the Fundamental features of an object-oriented language like Java: object classes and interfaces, exceptions, and libraries of object collections
2. Introduce students to fundamental concepts like exception handling, generics, collection classes, and streams.

Syllabus

Unit I:

Features of Object-Oriented Programming languages, Abstraction, Encapsulation, Inheritance, polymorphism, and late binding. Programming paradigms, Bytecode, JDK, JRE, JVM.

Concept of a class and object, ways of representing objects, access specifiers, constructors and methods, constructor overloading

Unit II:

Method Overloading, Arrays and Array of objects, Wrapper classes (Integer, Double etc.), String Class, creating packages, importing packages, access specifiers, static and non static members.

Unit III:

Concept of inheritance, methods of derivation, use of super keyword and final keyword in inheritance, overriding, run time polymorphism, abstract classes and methods, Interface, implementation of interface Lambda Expressions Introduction, Block, passing Lambda Expressions as arguments

Unit IV:

Exceptions: Types of exception, use of try-catch block, handling multiple exceptions, using finally, throw and throws clause, user-defined exceptions.

Introduction to streams, byte streams, character streams, file handling in Java, Serialization.

Unit V:

Generics: type-safety, generic class with two type parameters, bounded generics, wildcard, and generic method.

Collection classes: Arraylist, TreeSet, HashMap, Iterator, ListIterator, Collections class, Comparator, Comparable

Introduction to Design Patterns, Need of Design Pattern, Classification of Design Patterns, Role of Design Pattern in Software design, Creational Patterns, Structural Design Patterns and Behavioral Patterns.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Apply object-oriented principles such as abstraction, encapsulation, inheritance and polymorphism to develop efficient Java Programs.
2. Illustrates various Java constructs, including constructors, methods, arrays, wrapper classes, packages, and lambda expressions for effective program development.
3. Implement exception handling mechanisms and Java streams for robust and error-free programming.
4. Utilize generics and collections to develop scalable and maintainable software solutions.
5. Analyze the characteristics, significance and applications of design patterns in the software development process.

Text Books

1. Herbert Schildt; JAVA The Complete Reference; Ninth Edition, Tata McGraw- Hill Publishing Company Limited.
2. Design Patterns by Erich Gamma, Pearson Education

Reference Books

1. Herbert Schildt and Dale Skrien; Java Fundamentals A Comprehensive Introduction; Tata McGraw- Hill Education Private Ltd 2013.
2. Core Java Volume I – Fundamentals" by Cay S. Horstmann and Gary Cornell

Syllabus for Semester II, B. Tech. Computer Science & Engineering [Cyber Security]

Course Code: 24CS01PR0201 **Course: Object Oriented Programming Lab**

L: 0 Hrs, P: 2Hr, Per Week **Total Credits: 1**

- Practical's will be conducted based on Syllabus of Object-Oriented Programming [24CS01TH0201]

Course Objectives

1. To make students understand the Fundamental features of an object-oriented language like Java: object classes and interfaces, exceptions, and libraries of object collections
2. Introduce students to fundamental concepts like exception handling, generics, collection classes, and streams.

Course Outcomes:

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

1. Execute Java programs using the concept of classes, objects, methods, wrapper classes and packages to enhance code reusability and modularity.
2. Develop reusable and modular code by implementing inheritance and interfaces.
3. Implement robust programming practices using exception handling mechanism and Java streams for effective error handling and file operations.
4. Utilize generics and collection classes to data management and software scalability.

Syllabus for Semester II, B. Tech. Computer Science & Engineering [Cyber Security]

Course Code: 24CS01TH0202 **Course: Data Structures**

L: 3 Hrs, P: 0Hr, Per Week **Total Credits: 3**

Course Objectives

1. To introduce the basic concepts of data structures and algorithms.
2. To prepare students to use linear and non-linear data structures.
3. To familiarize students with different searching and sorting techniques.
4. To enable students to use appropriate data structure for solving real-world problems.

SYLLABUS

UNIT-I: Data Structures and Algorithm Basics

Introduction: Elementary data organizations and operations on it. Abstract data types (ADT) and their characteristics.

Algorithms: Characteristics, Asymptotic notations, time and space trade-offs, Analysis of algorithm.

Array ADT: Representations – row-major and column-major form, Dynamic Arrays, Implementation of Real- life problems using arrays.

UNIT-II: Stacks and Queues

Stack ADT: Stack implementation using arrays, Applications of stacks – expression conversion and evaluation, implementation of multiple stacks, Real life problem implementation using stacks

Queue ADT: Queue implementation using arrays, Circular queue, Real life problem implementation using Queue, introduction to double-ended queues and priority queue

UNIT-III: Linked Lists

Singly Linked Lists (SLL): Creation of SLL, Operations on SLL: Insertion, Deletion, Traversal, reversal, ordering, etc., Linked representation of stacks and queues, Header node linked lists.

Doubly and Circular Linked Lists (DLL and CLL): Creation of Linked list and operations on it.

UNIT-IV: Trees

Trees: Terminologies, Binary tree and operations, Binary search tree [BST] and operations, Threaded binary trees.

Self-balancing Search Trees: Tree rotations, AVL tree and operations, B tree, B+- tree and operations.

UNIT-V: Sorting, Searching

Sorting: Internal and External sorting, Concept of Stable sort. Implementation of Shell, quick, merge, heap, counting sort, performance analysis and comparison.

Searching: Revision of linear search, binary search and complexity analysis of search methods. Hash functions and hash tables, closed and open hashing, randomization methods (division method, mid-square method, folding), collision resolution techniques.

Introduction to Graphs: Basic terminologies, representation of graphs, graph traversals: depth first search (DFS) and Breadth first search (BFS).

Course Outcomes:

On successful completion of the course, students will be able to:

1. Analyse the efficiency of algorithms through time and space complexities.

2. Implement real life problems using different linear data structures.
3. Implement real life problems using different Nonlinear data structures.
4. Apply different searching, sorting and hashing methods for efficient search.

Text Books

1. Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed; Fundamentals of Data Structures in C; Second Edition; Universities Press; 2008.
2. Robert Kruse, C. L. Tondo, Bruce Leung, Sashu Mogalla, Data Structures and Program Design in C; Second Edition; Pearson Education; 2006.
3. Mark Allen Weiss; Data Structures and Algorithm Analysis in C; Second Edition; Pearson Education; 2002.

Reference Books

1. Seymour Lipschutz; Data Structures; First Edition; McGraw Hill; 2006.
2. Yedidyah Moshe, J. Augenstein, Aaron M. Tenenbaum; Data Structures Using C; Second Edition; PHI publication.
3. Thomas Cormen, Charles Leiserson, Ronald Rivest and Clifford Stein, Introduction to Algorithms, Third Edition; Prentice Hall of India; 2009.

Syllabus for Semester II, B. Tech. Computer Science & Engineering [Cyber Security]

Course Code: 24CS01PR0202 **Course: Data Structures Lab**

L: 0 Hrs, P: 2Hr, Per Week **Total Credits: 1**

- Practical's will be conducted based on Syllabus of Data Structure [24CS01TH0202]

Course Objectives

1. To impart to students the basic concepts of data structures and algorithms.
2. To familiarize students on different searching and sorting techniques.
3. To prepare students to use linear (stacks, queues, linked lists) and non-linear (trees, graphs) data structures.
4. To enable students to devise algorithms for solving real-world problems.

Text Books

4. Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed; Fundamentals of Data Structures in C; Second Edition; Universities Press; 2008.
5. Robert Kruse, C. L. Tondo, Bruce Leung, Sashu Mogalla, Data Structures and Program Design in C; Second Edition; Pearson Education; 2006.
6. Mark Allen Weiss; Data Structures and Algorithm Analysis in C; Second Edition; Pearson Education; 2002.

Reference Books

4. Seymour Lipschutz; Data Structures; First Edition; McGraw Hill; 2006.
5. Yedidyah Moshe, J. Augenstein, Aaron M. Tenenbaum; Data Structures Using C; Second Edition; PHI publication.
6. Thomas Cormen, Charles Leiserson, Ronald Rivest and Clifford Stein, Introduction to Algorithms, Third Edition; Prentice Hall of India; 2009.

Syllabus for Semester II, B. Tech. Computer Science & Engineering [Cyber Security]

Course Code: 24CS01PR0203 **Course: Computer Workshop-II Lab**

L: 0 Hrs, P: 2Hr, Per Week **Total Credits: 1**

Course Outcomes

On successful completion of the course, students will be able to:

1. Design and develop dynamic web pages using JavaScript.
2. Demonstrate PHP database connectivity and perform basic CRUD operations.
3. Apply ES6 features to create interactive and dynamic web designs.
4. Develop high-fidelity designs and prototypes in Figma

Syllabus:

JavaScript: Introduction to JavaScript, Syntax, Variables and Data Types, Statements, Operators, Literals, Functions, Objects-Arrays-Built-in Objects, Handling Events in JavaScript, Form creation & validation, PHP database connectivity.

Introduction to ES6: Let and Const Declarations, Arrow Functions and Template Literals, Destructuring and Spread/Rest Operators, Classes and Modules, Exploring array methods.

UX Programming: Figma Basics, Wireframe and Prototype, Digital Storytelling

Text Books

1. JavaScript: The Definitive Guide: Master the World's Most-Used Programming Language, David Flanagan, Shroff/O'Reilly, 7th edition, 2020.
2. PHP & MySQL, Jon Duckett, John Wiley & Sons Inc, 1st edition, 2022.
3. Simply ES6: Mastering JavaScript and ES6 to its fullest, Anna Voice, Ray Voice, Independently published, 2nd edition, 2020.
4. Ultimate Figma for UI/UX Design, Aditi Sharma, Orange Education Pvt. Ltd, 2025.

Reference Books

1. JavaScript: The Complete Reference, Thomas Powell, Fritz Schneider, MGH, 3rd edition, 2012.
2. Exploring ES6, Axel Rauschmayer, Leanpub, 2018.
3. User story mapping, Jeff Patton, O'Reilly Media, 1st edition, 2014.

Syllabus for Semester II, B. Tech. Computer Science & Engineering [Cyber Security]

Course Code : 24CS01TH0204 **Course : Operating Systems**

L: 3Hrs, T: 0 Hr, P: 0Hrs, Per Week **Total Credits: 3**

Course Objectives

1. To learn the need and evolution of operating systems.
2. To learn various concepts and issues related to Process management, Memory management and File management.

Syllabus

Unit I:

Introduction: Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls

Process Management: Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching, Types of Schedulers and their role, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time. Scheduling algorithms: Pre-emptive and Non-pre-emptive, FCFS, SRTF, Priority, RR, Multilevel queue and multilevel feedback queue.

Unit II:

Threads: difference between a process and a thread, Benefits of threads, Types of threads, Concept of multithreads.

Inter-process Synchronization: Critical Section, Race Conditions, Mutual Exclusion, Peterson's solution for synchronization, Hardware Solutions, Semaphores, Monitors, Classical synchronization Problems: Producer- Consumer Problem, Reader-Writer Problem, Dinning Philosopher Problem.

Unit III:

Deadlocks: Necessary and sufficient conditions for Deadlock, Deadlock Prevention,
Deadlock Avoidance: Banker's algorithm, Deadlock Detection and Recovery.

Unit IV:

Memory Management: Basic concept, Address binding, Dynamic loading, Dynamic Linking, Swapping, Logical and Physical address mapping, Contiguous Memory allocation – Fixed and variable partition, internal and external fragmentation, Compaction, Non- contiguous Memory allocation: Segmentation: principle of operation, Segment Map table, protection and sharing, Paging: Principle of operation – Page Map table, Hardware support for paging, Protection and sharing, Structure of Page Map table.

Virtual Memory: Concept of Virtual Memory, Instruction Interruptibility, Locality of reference, Demand paging: Page fault, Dirty bit, valid-invalid bit, Page Replacement algorithms: First in First Out, Optimal, Least

Recently used, LRU approximation algorithms, counting based page replacement, Page Buffering algorithms, Local Vs Global algorithms, Thrashing, Page allocation strategies to overcome trashing: Working set model and Page Fault Frequency

Unit V:

File Management: Concept of File, Access methods, File types, File operations, Directory structure, File System structure, Allocation methods, Free-space management.

Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK, Boot block, Bad blocks.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Differentiate between different types of operating systems and different CPU scheduling algorithms
2. Apply the concept of process synchronization in real life problems
3. Identify the occurrence of deadlock and handle it.
4. Apply various memory management techniques
5. Apply various file management techniques

Text Books

1. Operating System Concepts, 8th Edition by A. Silberschatz, P.Galvin, G. Gagne, Wiley India.
2. Modern Operating Systems, 2nd Edition by Andrew Tanenbaum, PHI.

Reference Books:

1. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India.
2. Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly

Syllabus for Semester II, B. Tech. Computer Science & Engineering [Cyber Security]

Course Code : 24CS01PR0204 **Course : Operating Systems Lab**

L: 0Hrs, P: 2Hrs, Per Week **Total Credits: 1**

- Practical's will be based on Syllabus of Operating Systems [24CS01TH0204]

Course Objectives

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

Course Outcomes:

On successful completion of the course, students will be able to:

1. Implement system commands by making use of LINUX system calls.
2. Implement processes and process schedulers.
3. Design solutions to process synchronization and deadlock handling.
4. Implement Memory management and File management solutions.

Syllabus for Semester II, B. Tech. Computer Science & Engineering [Cyber Security]

Course Code: 24HS03TH0213 **Course: Calculus & Linear Algebra**

L: 3 Hrs, P: 0Hr, Per Week **Total Credits: 3**

Course Objective

The objective of this course is to familiarize the prospective engineers with techniques in Calculus. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Course Outcomes

On successful completion of the course, student shall be able to

1. Apply the concepts of continuity and differentiability to find Taylor's and Maclaurin series.
2. Understand the methods of partial derivatives and apply these concepts to determine extreme values of the functions of two variables.
3. Demonstrate the basic knowledge of vector differentiation and line integral.
4. Interpret the solutions of system of linear equations and use the concepts of Eigen values, Eigen vectors to find diagonalization of matrices, reduction of quadratic form to canonical form.
5. Internalize convergence of sequences and apply it to determine whether infinite series convergent or divergent with appropriate tests.

Syllabus

Unit I: (8 Lectures)

Differential Calculus: Functions of univariate, Mean value theorems: Rolle's theorem, Lagrange's theorem, Cauchy's theorem, Taylor's theorem, Taylor's and Maclaurin series.

Unit II: (10 Lectures)

Partial Differentiation: Partial derivatives, Euler's Theorem, chain rule, application of partial differentiation: total derivative, Jacobians, Maxima, Minima for the functions of two variables., Extrema of function of multivariable,

Unit III: (8 Lectures)

Vector Calculus: Scalar and vector fields, gradient of scalar point function, directional derivatives, divergence and curl of vector point function, application of vector calculus:Line integral, Gradient Descent method.

Unit IV: (8 Lectures)

Rank-nullity theorem; Consistency of system of linear equations and its solution, Orthogonal matrices, Eigen values and eigenvectors, Diagonalization of matrices, Orthogonal transformation and quadratic to canonical forms, Introduction to n-dimensional vector spaces, Singular value decomposition and its applications.

Unit V: (6 Lectures)

Infinite series: Sequences, Infinite series of real and complex numbers, Cauchy criterion, tests of convergence, absolute and conditional convergence, uniform convergence, power series, radius of convergence.

Text / References Books

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
5. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
6. P. N. Wartikar and J. N. Wartikar, A text book of Applied Mathematics Volume I & II, Pune, Vidhyarthi Griha Prakashan, Pune-411030 (India).

Syllabus for Semester II, B. Tech. Computer Science & Engineering [Cyber Security]

Course Code : 24HS02TH0203 Course : Foundational Literature of Indian Civilization

L: 1 Hrs, P: 0 Hrs, Per Week Total Credits: 1

~~Course outcome:~~

At the end of the course the students will be able to achieve the following:

CO1: Understand the Indian knowledge system and its scientific approach.

CO2: Get introduced to the Vedic corpus and recognize the multi-faceted nature of the knowledge contained in the Vedic corpus.

CO3: Understand the salient features of the philosophical systems of the Vedic and non-Vedic schools.

CO4: Develop an understanding about the foundation of Vedic Mathematics.

Syllabus

Unit I: Overview of Indian Knowledge System:

Importance of ancient knowledge, defining IKS, Historicity of IKS, Some unique aspects of IKS.

Unit II: The Vedic corpus:

Introduction of Vedas, four Vedas, divisions of four Vedas, six Vedangas, Distinct features of Vedic life.

Unit III: Indian Philosophical systems:

Development and unique features, Vedic schools of philosophy, *Samkhya* and *Yoga* School of philosophy, *Nayay* and *Vaisesika* school of philosophy, *Purva-mimamsa* and *Vedanta* schools of Philosophy, Non-vedic philosophies: Jainism, Buddhism, and other approaches

Unit IV: Vedic Maths -1

Introduction of Vedic Mathematics, Bodhyan geometry, circular functions, inverse circular functions.

Unit -V: Vedic Maths – 2

Multiplication of polynomials by *nikhilaṃ* and *ūrdhvatiryagbhyām* sutra. Verification by *Gunitasamuccayaḥ*. Division of two polynomials using *parāvartya yojayet*. HCF and LCM of two polynomials using *ādyamādyenāntyamantyena* and *ānurūpyeṇa.* Factorization of polynomials up-to degree 3 using *ānurūpyeṇa*, *Lopanasthāpanābhyām*, *ādyamādyenāntyamantyena*.

Reference Books

1. B. Mahadevan, Vinayak Rajat Bhar, Nagendra Pavana R. N., "Introduction to Indian Knowledge System: Concepts and Applications" PHI, 2022
2. S.C. Chatterjee and D.M. Datta, An introduction to Indian Philosophy, University of Calcutta, 1984

Syllabus for Semester II, B. Tech. Computer Science & Engineering [Cyber Security]

Course Code : 24HS02PR0202 **Course : Professional Communication Lab**

L: 0 Hrs, P: 2 Hrs, Per Week **Total Credits: 1**

Course Objective

To enhance competency of communication among learners and prepare them for effective workplace communication

Course Outcomes

On completion of Professional Communication Lab course, students will be able to achieve the following**:**

CO1: Implement essential language skills- listening, speaking, reading, and writing

CO2: Demonstrate the techniques of effective Presentation Skills

CO3: Evaluate and apply the effective strategies for Group Discussions and Personal Interviews

CO4: Effectively implement the comprehensive principles of written communication

Syllabus

Professional Communication-1

Practical 1: Speaking Skills

This practical will cover the following topics: Effective communication techniques, Role of paralinguistic features viz. pronunciation, stress, intonation and rhythm, meeting people, asking questions, types of barriers and techniques to overcome them.

Practical 2: Listening Skills

This practical will cover the following topics: Listening Comprehension, active listening, reasons for poor listening, traits of a good listener, and barriers to effective listening

Practical 3: Reading

This practical will cover the following topics: Reading Comprehension: types and strategies

Professional Communication-2

Practical 4: Presentation Skills: Orientation & Mock Session

This practical will cover the following topics: Introduction to professional presentation skills, planning the content, effective delivery, aspects of non-verbal communication, visual designing, tips for effective presentations

Practical 5: **Presentation Skills: Practice**

Practical 6: Group Discussions and Personal Interview: Orientation & Mock Session

This practical will cover the following topics: types of group discussion, strategies for effective group discussion, types of questions in an interview, resume making, use of power words, tips for a successful interview

Practical 7: Group Discussions and Personal Interview: Practice

Professional Communication-3

Practical 8: Writing Practices- 1

This practical will cover the following topics: Vocabulary building, Grammar and mechanics

Practical 9: Writing Practices-2

This practical will cover the following topics: Sentence and paragraph structures, Note-making

Practical 10: Writing Practices- 3

This practical will cover the following topics: Academic Correspondence

Reference Books

1. Communication Skills. Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.
2. Practical English Usage. Michael Swan. OUP. 1995.
3. Remedial English Grammar. F.T. Wood. Macmillan.2007
4. On Writing Well. William Zinsser. Harper Resource Book. 2001
5. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.

Syllabus for Semester II, B. Tech. Computer Science & Engineering
[Cyber Security]

Course Code :24HS04PR0101 **Course: Sports Yoga Recreation**
L: 0 Hrs, P: 2 Hrs, Per Week **Total Credits: 1**

Aim of the Course: The course aims to foster Health and wellness through Healthy and Active Lifestyle and creating awareness about the fundamentals of Physical Education, Sports, Yoga, Recreation and its effectiveness through practical experiences and hands on activities.

Objectives of the Course:

1. To impart the students with basic concepts of Sports, Yoga and Recreational activities for health and wellness.
2. To familiarize the students with health-related Exercise and evaluate their Health-related Fitness.
3. To make Overall growth & development with team spirit, social values and leadership qualities among students through various sports, games and Yogic activities.
4. To create Environment for better interaction and recreation among students as neutralizer for stress through various minor and recreational games.

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

1. Understand fundamental skills, basic principle and practices of sports and Yoga.
2. Practically learn the principles of implementing general and specific conditioning of physical exercises and yoga.
3. Develop Health-related fitness and Body-mind co-ordination through various fitness activities, sports, recreational games and yoga.
4. Practice Healthy & active living with reducing Sedentary Life style.

Course Content:

Unit 1:

- Warm up and Cool Down and Stretching Exercises.
- General and Specific Exercises.
- Calculation of BMI & Resting Pulse Rate.
- General and Specific exercises for strength, Speed, Agility, Cardiovascular Endurance, Flexibility, Coordinative abilities.
- Practice of Fundamental Skills of Volleyball, Table Tennis and Chess, etc.
- Knowledge and practice of the Equipment used in a Gymnasium and its application.
- Yoga: Standing, Sitting, Prone & Supine positions.

Unit 2:

- Suryanamaskar.
- Pranayama, Meditation and Relaxation Techniques.
- Recreational Games.
- Practice of Fundamental Skills of Basketball, Football, Carrom, etc.
- Health related Physical Fitness Test.

Assessment Pattern:

Assessment Type	Weightage in Marks	Total Marks
Practical	Physical Efficiency Test – 30 Marks Sports/Games skill Activity/Project – 10 Marks Yoga Activities – 10 Marks	50
		Total – 50 Marks

References:

1. Russell, R.P. (1994). Health and Fitness Through Physical Education. USA: Human Kinetics.
2. Uppal, A.K. (1992). Physical Fitness. New Delhi: Friends Publication.
3. AAPHERD "Health related Physical Fitness Test Manual."1980 Published by Association drive Reston Virginia
4. Kumar, Ajith. (1984) Yoga Pravesha. Bengaluru: Rashtrothanna Prakashana.
5. Dr. Devinder K. Kansal, A Textbook of Test Evaluation, Accreditation, Measurements and Standards (TEAMS 'Science)

Syllabus for Semester II, B. Tech. Computer Science & Engineering [Cyber Security]

Course Code: 24HS01TH0202 **Course: Environmental Science**

L: 1 Hrs, P: 0 Hrs, Per Week **Total Credits: 1**

Syllabus:

Unit I: Sustainability Engineering

Multidisciplinary nature of Environmental Science, air and water pollution; solid waste management; local and global environmental challenges; climate change; sustainable cities; sustainable sources of energy, Introduction to the idea of sustainability and its relevance; environment-related legislation; Green Chemistry

Unit II: E-Waste and Green Computing

E-waste Management: Sources, Legislation, Prevention, Control, Recent developments. Waste due to Nano-materials and Micro-Plastics.

Green Computing: Green Computing, Computing in Environment and Research, Green devices and green data Servers.

Text Books:

1. Shikha Agrawal, Engineering Chemistry: Fundamentals and Applications, Cambridge University Press.
2. Dr. Rajshree Khare, A Textbook of Engineering Chemistry (AICTE), S.K. Kataria & amp; Sons.
3. S. S. Dara, A Textbook of Engineering Chemistry, S. Chand Publications.
4. M Afshar Alam, Sapna Jain, Hena Parveen, Green Computing Approach Towards Sustainable Development, Wiley Interscience Publications.

Reference Books:

1. E-waste recycling and management: present scenarios and environmental issues, Khan, Anish, and Abdullah M. Asiri. 2019, Springer, Vol. 33. ISBN: 978-3-030-14186-8.
2. Hans-Eckhardt Schaefer, Nanoscience: The Science of the Small in Physics, Engineering, Chemistry, Biology and Medicine, Springer-Verlag Berlin Heidelberg.

Syllabus for Semester II, B. Tech. Computer Science & Engineering
[Cyber Security]

Course Code: 24HS01PR0101 **Course: Environmental Science Lab**
L: 0 Hrs, P: 2 Hrs, Per Week **Total Credits: 1**

The students will learn to:

1. Apply the fundamental principles of measurement and skills in preparation and handling of Environmentally hazardous materials and interpret the statistical data related to measurements.
2. Use of the computational tools for searching, interpretation of results, etc. and preparation of case study regarding Environmental Issues.

List of Experiments:

Any Eight Experiments from the following:

[1] Demonstration of Handling of hazardous chemicals, MSDS (material safety data sheet), waste minimization strategies and chemical waste disposal.

[2] Preparation of different Solutions: Molar solution, Normal solution and percent solution and Determination of concentration in their various forms.

[3] Basic statistical analysis of results of neutralization of acid against the base and preparing acceptable graphs using software.

[4] Estimation of Copper ions from acid digested PCB solution.

[5] Estimation of Chromium ions from e-waste sample.

[6] Prediction of NMR spectra and analytical data of molecules using Computational Software and its analysis.

[7] Spectroscopic determine of wavelength of maximum absorption of chemical/biological compound in solution and plotting of calibration curves.

[8]Estimation of Fe (II) ions from e-waste rust spectrophotometrically / calorimetrically using 1,10-Phenanthroline method.

[9] Determination of Free CO_2 in the given water sample.

[10] Determination of dissolved oxygen (DO) in the given water sample.

[11] Estimation of Chlorine in water.

[12] Determination of rate of the reaction at room temperature and analysis of experimental data using Computational Software

[13] Determination of AQI of a region.

[14] Use of various open online search tools for Environmental Case Studies.

Suggested Books/Reference Books:

(1) S. S. Dara, A Textbook on Experiments and Calculations in Engineering Chemistry, S. Chand Publications.

(2) J. B. Yadav, Advanced Practical Physical Chemistry, Krishna's Prakashan Media (P) Limited.

(3) A. J. Elias, Collection of Interesting General Chemistry Experiments, Universities Press Publications.

(4) V. K. Ahluwalia, S. Dhingra and A. Gulati, College Practical Chemistry, Universities Press Publications.

Suggested Reference Books:

(1) David Young, Computational Chemistry: A Practical Guide for Applying Techniques to Real World Problems, Wiley Interscience Publications

Syllabus for Semester II, B. Tech. Computer Science & Engineering [Cyber Security]

Course Code: 24HS02PR0206 **Course : Liberal/Performing arts**

L: 0 Hr, P: 2 Hrs, Per Week **Total Credits: 1**

~~Liberal/Performing arts basket~~

Sr. No.	Course Code	Course Name	Sem	Hours/week	Credits	Maximum marks	
						Learning Assessment 1	Learning Assessment 2
1	24HS02PR0206-01	Fundamentals of Indian Classical Dance: Bharatnatyam	I/II	2	1	25	25
2	24HS02PR0206-02	Fundamentals of Indian Classical Dance: Kathak	I/II	2	1	25	25
3	24HS02PR0206-03	Introduction to Digital Photography	I/II	2	1	25	25
4	24HS02PR0206-04	Introduction to Japanese Language and Culture	I/II	2	1	25	25
5	24HS02PR0206-05	Art of Theatre	I/II	2	1	25	25
6	24HS02PR0206-06	Introduction to French Language	I/II	2	1	25	25
7	24HS02PR0206-07	Introduction to Spanish Language	I/II	2	1	25	25
8	24HS02PR0206-08	Art of Painting	I/II	2	1	25	25
9	24HS02PR0206-09	Art of Drawing	I/II	2	1	25	25
10	24HS02PR0206-10	Nature camp	I/II	2	1	25	25
11	24HS02PR0206-11	Developing Self-awareness	0	2	1	25	25
12	24HS02PR0206-12	Art of Poetry	0	2	1	25	25
13	24HS02PR0206-13	Creative and content writing	0	2	1	25	25
14	24HS02PR0206-14	Science of life through Bhagwad Gita	0	2	1	25	25
15	24HS02PR0206-15	Sanskrit Sambhashan Spoken Sanskrit	0	2	1	25	25

16	24HS02PR0206-16	Kirtan Kala	0	2	1	25	25
17	24HS04PR0202-1		0	2	1	25	25

		Adventure Sports					
18	24HS04PR0202-2	Introduction to Defense Forces & Obstacle Training	0	2	1	25	25
19	24HS04PR0202-3	Self Defense and Indian Martial Arts	0	2	1	25	25
20	24HS04PR0202-4	Basic Nutritional Course	0	2	1	25	25

Syllabus for Semester II, B. Tech. Computer Science & Engineering
[Cyber Security]

Course Code: 24HS02PR0206-01 Course: Fundamentals of Indian Classical Dance: Bharatnatyam
L: 00 Hrs, T: 0 Hr, P: 2 Hrs, Per Week Total Credits: 01

Course objective

The course aims to introduce the students to Bharatnatyam, an important element of Indian traditional knowledge system. The course will not only provide the learning and skill to perform this art but would also enhance many mental and physical aspects of the students such as strength, flexibility, discipline, self-confidence, creativity, focus, coordination, etc.

Course Outcomes

On completion of the course, students will be able to achieve the following:

CO1: Understand the importance of dance and Bharatnatyam as an Indian dance form
CO2: Develop skills to perform the dance form at its basic level.
CO3: Evaluate their strengths and interest to take bridge course to give *Pratham* (1st level formal exam of Bharatnatyam).

Syllabus

Practical -1: Orientation in Bharatnatyam
Practical-2: Tattu Adavu till 8, Naatta Adavu 4 Steps, Pakka Adavu 1 step, Metta Adavu 1 Step, Kuditta Metta Adavu 4 Steps,
Practical -3: Practice sessions
Practical-4: Tatta Kuditta Adavu (Metta), Tatta Kuditta Adavu (Metta) 2 Steps, Tirmanam Adavu 3 Steps, Kattu Adav - 3 Steps, Kattu Adav - 3 Steps
Practical-5: Practice sessions
Practical-6: Tiramanam (front) 3 Steps, Repeat of Tiramanam (Overhead) 3 Steps,
Practical-7: practice sessions
Practical – 8: final practice sessions and performances.

Recommended Reading

1. Introduction to Bharata's Natyasastra, Adya Rangacharya, 2011
2. The Natyasastra and the Body in Performance: Essays on the Ancient Text, edited by Sreenath Nair, 2015
3. Bharatanatyam How to ... : A Step-by-step Approach to Learn the Classical Form, Eshwar Jayalakshmi, 2011

Syllabus for Semester II, B. Tech. Computer Science & Engineering
[Cyber Security]

Course Code: 24HS02PR0206-02 Course: Fundamentals of Indian Classical Dance: Kathak
L: 00 Hrs, T: 0 Hr, P: 2 Hrs, Per Week Total Credits: 01

Course objective

The course aims to introduce the students to Kathak, an important element of Indian traditional knowledge system. The course will not only provide the learning and skill to perform this art but would also enhance many mental and physical aspects of the students such as strength, flexibility, discipline, self-confidence, creativity, focus, coordination, etc.

Course Outcomes

On completion of the course, students will be able to achieve the following: CO1: Understand the importance of dance and Kathak as an Indian dance form CO2: Develop skills to perform the dance form at its basic level.

CO3: Evaluate their strengths and interest to take bridge course to give *Prarambhik* (1^{st} level formal exam of Kathak).

Syllabus

Practical -1: Orientation in Kathak. Correct posture of kathak, Basic Movements and exercise Stepping, Chakkar of 5 counts (Bhramari),
Practical -2: practice sessions of practical 1
Practical -3: Hastaks, Hastaks and Steppings, Reciting asamyukta Mudra shloka, Hastak and steppings
Practical -4: practice sessions of practical 3
Practical -5: Todas and Asamyukta hasta mudra shlok, Vandana of Shlok, 2 Todas and Vandana, Ghante Ki Tihai,
Practical -6: practice sessions of practical 5
Practical -7: 2 1 Chakkardar Toda and Ginnti Ki Tihai, 2 Todas and 1 Chakkardar Toda, practice sessions
Practical -8: Final performances.

Recommended reading

1. Kathak Volume1 A "Theoretical & Practical Guide" (Kathak Dance Book), Marami Medhi & Debasish Talukdar, 2022, Anshika Publication (13 September 2022)

Syllabus for Semester II, B. Tech. Computer Science & Engineering
[Cyber Security]

Course Code: 24HS02PR0206-03 Course: Introduction to Digital Photography
L: 00 Hrs, T: 0 Hr, P: 2 Hrs, Per Week Total Credits: 01

Course objective
The course aims to develop basic skills of students in digital photography to lay a foundation for them as a hobby and/or a profession.

Course outcome:
At the end of the course the students will be able to achieve the following:
CO1: Develop an understanding of the technical aspects and aesthetics of
Photography. CO2: Apply the rules of digital photography for creating photographs.
CO3: Develop skills to enhance photographs through post processing.
CO4: Create a portfolio of their photographs in selected genre.
Syllabus
Practical 1: **Orientation in digital photography:** Genres, camera handling and
settings Practical 2: **Rules of Composition**
Practical 3: **Rules of Composition**: practice sessions
Practical 4: **Understanding Exposure and Art of Pre-Visualization**
Practical 5: **Rules of Composition and Art of Pre-Visualization:** practice sessions
Practical 6: **Post Processing Photographs and Portfolio creation**
Practical 7: **Post Processing Photographs:** practice sessions
Practical 8: **Portfolio finalization and presentation in selected genre.**

Reference material

1. Scott Kelby (2020) The Digital Photography Book: The Step-by-Step Secrets for how to Make Your Photos Look Like the Pros, Rocky Nook, USA
2. Larry Hall (2014) Digital Photography Guide: From Beginner to Intermediate: A Compilation of Important Information in Digital Photography, Speedy Publishing LLC, Newark
3. J Miotke (2010) Better Photo Basics: The Absolute Beginner's Guide to Taking Photos Like a Pro, AMPHOTO Books, Crown Publishing Group, USA

Syllabus for Semester II, B. Tech. Computer Science & Engineering
[Cyber Security]

Course Code: 24HS02PR0206-04 Course: Introduction to Basic Japanese Language
L: 00 Hrs, T: 0 Hr, P: 2 Hrs, Per Week Total Credits: 01

Course objective

The course aims to develop basic communication skills in Japanese Language and help develop a basic understanding of Japanese culture for effective cross-cultural communication.

Course outcome

After the completion of the course the students will be able to achieve the following:
CO1: Basic understanding about Japan as a country and Japanese culture.
CO2: Ability to use vocabulary required for basic level communication in Japanese language.
CO3: Able to frame simple sentences in Japanese for everyday conversations

Syllabus

Practical-1: Orientation about Japan, its language, and its culture
Practical-2: Communication Skills 1: Vocabulary for basic Japanese language
Practical -3: Practice sessions
Practical-4: Basic day to day greetings in Japanese language and their usage through role-play
Practical-5: Practice sessions
Practical- 6: Communication Skills 2: framing sentences
Practical- 7: Practice sessions
Practical- 8: Introduction of Japanese Culture, Arts, Traditions, Etiquettes and Manners etc.

Recommended reading

1. Marugoto Starter (A1) Rikai - Course Book for Communicative Language Competences, by The Japan Foundation, Goyal Publishers & Distributors Pvt. Ltd (ISBN: 9788183078047)
2. Japanese Kana Script Practice Book – Vol. 1 Hiragana, by Ameya Patki, Daiichi Japanese Language Solutions (ISBN: 9788194562900)

Syllabus for Semester II, B. Tech. Computer Science & Engineering
[Cyber Security]

Course Code: 24HS02PR0206-05 **Course: Art of Theatre**
L: 00 Hrs, T: 0 Hr, P: 2 Hrs, Per Week **Total Credits: 01**

Course objectives:
The course aims to develop in the students, an actor's craft through physical and mental training.

Course Outcomes:
On completion of the course, students will be able to achieve the following:
CO1: Understand and synthesize the working of the prominent genres of theatre across the world.
CO2: Apply the skill of voice and speech in theatre and public speaking
CO3: Apply the art of acting and also develop generic skills such as confidence, communication skills, self-responsibility, motivation, commitment, interpersonal skills, problem solving, and self-discipline.
CO4: Apply skills acquired related to technical/production aspects of theatre and also develop problem solving and interpersonal skills.

Syllabus:

Practical 1: **Orientation in theatre**
Practical 2: **Voice and Speech training**
Practical 3: **Voice and Speech training**: practice sessions
Practical 4: **Art of acting**
Practical 5: **Art of acting:** practice sessions
Practical 6: **Art of script writing**
Practical 7: **Art of script writing:** practice sessions
Practical 8: **Final performances**

Reference books:
1. Boleslavsky, R. (2022). Acting: The First Six Lessons (1st ed., pp. 1-92). Delhi Open Books.
2. Shakthi, C. (2017). No Drama Just Theatre (1st ed., pp. 1-171). Partridge.
3. Bruder, M., Cohn, L. M., Olnek, M., Pollack, N., Previto, R., & Zigler, S. (1986). A Practical Handbook for the Actor (1st ed.). Vinatge Books New York.

Syllabus for Semester II, B. Tech. Computer Science & Engineering
[Cyber Security]

Course Code: 24HS02PR0206-06 **Course: Introduction to French Language**
L: 00 Hrs, T: 0 Hr, P: 2 Hrs, Per Week **Total Credits: 01**

Course objective:

To help build a foundation and interest in French language so that the students can pursue the proficiency levels of the language in higher semesters.

Course outcomes:

On successful completion of the course the students will be able to achieve the following:
CO1. Demonstrate basic knowledge about France, the culture and similarities/differences between India and France
CO2. Learn to use simple language structures in everyday communication. CO3. Develop ability to write in basic French about themselves and others. CO4. Develop ability to understand beginner level texts in French

Syllabus
List of Practical's

Practical-1: Orientation about France, the language, and culture
Practical-2: Communication Skills 1: Vocabulary building for everyday conversations
Practical -3: Practice sessions
Practical-4: Reading and writing Skills : Reading and writing simple text in French
Practical-5: Practice sessions
Practical-6: Communication Skills 2: listening comprehension
Practical-7: Practice sessions
Practical-8: Writing Skills: Write basic French and practice

Recommended reading

1. 15-minute French by Caroline Lemoine
2. Cours de Langue et de Civilisation Françaises by G. Mauger Vol. 1.1
3. Cosmopolite I by Natalie Hirschsprung, Tony Tricot

Syllabus for Semester II, B. Tech. Computer Science & Engineering
[Cyber Security]

Course Code: 24HS02PR0206-07 **Course: Introduction to Spanish Language**
L: 00 Hrs, T: 0 Hr, P: 2 Hrs, Per Week **Total Credits: 01**

Course objective:

To help build a foundation and interest in Spanish language so that the students can pursue the proficiency levels of the language in higher semesters.

Course outcomes:

On successful completion of the course the students will be able to achieve the following:
CO1. Demonstrate basic knowledge about Spain, the culture and similarities/differences between India and France
CO2. Learn to use simple language structures in everyday communication.
CO3. Develop ability to write in basic Spanish about themselves and others.
CO4. Develop ability to read and understand beginner level texts in Spanish

Syllabus
List of Practicals

Practical-1: Orientation about Spain, the language, and culture
Practical-2: Communication Skills 1: Vocabulary building for everyday conversations
Practical -3: Practice sessions
Practical-4: Reading and writing Skills : Reading and writing simple text in Spanish
Practical-5: Practice sessions
Practical-6: Communication Skills 2: listening comprehension
Practical-7: Practice sessions
Practical-8: Writing Skills: Write basic Spanish and practice
Recommended reading

1. 15-Minute Spanish by Ana Bremon
2. Aula Internacional 1 by Jaime Corpas ,Eva Garcia, Agustin Garmendia.
3. Chicos Chicas Libro del Alumno by María Ángeles Palomino

Syllabus for Semester II, B. Tech. Computer Science & Engineering
[Cyber Security]

Course Code: 24HS02PR0206-08 **Course: Art of Painting**
L: 00 Hrs, T: 0 Hr, P: 2 Hrs, Per Week **Total Credits: 01**

Course objective

Painting is fundamentally about learning to see, and to transport that vision onto paper through a variety of mark making techniques. This course aims to develop basic skills of students in painting to lay a foundation for them as a hobby and/or a profession.

Course outcome:

At the end of the course the students will be able to achieve the following:

CO1: Become familiar with the basic methods, techniques & tools of painting.
CO2: Train the eye and hand to develop sense of balance, proportion and rhythm.
CO3: Develop the ability to observe and render simple natural forms.
CO4: Enjoy the challenging and nuanced process of painting.

Syllabus

Practical 1: **Orientation in Painting tools & basics of lines, shapes, light, shadows and textures**
Practical 2: **The art of observation -** how to see shapes in drawing
Practical 3: **Introduction Water color -** how to handle water paints
Practical 4: **Introduction to acrylic colors -** how to handle acrylic paints
Practical 5: **Explore layering paint and capturing the quality of light with paint.**
Practical 6: **Create landscape painting**
Practical 7: **Create Abstract painting**
Practical 8: **Paint on Canvas** (try to recreate any famous painting)

Reference material

1. Drawing made easy by Navneet Gala; 2015th edition
2. Alla Prima II Everything I Know about Painting--And More by Richard Schmid with Katie Swatland
3. Daily Painting: Paint Small and Often To Become a More Creative, Productive, and Successful Artist by Carol Marine

Syllabus for Semester II, B. Tech. Computer Science & Engineering
[Cyber Security]

Course Code: 24HS02PR0206-09 **Course: Art of Drawing**
L: 00 Hrs, T: 0 Hr, P: 2 Hrs, Per Week **Total Credits: 01**

Course objective

Drawing is fundamentally about learning to see, and to transport that vision onto paper through a variety of mark making techniques. This course aims to develop basic skills of students in drawing to lay a foundation for them as a hobby and/or a profession.

Course outcome:

At the end of the course the students will be able to achieve the following:

CO1: Become familiar with the basic methods, techniques & tools of drawing.
CO2: Train the eye and hand to develop sense of balance, proportion and rhythm.
CO3: Develop the ability to observe and render simple natural forms.
CO4: Enjoy the challenging and nuanced process of drawing.

Syllabus

Practical 1: **Orientation in Drawing tools & basics of lines, shapes, light, shadows and textures**
Practical 2: **The art of observation** how to see shapes in drawing
Practical 3: **One/two-point basic linear perspective**
Practical 4: **Nature drawing and landscapes**
Practical 5: **Gestalt principles of visual composition**
Practical 6: **Figure drawing**: structure and proportions of human body
Practical 7: **Gesture drawing:** expression and compositions of human figures
Practical 8: **Memory drawing:** an exercise to combine the techniques learnt

Reference material

1. Drawing made easy by Navneet Gala; 2015th edition
2. Perspective Made Easy (Dover Art Instruction) by Ernest R. Norling

Syllabus for Semester II, B. Tech. Computer Science & Engineering
[Cyber Security]

Course Code: 24HS02PR0206-10 **Course: Nature Camp**
L: 00 Hrs, T: 0 Hr, P: 2 Hrs, Per Week **Total Credits: 01**

Course Objective: To create an opportunity for the students to develop affinity with nature and thus subsequently impact their ability to contribute towards sustainability of nature.

Course outcome:

After the completion of the course the students will be able to do the following:
CO1: Develop an affinity with nature by observing and understanding it marvels with guidance from experts
CO2: Develop an understanding of the challenges and solutions associated with nature and its conservation.

Course content

In collaboration with the Forest Department and/or a local NGO working in the field of environment conservation, this course would be conducted in 24 hours. Students will be taken to a tiger reserve in Central Indian region or Forest fringe villages or work with an NGO from Central Indian region working on natural resource management. The camps (for 2 days) will cover any one of the following topics as decided by the course coordinator:

1. Awareness about each element of biodiversity (camps on moths, butterflies, birds, other wildlife etc)
2. Environment management (water, forest, wildlife) – practices of Forest Department in managing a tiger reserve, and other aspects of water and forest conservation.
3. Sustainable natural resource management - initiatives by rural communities and local NGOs
4. Man-animal conflict and solutions (socio-economic and technical) – role of local communities and Forest Department
5. Traditional practices in environment conservation – role of local communities and local NGOs

Syllabus for Semester II, B. Tech. Computer Science & Engineering
[Cyber Security]

Course Code: 24HS02PR0206-11 **Course: Developing Self-awareness**
L: 00 Hrs, T: 0 Hr, P: 2 Hrs, Per Week **Total Credits: 01**

Course objectives:

The course aims to develop students in their personal as well as professional life by means of graphotherapy, NLP, and Neurobics

Course Outcomes:

On completion of the course, students will be able to achieve the following:

CO1: Gain foundational understanding of graphology and through self-analysis will achieve greater awareness about their strengths and weaknesses & areas for personal growth
CO2: students will be equipped with tools and techniques for continuous self-improvement, using signature analysis and graphotherapy as part of their personal development journey
CO3: understand how to use Neuro Linguistic Programming (NLP) strategies to set and achieve goals effectively, overcoming mental blocks and limiting beliefs.
CO4: Enhance ability to absorb, retain, and recall information, which can benefit academic and professional performance.

Syllabus:

Practical 1: **The Power of Handwriting (Handwriting is Brainwriting)**
Practical 2: **Know yourself through handwriting**
Practical 3: **The Role of Signature in your life**
Practical 4: **Graphotherapy to enhance yourself in all ways**
Practical 5: **Neurolinguistic Programming , S.M.A.R.T Goal**
Practical 6: **Effective Communication Model, Rapport Building and Anchor**
Practical 7: **Brain Directives & Linguistic Presuppositions**
Practical 8: **Neurobics**

Syllabus for Semester II, B. Tech. Computer Science & Engineering
[Cyber Security]

Course Code: 24HS02PR0206-12 **Course: Art of Poetry**
L: 00 Hrs, T: 0 Hr, P: 2 Hrs, Per Week **Total Credits: 01**

Course Outcomes:

To familiarize the students with the art of poetry and develop a sense of appreciation for the art

At the end of the course the student will be able to achieve the following:

CO1: Understand the origin and development of poetry
CO2: Appreciate the art of poetry in life
CO3: Develop aesthetic sense
CO4: Develop holistic perspective to their personality

Syllabus

Practical 1: **Art of poetry – orientation**
Practical 2: **Forms of poetry – orientation**
Practical 3: **Forms of poetry – recitation**
Practical 4: **Application of poetry – orientation**
Practical 5: **Application of poetry – practical session**
Practical 6: **Poetry and aesthetics**
Practical 7: **Writing poetry – orientation**
Practical 8: **Writing poetry – writing sessions**

Reading material

I. The Art of Poetry

1. Fry, S. (2005). The ode less travelled: Unlocking the poetic mind. HarperCollins.
2. Addonizio, K., & Laux, D. (1997). The poet's companion: A guide to the pleasures of writing poetry. W.W. Norton & Company.
3. Lucy, J. (Ed.). (2001). The art of poetry. Penguin Books.

II. Understanding and Interpretation of Poetry

1. Hirsch, E. (1999). How to read a poem: And fall in love with poetry. Harcourt Brace & Company.
2. Pinsky, R. (1998). The sounds of poetry: A brief history. Farrar, Straus and Giroux.
3. Meyer, M. (2005). Poetry: An introduction. Bedford/St. Martin's.

III. Writing Poetry

1. Hugo, R. (1979). The triggering town: Lectures and essays on poetry and writing. W.W. Norton & Company.
2. Bradbury, R. (1990). Zen in the art of writing: Releasing the creative genius within you. Bantam Books.
3. Behn, R., & Twichell, C. (Eds.). (1992). The practice of poetry: Writing exercises from poets who teach. HarperCollins.

Syllabus for Semester II, B. Tech. Computer Science & Engineering
[Cyber Security]

Course Code: 24HS02PR0206-13 **Course: Creative and content writing**
L: 00 Hrs, T: 0 Hr, P: 2 Hrs, Per Week **Total Credits: 01**

Course objective:

The objective of the course is to equip students with comprehensive skills in creative and content writing through experiential learning and real-world applications.

Course outcomes:

On completion of the course, student will be able to achieve the following:

CO1: Understand and apply fundamental concepts and techniques of creative writing.
CO2: Apply storytelling techniques to create engaging narratives.
CO3: Develop and implement effective SEO and digital content strategies
CO4: Create and refine content using various tools and applying diverse writing styles and formats.
CO5: Utilize digital tools to craft multimedia narratives and create a professional portfolio.

Syllabus

Creative Writing

Practical 1: **Introduction to Creative and Content Writing**
Practical 2: **Character and Story Development**
Practical 3: **Crafting Compelling Narratives**

Content Writing

Practical 4: **SEO and Digital Content Strategies**
Practical 5**: Writing for Media**
Practical 6: **Tools**

Content Creation

Practical 7: **Digital Storytelling**
Practical 8: **Creative Portfolio Launch**

Syllabus for Semester II, B. Tech. Computer Science & Engineering
[Cyber Security]

Course Code: 24HS02PR0206-14 Course: Science of life through Bhagwad Gita
L: 00 Hrs, T: 0 Hr, P: 2 Hrs, Per Week Total Credits: 01

Course Objective

The objective of the course is to seek directions from the Bhagwad Gita to garner life skills for a successful and happy life

Course Outcome

CO1: To understand the methodology to correctly interpret and analysis the scripture
CO2: To understand the application of various teaching of the Bhagwad Gita
CO3: Use meditation and breathing techniques for healthy mind and body.

Syllabus

Practical 1: **Introduction to Bhagwad Gita - methodology**
Practical 2: **Real life application of chapter 1-3**
Practical 3: **Real life application of chapter 4-6**
Practical 4: **Real life application of chapter 7-9**
Practical 5: **Real life application of chapter 10-12** Practical 6: **Real life application of chapter 13-15** Practical 7: **Real life application of chapter 16-18** Practical 8: **Meditation and breathing techniques**

Syllabus for Semester II, B. Tech. Computer Science & Engineering
[Cyber Security]

Course Code: 24HS02PR0206-15 **Course: *Sanskrit Sambhashan- Spoken Sanskrit***
L: 00 Hrs, T: 0 Hr, P: 2 Hrs, Per Week **Total Credits: 01**

Course objectives:

The objective of the course is to enhance the communication skills of the students in Sanskrit

Course outcome

At the end of the course, the students will be able to achieve the following: CO1: Enhanced writing skills in Sanskrit
CO2: Enhanced speaking skills in Sanskrit CO3: Enhanced listening skills in Sanskrit CO4: Enhanced writing skills in Sanskrit

Syllabus:

संस्कृतसम्भाषणशिबिरस्य पाठ्यक्रमः

प्रथमं दिनम्

- गीतम् - पठत संस्कृतम्.....।
- मम नाम -भवतः नाम किम्? भवत्याः नाम किम्? द्वयोः मध्ये परिचयः। परस्परं 5 जनान्।
- सः कः? सा का? तत् किम्?
- एषः, एषा, एतत्।
- अहम्, भवान्, भवती..... ...अभिनयः।
- आम्,न, वा/किम्.....अभिनयः।
- अस्ति × नास्ति.....अभिनयः।
- अत्र, तत्र, कुत्र, सर्वत्र, अन्यत्र, एकत्र - अभिनयः।
- षष्ठी - तस्य, एतस्य, कस्य, तस्याः, एतस्याः, कस्याः, मम, भवतः, भवत्याः.....अभिनयः।
  मम नासिका, भवतः नासिका, भवत्याः नासिका।
  एतत् कस्य? अङ्गानि प्रदर्श्य प्रश्नः।
- दशरथस्य..., सीतायाः..., लेखन्याः..., पुस्तकस्य...,। स्फोरकपत्रस्य (Flash Card) उपयोगः करणीयः। 'पुत्रः' 'पतिः' इत्यादीनां वाक्यपत्राणाम् (Charts) उपयोगः करणीयः।
- गीतम् - मनसा सततं स्मरणीयम्।
- आवश्यकम्, मास्तु, पर्याप्तम्, धन्यवादः, स्वागतम्।
- पूर्वनिश्चितसम्भाषणप्रदर्शनम्।
- क्रियापदानां पाठनम् - गच्छति। आगच्छति। पठति। लिखति। खादति।पिबति। क्रीडति। वदति। उत्तिष्ठति। उपविशति।
- गच्छामि। आगच्छामि.....।
- गच्छतु। आगच्छतु.....।
- सङ्ख्याः - (अ) 1, 2, 3, 4,.....10। (आ) 10, 20, 30,.....100।
- समयः - 5.00, 5.15, 5.30, 4.45 ।
- कथा - गतानुगतिको लोकः। (काचित् कथा सरलया भाषया वक्तव्या)।
- रटनाभ्यासः (पूर्वमेव लिखितानि पठितानि च कानिचित् वाक्यानि वाचनीयानि)।
- एकं वाक्यम् (प्रत्येकं छात्रः एकं वाक्यं वदेत्।)
- सूचना।
- ऐक्यमत्यः।

द्वितीयं दिनम्

- गीतम्।
- पुनस्स्मारणम्।
- शब्देषु लिङ्गभेदज्ञापनम् - यथा -सः सुधाखण्डः, सा कुञ्चिका, तत् पुष्पम्।
- बहुवचनपाठनम् – बालकाः..., बालिकाः..., लेखन्यः..., पुस्तकानि...।
- ते, के, ताः, काः, तानि, कानि, एते, एताः, एतानि, भवन्तः, भवत्यः, वयम्। (चित्राणि उपयोक्तव्यानि।)
- वचनपरिवर्तनाभ्यासः। यथा - सः बालकः - ते बालकाः।
- अस्ति - सन्ति।
- कति?
- सप्तमी - हस्ते। उत्पीठिकायाम्। लेखन्याम्। पुस्तके। (स्फोरकपत्रस्य प्रयोगः करणीयः।) वाक्यपत्रस्य उपयोगेन वाक्यानि वाचनीयानि।
- कदा?
- उत्तराणां प्रश्नाः। (शिक्षकः आरम्भे उत्तरं वदेत्, अनन्तरं छात्राः तस्य प्रश्नं पृच्छेयुः।) यथा - रामः प्रातःकाले शालां गच्छति। रामः कदा शालां गच्छति?
- अद्य, श्वः, परश्वः, प्रपरश्वः, ह्यः, परह्यः, प्रपरह्यः, इदानीम्।
- गीतम्।
- गच्छन्ति। गच्छामः। गच्छन्तु।
- शिष्टाचारः - सुप्रभातम्/नमस्कारः/शुभरात्रिः/हरिः ओम्/क्षम्यताम्/चिन्ता मास्तु।
- प्रातर्विधिः - दन्तधावनम् इत्यादयः शब्दाः पाठनीयाः।
- सङ्ख्या - 1-50।
- समयः - 6.05, 6.10, 5.55, 5.50
- स्वागतसम्भाषणम्। (शिक्षकः सहशिक्षकेण सह कृत्वा प्रदर्शयेत्)
- कथा।
- रटनाभ्यासः।
- वाक्यद्वयम् (प्रत्येकम् अपि छात्रः वाक्यद्वयं वदेत्।)
- सूचनाः।
- ऐक्यमत्यः।

तृतीयं दिनम्

- गीतम्।
- पुनस्स्मारणम्।
- क्रियापदानां बहुवचनरूपाणि।
  गच्छन्ति - गच्छामः - गच्छन्तु (Chart दर्शनीयम्)
  पिबन्ति - पिबामः - पिबन्तु।
  लिखन्ति - लिखामः - लिखन्तु।
  इत्यादिपरिवर्तनाभ्यासः कारणीयः।
- द्वितीयाविभक्तिः - स्फोरकपत्राणाम् उपयोगः।
  (वाक्यपत्राणि उपयुज्य वाक्यानि वाचनीयानि।)
- कृपया ददातु - वस्तूनि प्रदर्श्य।
  शिक्षकः एकैकं वस्तु प्रदर्शयति।
  उदा. – ग्रन्थः, घटी,.....
  छात्राः - कृपया ग्रन्थं ददातु, कृपया घटीं ददातु इत्यादि
  वदेयुः। (स्फोरकपत्रस्य उपयोगः)
- पुरतः, पृष्ठतः, वामतः, दक्षिणतः, उपरि, अधः।
  (चित्रं दर्शनीयम्)
- इतः, ततः, ...तः, गृहतः, कुतः?
  (स्फोरकपत्राणाम् उपयोगः)
  वाक्यपत्राणि उपयुज्य वाक्यानि वाचनीयानि।
- गीतम्।
- कथम्? सम्यक्।
- शीघ्रम् × मन्दम्। उच्चैः × शनैः।
- पठनार्थम्, किमर्थम्?
- सप्तककाराः - किम्, कुत्र, कति, कदा, कुतः, कथम्, किमर्थम् (Chart प्रदर्शनीयम्)।
  एकैकम् उपयुज्य परस्परं प्रश्नाः।
- अपि।
- अस्तु।
- अहं न जानामि। - कानिचन वाक्यानि।
- भूतकालीनक्रियापदानां पाठनम्।
  गतवान् - पठितवान् - लिखितवान्।
  गतवती - पठितवती - लिखितवती।
- क्रियापदकोष्ठकस्य प्रथमपृष्ठस्य अभ्यासः।
- द्वितीयपृष्ठस्य सर्वाणि क्रियापदानि उपयुज्य छात्राः वर्तमानकाले वाक्यानि वदन्ति। (ए.व - ब.व.)
- विशिष्टक्रियापदानाम् अभ्यासः -
  करोमि - कुर्मः। करोति - कुर्वन्ति।
  ददामि - दद्मः। ददाति - ददति।
  शृणोमि – शृणुमः। शृणोति - शृण्वन्ति।
  जानामि – जानीमः। जानाति – जानन्ति।
- सम्बोधनम् - भोः !, श्रीमन् !, मान्ये !, भगिनि!, मित्र !, ...महोदय!, राम !, सीते ! इत्यादि।
- सङ्ख्या- 1-100।
- समयः - 1.00, 2.00, 3.00, 4.00।
- सम्भाषणप्रदर्शनम् (मित्रसंलापः)।
- कथा।
- वाक्यत्रयम् एकैकोऽपि छात्रः वदेत्।
- सूचना।
- ऐक्यमत्रः।

चतुर्थं दिनम्

- गीतम्।
- पुनःस्मारणम्।
- च
- अतः
- एव
- इति
- अस्मि
- यदि -तर्हि
- यथा - तथा
- तः - पर्यन्तम् (वाक्यपत्रस्य उपयोगेन वाक्यानि वाचनीयानि।)
- अद्य आरभ्य
- कृते (वाक्यपत्रस्य उपयोगः करणीयः)
- क्तवतुप्रत्ययान्तानाम् अभ्यासः
  गतवान् - पठितवान् - लिखितवान् (ए.व. पुंलिङ्गे)।
  गतवती - पठितवती - लिखितवती (ए.व. स्त्रीलिङ्गे)।
  गतवन्तः - पठितवन्तः - लिखितवन्तः (ब.व. पुंलिङ्गे)।
  गतवत्यः - पठितवत्यः - लिखितवत्यः (ब.व. स्त्रीलिङ्गे)।
- सः गतवान् - सा गतवती - लिङ्गपरिवर्तनाभ्यासः।
- अहं गतवान् - अहं गतवती - लिङ्गपरिवर्तनाभ्यासः।
- क्रियापदानां कालपरिवर्तनाभ्यासः।
  यथा - गच्छति - गतवान्, गतवती।
- गीतम्।
- विशेषपाठनम् - आसीत्, आसन्, आसम्।
- एकः, एका, एकम् - लिङ्गभेदः ज्ञापनीयः।
  (स्फोरकपत्रस्य उपयोगः)

- भोजनसम्बन्धिशब्दाः यथा - सूपः, शाकम्, इत्यादयः।
- सङ्ख्या।
- समयः।
- ॐ – सङ्ख्याक्रीडा।
- कथा।
- सम्भाषणप्रदर्शनम्।
- चत्वारि वाक्यानि।
- सूचना।
- ऐकमत्यम्।

पञ्चमं दिनम्

- गीतम्।
- पुनःस्मारणम्।
- वाहनानां नामानि।
- तृतीयाविभक्तिः - दण्डेन, माषिकया, लेखन्या, पुष्पेण।
  (वाक्यपत्रस्य आधारेण वाक्यानि वाचनीयानि।)
- सह, विना।
- अद्यतन, ह्यस्तन, श्वस्तन, पूर्वतन, इदानीन्तन
- भविष्यत्कालीनक्रियापदानां पाठनम्।
  गमिष्यति, पठिष्यति, लेखिष्यति।(कोष्ठकस्य साहाय्येन)
- गत,आगामि।
- गीतम्।
- स्म।
- अभवत्।
- क्त्वाप्रयोगः (कोष्ठकस्य साहाय्येन)।
- यदा – तदा।
- बन्धुवाचकशब्दाः।
- वेशभूषणानां नामानि।
- वर्णाः।
- रुचयः।
- क्रीडा - एकश्वासेन सङ्ख्याकथनम्।
- कथा।
- पञ्च वाक्यानि।
- सूचना।
- ऐकमत्यम्।

षष्ठं दिनम्

- गीतम्।
- पुनःस्मारणम्।
- नूतनम् x पुरातनम्,
- बहु x किञ्चित्,
- दीर्घः x ह्रस्वः।
- उन्नतः x वामनः।
- स्थूलः x कृशः।
- एतादृश, तादृश, कीदृश?
- तुमुन् (कोष्टकस्य साहाय्येन)।
- किन्तु।
- निश्चयेन।
- बहुशः / प्रायशः।
- किल / खलु।
- शक्नोति।
- गीतम्।
- विशेषणविशेष्यभावस्य अभ्यासः।(प्रथमाविभक्तौ)
  सः उत्तमः बालकः।
  सा उत्तमा बालिका।
  तत् उत्तमं पुस्तकम्।
- इव। विनोदकणिका।(गतवान् 'इव' अभिनयं कृतवान्!)
- अपेक्षया।
- पशूनां नामानि।
- अवयवानां नामानि।
- वाक्यविस्तारणाभ्यासः।
  (सः मम पुस्तकं प्रातःकाले पञ्चवादने पठितवान्।)
- इतः पूर्वम् - इतः परम्।
- 'रामकृष्ण' सङ्ख्याक्रीडा।
- कथा।
- षट् वाक्यानि।
- सूचना।
- ऐकमत्यम्।

सप्तमं दिनम्

- गीतम्।
- पुनःस्मारणम्।
- क्त्वा - तुमुन् - परिवर्तनाभ्यासः।
- बहिः x अन्तः।
- रिक्तम् x पूर्णम्।
- इतोऽपि।
- इत्युक्ते।
- अन्ते।
- चेत् - नो चेत्।

- गीतम्।
- आरोग्यसम्बन्धिशब्दाः – वैद्यरोगिसम्भाषणम्।
- प्रश्नोत्तरस्पर्धा।
- ऋषीणां नामानि।
- कथा - शिक्षकः एकां कथां वदति। अनन्तरं छात्रेषु एकैकः तस्याः कथायाः एकैकं वाक्यम् उक्त्वा कथां सम्पूर्णां करोति।
- सङ्ख्या - दीर्घसङ्ख्यापाठनम्।
- प्रश्नोत्तरम्।
- क्रीडा - (गणद्वये नामस्मरणक्रीडा)
- कथा।
- पुस्तकानां परिचयः।
- सप्त वाक्यानि।
- सूचना।
- ऐक्यमन्त्रः।

अष्टमं दिनम्

- गीतम्।
- पुनःस्मारणम्।
- वारम्।
- अतः - यतः परिवर्तनाभ्यासः।
- यद्यपि – तथापि।
- यत्र – तत्र।
- कति - कियत् - एतयोः भेदज्ञापनम्।
- यावत् – तावत्।
- यत् – तत्।
- यः - सः।
- या – सा।
- गीतम्।
- अस्माकम्।
- चर्चा।
- सङ्ख्या - 'शतायुः - गतायुः' क्रीडा।
- विनोदकणिकाकथनम्।
- कथा।
- अष्ट वाक्यानि।
- समाजनिधिविषये सूचना।
- ऐक्यमन्त्रः।

नवमं दिनम्

- गीतम्।
- पुनःस्मारणम्।
- चित्।
- ....द्वयम्।
- सङ्ख्यासु लिङ्गभेदः।
  एकः - एका - एकम्
  द्वयम् - द्वयम् - द्वयम्
  त्रयः - तिस्रः - त्रीणि
  चत्वारः - चतस्रः - चत्वारि
- शिश्रकः - अहं वैद्यः - मम नाम सुरेशः (छात्राः तमुद्दिश्य प्रश्नान् पृच्छेयुः।)
- ..... अर्थम् (समाजार्थम्, संस्कृतकार्यार्थम्...)।
- गीतम्।
- तव्यत् – अनीयर्।
- अनन्त्यकथारचना।
- सङ्ख्यान्वेषणम् (क्रीडा)।
- छात्रैः सह प्रश्नोत्तरम्।
- समाजनिधिविषये पुनःस्मारणम्।
- ऐक्यमन्त्रः।

दशमं दिनम्

- गीतम्।
- पुनःस्मारणम्।
- पत्रलेखनम्।
- दूरवाणीसम्भाषणम्।
- मार्गनिर्देशः – कुत्र गन्तव्यम् इत्यादि।
- तव्यत् अभ्यासार्थम् – अद्य किं किं करणीयम् ?
- सान्दर्भिकभाषणम् –
  1. प्रवासात् प्रतिनिवर्तनस्य।
  2. आपणिकस्य इत्यादि।
- क्रीडा – सङ्ख्यायोजनम् (गणद्वये)।
- शुभाशयाः।
- असत्यकथनम् / कल्पनाकथनम्।
- समारोपः (सर्वैः शिक्षार्थिभिः भारतमातुः पूजां कृत्वा निधिसमर्पणं करणीयम्।)
- पत्राचारप्रगतशिक्षणादिविषये सूचना।
- ऐक्यमन्त्रः।

Syllabus for Semester II, B. Tech. Computer Science & Engineering
[Cyber Security]

Course Code: 24HS02PR0206-16 **Course: *Kirtan Kala***
L: 00 Hrs, T: 0 Hr, P: 2 Hrs, Per Week **Total Credits: 01**

Course objectives:

The objective of the course is to provide the students with a spiritual experience as well as its benefits to them in the form of better abilities to concentrate and develop the ability to create a peaceful mind.

Course outcome

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

CO1: Learn from the inspiring spiritual journey of the saints and the history of Kirtan tradition

CO2: Learn about the musical instruments used in the art of Kirtan

CO3: Develop communication skills

- कीर्तन परंपरेचा इतिहास आणि अखिल भारतातील कीर्तन परंपरांचा परिचय
- चार महिन्यात वीस संतचरित्रांचा परिचय अधिक त्याविषयी प्रवचन
- वीस संतांचा वाङ्मयीन परिचय
- प्रमुख पाच कीर्तन पद्धतींचे मांडणी तंत्र.
- पूर्वरंग – उत्तररंग सहित कीर्तनप्रक्रियेतील सर्व महत्वाचे टप्पे.
- कीर्तनासाठी आवश्यक असणारी कंठ संगीतात्मक माहिती
- टाळ, मृदंग, वीणा, तबला, पेटी या वाद्यांची ओळख.
- प्रवचनांसाठी अभ्यासग्रंथांचे मार्गदर्शन.
- वकृत्व कला, संभाषण कला, संवाद कौशल्य, कथाकथन यांची रहस्ये
- कीर्तनाचे अनुषंगाने संस्कृत मराठी श्लोक, सुभाषिते व प्रमाणाधार अशी ओव्या अभंगांची शिदोरी.

Syllabus for Semester II, B. Tech. Computer Science & Engineering
[Cyber Security]

Course Code: **24HS04PR0202-1** **Course Name: Adventure Sports**
L: 0 Hrs. T: 0 Hrs. P: 2 Hrs. Per Week **Total Credits: 01**

Course Objective:

This course introduces adventure sports, emphasizing experiential learning through participation in various activities. The course will cover the fundamentals, safety procedures, and physical and mental benefits of adventure sports. Students will engage in outdoor activities such as wall climbing, rappelling, and more, fostering a connection with nature and understanding the principles of risk management.

Syllabus:

- Tent pitching, knot practice session and Tent allotment
- Activities like Jumaring and Climbing
- Individual challenge like Burma bridge, ladder bridge, multi vine
- Group Task like improvise raft making and Kayaking
- activities like Archery rifle shooting, cycle ride

Pattern of Classes: 2 Days and 1 Night Camp

Course Outcome: By the end of this course, students will:

- Understand the principles and benefits of adventure sports.
- Develop basic skills in selected adventure sports.
- Learn and apply safety measures and risk management techniques.
- Foster teamwork, leadership, and problem-solving skills.
- Cultivate a greater appreciation for nature and outdoor activities.

Syllabus for Semester II, B. Tech. Computer Science & Engineering
[Cyber Security]

Course Code: 24HS04PR0202-2 **Course Name: Introduction to Defense Forces & Obstacle Training**

L: 0 Hrs. T: 0 Hrs. P: 2 Hrs. Per Week **Total Credits: 01**

Course Objective:

- Understand the Structure and Function of Defense Forces
- Familiarize with Defense Force Training and Discipline
- Learn Basic Obstacle Course Techniques
- Apply Problem-Solving and Teamwork in Obstacle Training
- Explore the Role of Obstacle Training in Defense Preparedness

Syllabus:

- Knot and Hitch practice session
- Activities like Rappelling & Wall Climbing
- Burma bridge & ladder bridge
- First Aid
- Rifle Shooting
- Horse riding
- Group Task and Team building activities

Pattern of Classes: 2 Days and 1 Night Camp

Course Outcome:

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

- Describe the Structure and Functions of Defense Forces
- Demonstrate Knowledge of Defense Training Protocols
- Navigate Basic Obstacle Courses
- Collaborate and Problem-Solve in Team-Based Exercises
- Connect Obstacle Training to Defense Preparedness
- Evaluate and Reflect on Training Experiences

Syllabus for Semester II, B. Tech. Computer Science & Engineering
[Cyber Security]

Course Code: 24HS04PR0202-3 **Course Name: Self Defense & Indian Martial Arts**
L: 0 Hrs. T: 0 Hrs. P: 2 Hrs. Per Week **Total Credits: 01**

Course Objective:

This course provides students with practical knowledge and skills in self-defense, focusing on personal safety and awareness. Students will learn basic techniques for self-defense, including striking, blocking, and evasion, while also discussing the legal and ethical considerations of self-defense. The course will emphasize both physical techniques and mental preparedness.

Syllabus:

1. **Mental Awareness**
    - Importance of Self Defense
    - Types of Self Defense
    - Rules of Self Defense
2. **Physical Session**
    - Various Self Defense Techniques
    - Different Situational Defense Techniques
3. **Improvise Weapon**
    - Knowledge and practice of different equipment's which can be used for self defense
4. **Martial Arts**
    - Introduction of Indian Martial Arts
    - Demonstration of Indian Martial Arts
    - Training of Indian Martial Arts (Lathi Kathi)

Pattern of Classes: Training/Classes at Campus

Course Outcome: By the end of this course, students will:

- Understand the principles of personal safety and awareness.
- Learn and practice basic self-defense techniques.
- Develop strategies to avoid dangerous situations.
- Understand the legal and ethical implications of using self-defense.
- Build confidence and physical fitness through regular practice.

Syllabus for Semester II, B. Tech. Computer Science & Engineering
[Cyber Security]

Course Code: 24HS04PR0202-4 **Course Name: Basic Nutritional Course**
L: 0 Hrs. T: 0 Hrs. P: 2 Hrs. Per Week **Total Credits: 01**

Course Objective:

In the "Basics of Nutrition" course, students will develop a comprehensive understanding of essential nutrients and their roles in supporting overall health. They will learn to apply dietary guidelines effectively, tailoring recommendations to various age groups and health conditions. Additionally, students will cultivate the skills needed to assess and improve their own and others' eating habits for better health outcomes.

Syllabus:

Unit I

- Introduction to Nutrition – Define Balanced Diet, Nutrition, Optimum Nutrition, Nutrients, Concept of Health, Recommended Dietary Allowances (RDA)
- Carbohydrates (sources, functions and digestion)
- Proteins (sources, functions and digestion)
- Fats (sources, functions and digestion)
- Micronutrients (vitamins and minerals-sources, functions and digestion)

Practical I

- Display of all the foods with the help of students and while demonstrating teacher will again explain role and importance of nutrition in daily life. Deficiency will lead to chronic diseases and its prevention is very necessary for the quality of life.

Unit II

- What is Body Mass Index?
- What is Basal Metabolic Rate?
- What is Ideal Body Weight? (Male/Female)
- How to read labels on Food Packets?
- How to choose smart food and Concept of Rainbow diet, My Food Pyramid or My plate given by ICMR-NIN.

Practical II

- Calculation of Body Mass Index, Basal Metabolic Rate, Ideal Body Weight (Male/Female) with the use of self-body measurements.
- Demonstration of Rainbow diet, My Food Pyramid or My plate in a class.

Pattern of Classes:

Theory Classes – 10
Practical Classes – 2

Course Outcome:

By the end of the course, students will be able to accurately describe the functions of key nutrients and their impact on health, create balanced meal plans based on established dietary guidelines, and critically evaluate nutrition information to distinguish between credible and misleading sources.

Syllabus for Semester III, B. Tech. Computer Science & Engineering [CYBER SECURITY]

Course Code: 24CS08TH0301 Course: Theory of Computation

L: 3Hrs, T: 0 Hr, P: 0Hr, Per Week Total Credits: 3

Course Objectives

1. This course aims to understand the basic theory of computation concepts that lies at the backbone of all state-of-the-art applications and program design.
2. Students can understand the capabilities and limitations of computation, as well as the specific applications and characteristics of deterministic and non-deterministic finite automata, context-free grammars, and ultimately, Turing machines.

Syllabus

UNIT-I: Basics of Theory of Computation, Basics of Sets and Relation, Countability and Diagonalization, Pigeon- hole principle. Fundamentals of formal languages and grammars, Chomsky hierarchy of languages.

UNIT-II: Finite Automata, Deterministic finite automata (DFA), Nondeterministic finite automata (NFA) and equivalence with DFA, Minimization of finite automata, NFA with Epsilon Transitions, Finite Automata with output.

UNIT-III: Regular expressions and Regular languages, Regular grammars and equivalence with finite automata, properties of regular languages, pumping lemma for regular languages, Context-free grammars (CFG) and language (CFL), parse trees, ambiguity in CFG, Reduction of CFGs, Chomsky and Greibach normal forms.

UNIT-IV: Push Down Automata, Deterministic pushdown automata and non-deterministic pushdown automata, Acceptance by two methods: Empty stack and Final State, Equivalence of PDA with CFG, closure properties of CFLs.

UNIT-V: Turing Machines, The basic model for Turing machines (TM), Turing recognizable recursively enumerable) and Turing-decidable (recursive) languages, variants of Turing machines, unrestricted grammars and equivalence with Turing machines, and TMs as enumerators.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Describe the formal relationships among machines, languages, and grammars.
2. Generate the finite automata for given regular languages.
3. Construct a Regular expression and the grammar for a given language.
4. Design Pushdown Automata, Turing Machine for given languages.

Text Books

1. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, Introduction to Automata Theory, Languages, and Computation, Pearson Education Asia.

Reference Books

1. Harry R. Lewis and Christos H. Papadimitriou, Elements of the Theory of Computation, Pearson Education Asia.
2. Dexter C. Kozen, Automata and Computability, Undergraduate Texts in Computer Science, Springer.
3. Michael Sipser, Introduction to the Theory of Computation, PWS Publishing.
4. John Martin, Introduction to Languages and the Theory of Computation, Tata McGraw Hill

Syllabus for Semester III, B. Tech. Computer Science & Engineering [CYBER SECURITY]

Course Code: 24CS08TH0302 Course: Database Management System

L: 3Hrs, T: 0 Hr, P: 0Hr, Per Week Total Credits: 3

Course Objectives

1. To understand the role of a database management system in an organization.
2. To construct simple and advanced database queries using a data language.
3. To understand and apply logical database design principles and database normalization.
4. To recognize the need for transaction management and query processing.

SYLLABUS

UNIT-I Introduction to Database System

Concepts and Architecture Databases and Database Users, Characteristics of the Database Approach, Advantages of Using the DBMS Approach, When Not to Use a DBMS, Data Models, Schemas, and Instances, Three-Schema Architecture and Data Independence, Database Languages and Interfaces, The Database System Environment.

UNIT-II The Relational Data Model and SQL

Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Update Operations, Transactions, and Dealing with Constraint Violations, SQL Data Definition, Data Types and Constraints, Data Management in SQL, Transforming ER Model into Relational Model.

UNIT-III Database Design and Normalization

Functional Dependencies, Inference Rules, Equivalence, and Minimal Cover, Properties of Relational Decomposition, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form, Other Dependencies and Normal Forms.

UNIT IV Storage, Indexing, and Query Processing

Storage and File Organization, Indexing, Query Processing and Optimization, Ordered Indices, B+-Tree Index Files and its Extensions, Static Hashing and Dynamic Hashing, Bitmap Indices

UNIT V Transaction Processing, Concurrency Control and Recovery

Introduction to Transaction Processing, Characterizing Schedules Based on Recoverability, Characterizing Schedules Based on Serializability, Two-Phase Locking Techniques for Concurrency Control, Deadlock Handling and Multiple Granularity, Database Recovery Techniques.

Course Outcomes:

On completion of the course the student will be able to

1. Identify the basic concepts and various data model used in database design.
2. Recognize the use of normalization and functional dependency.
3. Understand the purpose of query processing and optimization.
4. Apply and relate the concept of transaction, concurrency control and recovery in database.

Text Books:

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan; “Database System Concepts” Sixth Edition, Tata McGraw Hill, 2011.
2. Ramez Elmasri and Shamkant Navathe; “Fundamentals of Database Systems”, Sixth Edition, Addison Wesley 2011.

Reference Books:

1. Raghu Ramakrishnan and Johannes Gehrke; “Database Management Systems”; Third Edition; Tata McGraw Hill Publication, 2003.
2. C. J. Date; “Database in Depth – Relational Theory for Practitioners”; O`Reilly Media, 2005.

Syllabus for Semester III, B. Tech. Computer Science & Engineering [CYBER SECURITY]

Course Code: 24CS08PR0302 Course: Database Management System Lab

L: 0 Hrs, T: 0 Hr, P: 2 Hr, Per Week Total Credits: 1

Course Objectives

1. To understand the role of a database management system in an organization.
2. To construct simple and advanced database queries using a data language.
3. To understand and apply logical database design principles and database normalization.
4. To recognize the need for transaction management and query processing.

SYLLABUS

Practical will be conducted based on 24CS08TH0302

Textbooks:

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan; “Database System Concepts” Sixth Edition, Tata McGraw Hill, 2011.
2. Ramez Elmasri and Shamkant Navathe; “Fundamentals of Database Systems”, Sixth Edition, Addison Wesley 2011.

Reference Books:

1. Raghu Ramakrishnan and Johannes Gehrke; “Database Management Systems”; Third Edition; Tata McGraw Hill Publication, 2003.
2. C. J. Date; “Database in Depth – Relational Theory for Practitioners”; O`Reilly Media, 2005.

Syllabus for Semester III, B. Tech. Computer Science & Engineering [CYBER SECURITY]

Course Code: 24CS08PR0303 Course: Data Handling and Visualization Lab

L: 0 Hrs, T: 0 Hr, P: 4 Hr, Per Week Total Credits: 2

Course Objectives

The course aims to familiarize the students with the process of exploring data, transforming data, and presenting it in a way that is meaningful to others.

Course Outcomes:

On completion of the course the student will be able to

1. Perform data extraction.
2. Understand and apply different data transformation and loading techniques.
3. Identify and apply appropriate data visualization technique(s).

Syllabus:

Experiments may include, but are not limited to the following:

- Extract data from different sources like text files, APIs, databases.
- Data cleaning techniques
- Data processing techniques
- Data loading techniques
- Data visualization techniques like plots (line plot, scatter plot, etc), charts (bar charts, pie chart, donut chart, etc) , histograms, Box and Whisker Plot, Maps, Word Clouds, Network diagrams, Correlation Matrices, etc

Reference Books:

1. Claus O. Wilke, “Fundamentals of Data Visualization – A Primer on Making Informative and Compelling Figures”, O’Reilly, 2019.
2. Kyran Dale, “Data Visualization with Python and JavaScript – Scrape, Clean and transform Your Data”, O’Reilly, 2016.

Syllabus for Semester III, B. Tech. Computer Science & Engineering [CYBER SECURITY]

Course Code: 24CS08TH0304 Course: Computer Networks

L: 3 Hrs, T: 0 Hr, P: 0 Hr, Per Week Total Credits: 3

Course Objectives:

1. To develop an understanding of modern network architectures from a design and performance perspective.
2. To introduce the student to the major concepts involved in network protocols.
3. To provide an opportunity to do network programming

Syllabus:

UNIT I: Data communication Components: Representation of data and its flow Networks, Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division

UNIT II: Data Link Layer: Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ.

UNIT III: Medium Access Sub Layer: Switching, Random Access, Multiple access protocols - Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA, IEEE 802 standard protocols. Network Layer: Internet Protocol (IP) – Logical Addressing: IPV4, IPV6; Address mapping: ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.

UNIT IV: Transport Layer: Elements of Transport protocols: Addressing, Connection establishment, Connection release, Crash recovery, User Datagram Protocol (UDP), Transmission Control Protocol, (TCP), TCP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.

UNIT V: Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls

Course Outcomes:

On successful completion of the course, students will be able to:

1. Understand basics of computer networks and reference models
2. Identify the Design issues of each layer of OSI model
3. Implement the protocols of OSI model

Textbooks:

1. Computer Networks: 5th ed by Andrew. S. Tanenbaum. PHI Publication.
2. Data Communications and Networks: 3rd ed by Behrouz A. Forouzan. Tata McGraw Hill Publication.

Reference Books:

1. James F. Kurose and Keith W. Ross: Computer Networking: A Top-Down Approach Featuring the Internet, 3rd Edition.
2. William Stallings, “Data and Computer Communications”, PHI 6th Edition

Syllabus for Semester III, B. Tech. Computer Science & Engineering [CYBER SECURITY]

Course Code: 24CS08PR0304 Course Name: Computer Networks Lab

L: 0 Hrs T: 0 Hrs P: 2 Hrs Per Week Total Credits: 1

Course Objectives:

1. To introduce use of different network simulation software.
2. To analyze performance of different protocols at various layers of a network architecture.
3. To demonstrate the implementation of various networking concepts.

Syllabus:

Experiments based on **24CS08TH0304** Syllabus.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Simulate and then configure different types of networks.
2. Implement algorithms present in different layers of OSI model
3. Implement networking concepts like server, client and addressing mechanism.

Syllabus for Bachelor of Technology (Core, AI & Data Science /AIML/ Data Science & Analytics/Business Systems/ Cognitive Computing/Quantum Computing/ Cyber Security/Block chain technology), Engineering & Information Technology (Information Security/IoT and Smart System/ E-Governance, Cyber Physical system) Engineering)

Semester III

Course Code: 24HS03TH0301 **Course Name: Discrete Mathematics**

L: 3Hrs. T: 0 Hrs. P: 0 Hrs. Per week Total Credits:3

Course Objective:

The objective of this course is to expose student to understand the basic importance of Logic, Number theory, Algebraic structures like groups and Field, combinatorics and graph theory l in computer science and Information technology.

Course Outcomes

On successful completion of the course, student shall be able to

1. Explore advanced topics such as recurrence relations, generating functions, and their use in solving combinatorial problems.
2. Applying modular arithmetic to cryptography, coding theory.
3. The fundamental concepts of propositional and predicate logic, including syntax, semantics, and the interpretation of logical expressions.
4. Understand the basic definitions, properties, and examples of groups, subgroups, and related algebraic structures
5. Use lattice-theoretic concepts to model and solve problems in computer science, logic.

Syllabus

Module 1: (8 Lectures)
Combinatorics: Addition and multiplication rule in combinatorics, Linear and Circular permutation, Combination, , Inclusion and Exclusion Principle, , recurrence relations, Ordinary generating function.

Module 2: (7 Lectures)
Modular Arithmetic: Modular Arithmetic, Euclid's Algorithm, primes, Fermat's theorem, Euler's theorem, Diophantine equations, Linear congruences, Chinese Remainder theorem, application to Cryptography.

Module 3: (7 Lectures)
Mathematical Logic: Statement and notations, connectives, Negation, conjunction, disjunction, conditional & bi-conditional statement. Tautologies, equivalence of formulas, Tautological implications, Theory of inference for statement calculus.

Module 4: (8 Lectures)
Groups: Group definitions and examples, cyclic group, permutation groups, subgroups and homomorphism, co-sets, Lagrange's theorem

Module 5: (7 Lectures)

Lattice theory: Lattices as partially ordered set, Properties of Lattice, Lattices as algebraic system, sub lattices, direct product, complimentary lattice , distributive lattices,.

Text Books:

1. Discrete Mathematical Structures with Applications to Computer Science: J. P. Tremblay and R. Manohar , Tata McGraw-hill.
2. Combinatorial Mathematics: C. L. Liu & D. P. Mohapatra, 3rd edition, Tata McGraw-hill.
3. David M Burton, 'Elementary Number Theory' , McGraw Hill, Seventh edition 2014.

Reference Books:

1. Foundations of Discrete Mathematics: K. D. Joshi, New age international Publication.
2. Discrete Mathematics: Kolman, Busby & Ross, Pearson Publication.

Syllabus for Semester IV, B. Tech. Computer Science & Engineering [CYBER SECURITY]

Course Code: 24CS08TH0401 Course: Cryptography

L: 3Hrs, T: 0 Hr, P: 0Hr, Per Week Total Credits: 3

Course Objectives

1. To understand basics of Cryptography.
2. To be able to secure a message over insecure channel by various means.
3. To learn about how to maintain the Confidentiality, Integrity and Availability of data
4. To understand various protocols to protect against the threats in the networks.

Syllabus

UNIT – I: Introduction to Cryptography

Introduction to security attacks - services and mechanism, Mathematics of Cryptography- Integer Arithmetic, Modular Arithmetic, introduction to cryptography - Conventional Encryption: Conventional encryption model - classical encryption techniques - substitution ciphers and transposition ciphers – cryptanalysis – steganography

UNIT – II: Stream & Block Ciphers

Mathematics of Symmetric-key Cryptography- Algebraic Structures- Groups, ring & Finite field, stream and block ciphers - Modern Block Ciphers: Block ciphers principals – Shannon's theory of confusion and diffusion - fiestal structure - data encryption standard (DES) - strength of DES – block cipher modes of operations - DES – AES.

Unit – III: Asymmetric-Key Cryptography

Confidentiality using conventional encryption - traffic confidentiality, Mathematics of Asymmetric-key cryptography, RSA algorithm– Diffie-Hellman key exchange algorithm- Elliptic curve cryptography– Elgamal encryption – Message Authentication and Hash Function: Authentication requirements - authentication functions - message authentication code - hash functions - birthday attacks.

Unit – IV: Hash Functions & Authentication

Message Authentication and Hash Function: Authentication requirements – authentication functions - message authentication code - hash functions - birthday attacks. MD5 message digest algorithm - Secure hash algorithm (SHA) Digital Signatures: Digital Signatures - authentication protocols - digital signature standards (DSS) - proof of digital signature algorithm - Authentication Applications: Kerberos and X.509 - directory authentication service

Unit – V: Application Layer Security, IP Security and Key Management

Electronic mail security-pretty good privacy (PGP), S/MIME, IP Security: Architecture - Authentication header - Encapsulating security payloads - combining security associations – key management.

Course Outcomes

1. Understand various cryptographic techniques.
2. Apply symmetric and asymmetric cryptographic algorithms.
3. Implement hashing and digital signature techniques.
4. Develop secure authentication mechanisms.
5. Apply cryptographic methods for network and application security.

Text Books

1. William Stallings, "Cryptography and Network security Principles and Practices", Pearson / PHI, 5th Edition
2. Wade Trappe, Lawrence C Washington, "Introduction to Cryptography with coding theory",

Pearson.
3. Behrouz A. Forouzan, Debdeep Mukhopadhyay, “Cryptography and Network Security” 3rd Edition, McGrawHill.

Reference Books

1. W. Mao, “Modern Cryptography – Theory and Practice”, Pearson Education.
2. Charles P. Pfleeger, Shari Lawrence Pfleeger – Security in computing – Prentice Hall of India.

Syllabus for Semester IV, B. Tech. Computer Science & Engineering [CYBER SECURITY]

Course Code: 24CS08TH0402 Course: Design & Analysis of Algorithms

L: 3Hrs, T: 0 Hr, P: 0Hr, Per Week Total Credits: 3

Course Objectives:

1. Students should learn techniques for effective problem solving in computing.
2. Students should analyze different paradigms of problem solving to solve a given problem in an efficient way.

Syllabus:

UNIT I: Mathematical foundations for arithmetic and geometric series, Recurrence relations and their solutions, Principles of designing algorithms and complexity calculation, Asymptotic notations for analysis of algorithms, worst case and average case analysis, amortized analysis and its applications.

UNIT II: Divide and Conquer- basic strategy, Binary Search, Quick sort, Merge sort, Strassen's matrix multiplication, Maximum sub-array problem, Closest pair of points problem, convex hull problem.

UNIT III: Greedy method – basic strategy, fractional knapsack problem, Minimum cost spanning trees, Huffman Coding, activity selection problem, find maximum sum possible equal to sum of three stacks, K Centers Problem.

UNIT IV: Dynamic Programming -basic strategy, Bellmen ford algorithm, all pairs shortest path, multistage graphs, optimal binary search trees, traveling salesman problem, String Editing, Longest Common Subsequence problem and its variations.

UNIT V: Basic Traversal and Search Techniques, breadth first search and depth first search, connected components. Backtracking basic strategy, 8-Queen's problem, graph coloring, Hamiltonian cycles, sum of subset problem, Introduction to Approximation algorithm. NP-hard and NP-complete problems, basic concepts, non-deterministic algorithms, NP-hard and NP complete, decision and optimization problems, polynomial reduction, graph based problems on NP Principle, vertex cover problem, clique cover problem

Course Outcomes:

On successful completion of the course, students will be able to:

1. Understand mathematical formulation, complexity analysis and methodologies to solve the recurrence relations for algorithms.
2. Design Greedy and Divide and Conquer algorithms and their usage in real life examples.
3. Design Dynamic programming and Backtracking Paradigms to solve the real life problems.
4. Understand NP class problems and formulate solutions using standard approaches.

Textbooks:

1. Thomas H. Cormen et.al; “Introduction to Algorithms”; 3 Edition; Prentice Hall, 2009.
2. Horowitz, Sahani and Rajasekaram; “Computer Algorithms”, Silicon Press, 2008.
3. Brassard and Bratley; “Fundamentals of Algorithms”, 1 Edition; Prentice Hall, 1995. 4. Richard Johnsonbaugh, “Algorithms”, Pearson Publication, 2003.

Reference Books:

1. Parag Himanshu Dave, Balchandra Dave, “Design and Analysis of Algorithms” Pearson Education, O'relly publication
2. Richard Johnsonbaugh, “Algorithms”, Pearson Publication, 2003.

Syllabus for Semester IV, B. Tech. Computer Science & Engineering [CYBER SECURITY]

Course Code: 24CS08PR0402 Course: Design & Analysis of Algorithms Lab

L: 0 Hrs, T: 0 Hr, P: 2 Hr, Per Week Total Credits: 1

Course Objectives:

1. Analyze the performance of algorithms.
2. Demonstrate a familiarity with major algorithms and data structures.
3. Apply important algorithmic design paradigms and methods of analysis.

Syllabus:

Experiment based on syllabus of Design and Analysis Algorithms (CCT206).

Course Outcomes:

On successful completion of the course, students will be able to:

1. Analyze greedy paradigm and implement greedy algorithms.
2. Analyze divide-and-conquer paradigm and synthesize divide-and-conquer algorithms.
3. Implement algorithms using Dynamic Approach and analyze it to determine its computational complexity.
4. Apply backtracking paradigm to realize real world problems.

Textbooks:

1. Thomas H. Cormen et.al. “Introduction to Algorithms”, Prentice Hall of India.
2. Horowitz, Sahani, Rajsekharam, “Computer Algorithms”, Galgotia Publications Pvt. Ltd.

Reference Books:

1. Brassard, Bratley, “Fundamentals of Algorithms”, Prentice Hall
2. Algorithms -- A Creative Approach, 3RD Edition, UdiManber, Addison-Wesley, Reading, MA

Syllabus for Semester IV, B. Tech. Computer Science & Engineering [CYBER SECURITY]

Course Code: 24CS08TH0403 Course: Fundamentals of Blockchain

L: 3 Hrs, T: 0 Hr, P: 0 Hr, Per Week Total Credits: 3

Course Objectives:

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

1. Understand the core concepts and mechanisms of blockchain technology.
2. Analyze different consensus mechanisms used in blockchain networks.
3. Apply cryptographic principles to blockchain security.
4. Utilize cryptocurrency wallets and understand cryptocurrency transactions.
5. Develop and deploy basic smart contracts on the Ethereum platform.

Unit-wise Syllabus:

Unit 1: Blockchain Introduction

Blockchain Technology Mechanisms & Networks, Blockchain Origins, Blockchain Objectives, Blockchain Users & Adoption, Blockchain Challenges, P2P Systems, Hash Pointers and Data Structures, Blockchain Transactions

Unit 2: Consensus Mechanisms and Security

Permissioned Blockchain, Permisionless Blockchain, Different Consensus Mechanisms- Proof of Work, Proof of Stake, Proof of Activity, Proof of Burn, Proof of Elapsed Time, Proof of Authority, Proof of Importance, Distributed Denial-of-Service (DDoS) Attack, 51% Attack, Double spending problem, Merkel Tree, Security Threats to Blockchain Technology

Unit 3: Cryptography Fundamentals

Encryption, Digital Signatures, Public-Key Cryptography, Private Key Cryptography

Unit 4: Cryptocurrency and Wallets

Types of Wallets, Desktop Wallets, App-based Wallets, Browser-based Wallets, Metamask, Creating an Account in Metamask, Use of Faucet to Fund Wallet, Transfer of Cryptocurrency in Metamask.

Unit 5: Smart Contracts and Ethereum

Overview of Ethereum, Writing Smart Contracts in Solidity, Remix IDE, Different Networks of Ethereum, Understanding Blocks in Blockchain, Compilation and Deployment of Smart Contracts in Remix.

Course Outcomes (COs):

CO1: Explain the fundamental concepts and architecture of blockchain technology.
CO2: Analyze and compare different consensus mechanisms used in blockchain networks.
CO3: Apply cryptographic principles to understand blockchain security.
CO4: Utilize and manage cryptocurrency wallets for transactions.
CO5: Develop and deploy basic smart contracts on the Ethereum platform.

Textbooks:

1. "Mastering Bitcoin: Programming the Open Blockchain" by Andreas M. Antonopoulos
2. "Blockchain Basics: A Non-Technical Introduction in 25 Steps" by Daniel Drescher
3. Reference Books:
4. "Ethereum: Blockchains, Smart Contracts, DApps" by Andreas M. Antonopoulos and Gavin Wood
5. "The Internet of Money" by Andreas M. Antonopoulos
6. Solidity documentation.

Syllabus for Semester IV, B. Tech. Computer Science & Engineering [CYBER SECURITY]

Course Code: 24CS08PR0403 Course Name: Fundamentals of Blockchain Lab

L: 0 Hrs T: 0 Hrs P: 2 Hrs Per Week Total Credits: 1

Course Objectives:

Upon successful completion of this lab course, students will be able to:

1. Configure and use cryptocurrency wallets for transactions.
2. Develop and deploy smart contracts on the Ethereum test networks.
3. Interact with blockchain networks using command-line tools and APIs.
4. Analyze and interpret blockchain data and transactions.
5. Explore and evaluate different blockchain platforms and tools.

Syllabus:

Cryptocurrency Wallet Setup and Usage

Setting up Metamask, Creating and Managing Accounts, Funding Wallets using Faucets, Performing Cryptocurrency Transactions, Exploring Different Wallet Types (Desktop, Mobile, Browser).

Smart Contract Development with Solidity

Introduction to Remix IDE, Writing Basic Smart Contracts, Compiling and Deploying Contracts on Test Networks (Ropsten, Rinkeby, Goerli), Interacting with Deployed Contracts.

Blockchain Network Interaction

Interacting with Ethereum Network using Command-Line Tools (geth, web3.js), Analyzing Blockchain Data using Block Explorers (Etherscan), Using APIs to Retrieve Blockchain Information.

Blockchain Data Analysis and Exploration

Analyzing Transaction Data, Exploring Block Structure and Content, Understanding Merkle Trees, Investigating Transaction Histories and Block Timestamps.

Exploring Alternative Blockchain Platforms

Introduction to Hyperledger Fabric/Sawtooth (Basic Setup/Exploration), Exploring other blockchain platforms (if time permits), Comparing different Blockchain platforms and features.

Course Outcomes:

CO1: Set up and use cryptocurrency wallets for practical transactions.
CO2: Develop and deploy smart contracts on Ethereum test networks.
CO3: Interact with blockchain networks using command-line tools and APIs.
CO4: Analyze and interpret blockchain data and transactions.
CO5: Explore and compare different blockchain platforms and tools.

Syllabus for Semester IV, B. Tech. Computer Science & Engineering [CYBER SECURITY]

Course Code: 24CS08PR0404 Course Name: Software Lab

L: 0 Hrs T: 0 Hrs P: 4Hrs Per Week Total Credits:2

Course Objectives:

1. To introduce the Python programming language.
2. To teach how to use Python for cybersecurity tasks.
3. To develop skills in automating security tasks using Python.

Syllabus:

Lab 1: Introduction to Python & Python Basics: Overview of Python, Installation and setup, Variables, data types, and operators, Control flow: loops and conditional statements, Functions and modules

Lab 2: Working with Files

Lab 3: Python Libraries for Cyber Security: Introduction to key libraries (e.g., socket, requests, scapy), Using libraries for network programming and analysis

Lab 4: Web Scraping and Data Analysis

Lab 5: Network Security with Python

Lab 6: Web Application Security

Lab 7: Cryptographic Operations

Lab 8: Penetration Testing with Python

Additional Contents:

Network Scanning and Enumeration (Wireshark, Nmap, Zenmap, Netcat etc.), Vulnerability Assessment (OpenVAS, Nikto, etc.), Lynis, Threat Detection using snort, Firewalls (pfSense: Exploring pfSense for configuring network security and firewalls) and UFW (Uncomplicated Firewall), Creating virtual environments for secure testing and practice. Web application security tools. Case Studies and Real-World Scenarios (Security incidents analysis and best practices)

Course Outcomes:

After successful completion of the course students will be able to:

1. Write Python scripts to automate security tasks.
2. Use Python libraries for network analysis and penetration testing.
3. Develop simple security tools using Python.

Reference books:

1. Black Hat Python: Python Programming for Hackers and Pentesters , Justin Seitz, Publisher: No Starch Press
2. Violent Python: A Cookbook for Hackers, Forensic Analysts, Penetration Testers and Security Engineers, TJ O'Connor, Syngress Publisher.
3. Python Forensics: A Workbench for Inventing and Sharing Digital Forensic Technology, Authors: Chet Hosmer, Joshua I. James, Publisher: Syngress
4. Python Network Programming for Network Engineers (Python Programming for Network Engineers), Author: Brandon Rhodes, John Goerzen, Publisher: O'Reilly Media
5. Gray Hat Python: Python Programming for Hackers and Reverse Engineers, Author: Justin Seitz, Publisher: No Starch Press

Case Studies:

1. **Stuxnet Worm** - Analyze the Stuxnet worm as a case study for threat detection and incident response.
2. **Target Data Breach** - Study the Target data breach case as an example of a security incident analysis.
3. **WannaCry Ransomware Attack** - Explore the WannaCry ransomware attack as a case study for vulnerability assessment and mitigation.

Additional Resources:

1. **Wireshark User's Guide** - Official documentation for Wireshark to deepen understanding of network packet analysis.
2. **Nmap Network Scanning** by Gordon Fyodor Lyon - Comprehensive guide to Nmap for network scanning and enumeration.
3. **OpenVAS Documentation** - Official documentation for OpenVAS for vulnerability assessment.
4. **Snort Intrusion Detection** - Official documentation for Snort for intrusion detection

Syllabus for Semester IV, B. Tech. Computer Science & Engineering [CYBER SECURITY]

Course Code: 24CS08PR0405 Course Name: Community Engagement Project

L: 0 Hrs T: 0 Hrs P: 4 Hrs Per Week Total Credits:2

Course Objectives:

1. Develop an understanding of rural society, lifestyle, gender roles, social structures, and traditional values.
2. Analyze rural livelihoods, agriculture, water management, non-farm activities and economic challenges.
3. Explore governance structures, Panchayati Raj institutions, self-help groups, and local administrative mechanisms.
4. Engage in field visits, social audits, awareness programs, and problem-solving initiatives for rural development.

Syllabus:

Week 1-2:

Appreciation of Rural Society: Rural lifestyle, rural society, caste and gender relations, rural values with respect to community, nature and resources, elaboration of "soul of India lies in villages' (Gandhi), rural infrastructure.

Week 3-4: Understanding rural and local economy and livelihood: Agriculture, farming, land ownership, water management, animal husbandry, non-farm livelihoods and artisans, rural entrepreneurs, rural markets, migrant labour.

Week 5-8: Rural and local Institutions: Traditional rural and community organisations, Self-help Groups, Panchayati raj institutions (Gram Sabha, Gram Panchayat, Standing Committees), Nagarpalikas and municipalities, local civil society, local administration.

Week 9-12: Rural and National Development Programmes: History of various development in India, current national programmes: Sarva Shiksha Abhiyan, Beti Bachao, Beti Padhao, Ayushman Bharat, Swatchh Bharat, PM Awaas Yojana, Skill India, Gram Panchayat Decentralised Planning, NRLM, MNREGA, SHRAM, Jal Jeevan Mission, SFURTI, Atma Nirbhar Bharat, etc.

Teaching/ Learning Methodology

- Visit Rural Schools / mid-day meal centres, study academic and infrastructural resources and gaps
- Visit local Anganwadi Centre and observe the services being provided
- Visit local NGOs, civil society organisations and interact with their staff and beneficiaries
- Visit MGNREGS project sites, interact with beneficiaries and interview functionaries at the site
- Field visit to Swachh Bharat project sites, conduct analysis and initiate problem-solving measures
- Interaction with self-help groups women members, and study of their functions and challenges; planning for their skill building and livelihood activities
- Conduct Mission Antyodaya surveys to support under Gram Panchayat Development Plan (GPDP)
- Participate in Gram Sabha meetings, and study community participation
- Associate with Social audit exercises at the Gram Panchayat level, and interact with programme beneficiaries
- Organize awareness programmes, health camps, Disability camps and cleanliness camps
- Organise orientation programmes for farmers regarding organic cultivation, rational use of irrigation and fertilizers and promotion of traditional species of crops and plants
- Formation of committees for common property resource management, village pond maintenance and fishing
- Classroom discussions, Group discussions, Field visit, Group presentation, Written assignment, Idea and project proposals for solving community issues

Course Outcomes

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

1. Understand the functioning of rural governance, Panchayati Raj, and self-help group initiatives and their impact on community welfare.
2. Gain applied knowledge of rural society, its social dynamics, and traditional community values.
3. Develop analytical skills to assess rural economies, livelihoods, and challenges faced by local communities.
4. Apply participatory approaches through fieldwork, social audits, and problem-solving for sustainable rural development.

Textbooks / Reference Books

1. Katar Singh, Anil Shishodia, Rural Development: Principles, Policies and Management, Fourth Edition, Atlantic Publishers and Distributors (P) Ltd, 2024, ISBN: 978-8126936786
2. Abhijit Guha, Nation-Building in Indian Anthropology: Beyond the Colonial Encounter, Routledge, Taylor & Francis, First Edition, 2022, ISBN: 978-1003341581
3. Surinder S. Jodhka, The Indian Village: Rural Lives in the 21st Century, Aleph Book Company; First Edition, 2023, ISBN: 978-9391047191
4. Parikshit Sahu, Rural Development in Modern India: Foundation and Pathways, Kaveri Books, 2021, ISBN: 978-9385719196
5. Manish Didwania, Sanjeev Prashar, Nitin Kishore Saxena, Rural Development & Management in India: Opportunities & Challenges (Countries and Cultures of the World), Nova Science Publishers Inc., 2017, ISBN: 978-1536118643
6. Jeet Ram Sharma, Leadership Dynamics in Panchayati Raj Institutions, IIP Iterative International Publishers, 2024, ISBN: 978-9357479585

Online Reference Course

1. https://onlinecourses.swayam2.ac.in/ugc23_ge04

Syllabus for Semester IV, B. Tech. Computer Science & Engineering [CYBER SECURITY]

Course Code: 24CS08TH0406 Course: Creativity, Innovation & Design Thinking

L: 2 Hrs, T: 0 Hr, P: 0 Hr, Per Week Total Credits: 2

Course Objectives:

1. Develop a human-centred approach when designing, innovating, developing, and testing new products, services, and processes.
2. Understand the significance of innovation in the digital age and lead disruptive advancements.
3. Foster a culture of design thinking to encourage innovation within an organization.
4. Conceptualize and develop innovative solutions both individually and collaboratively to enhance business impact.
5. Develop the ability to design and evaluate prototypes that prioritize customer needs and drive innovation.

Syllabus:

Unit I: Introduction: Meaning and concept of creativity - Creativity Process- Nature and characteristics of creativity, Factors affecting creativity, Recognizing and avoiding mental blocks, understanding creativity from studying the profiles ofn most creative personalities.

Unit II: Pattern Breaking: Thinking preferences. Lateral Thinking, Different techniques of creative problem solving- Brain storming, SCAMPER, Mind Mapping & Simulation, Metaphoric thinking, Outrageous thinking, other (new approaches)

Unit III: Decision and Evaluation: Focused Thinking Framework, Six Thinking Hats, Systematic logical thinking, Using math concepts, Eight-Dimensional (8D) Approach to Ideation: Uniqueness, Dimensionality, Directionality, Consolidation, Segmentation, Modification, Similarity, Experimentation

Unit IV: Innovation: Meaning and Importance — Difference with Creativity, Invention and Discovery Process, Nine lessons for Innovation, Design Thinking: Understanding the design thinking approach, Human centered design, Case Studies on Innovation business ideas like Amazon, Swiggy, Red bus, Flip fart, Ola, Big Basket, methods and techniques — organizational Aspects, Economic Aspects like venture capital, angel investors, Evaluation of Effectiveness of Innovation

Unit V: Ethical Considerations: Introduction to intellectual property rights - Patents, Copyrights©, Trademarks®, Trade Secret, Unfair Competition.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Practice the processes and methods of creative problem solving: observation, definition, representation, ideation, evaluation and decision making
2. Develop their creative and innovative thinking skills
3. Create building blocks of innovation
4. Practice and value teaming, communication, and creative problem solving
5. Design using human centered approach

Textbooks:

1. Design Thinking by Hasso Plattner, Christoph Meinel, Larry Leifer
2. The 7 Habits of Highly Effective People, by Stephen R. Covey
3. Creative Problem Solving for Managers - Tony Proctor - Routledge Taylor & Francis Group
4. The art of Innovation, by Tom Kelley and the Deep Dive story

Syllabus for Semester V, B. TECH CSE (Cyber Security)

Course Code: 24CS08TH0501 Course: Artificial Intelligence and Machine Learning

L: 3 Hrs, T: 0 Hr, P: 0 Hr, Per Week Total Credits: 03

Course Outcomes:

1. Understand the fundamental concepts of Artificial Intelligence (AI) and Machine Learning (ML).
2. Learn problem-solving, search strategies, and reasoning techniques in AI.
3. Understand various machine learning models, algorithms, and their applications.
4. Develop AI and ML models using programming frameworks.
5. Explore real-world applications of AI & ML in various domains.

Unit 1: Introduction to AI & ML (6 Hours): Introduction to AI: History and Evolution of AI, Strong AI vs. Weak AI, AI Applications in various domains like Healthcare, Finance, and Robotics. Problem-Solving and Search Strategies: AI as a Problem-Solving Tool, State Space Representation, Problem Formulation in AI. Search Strategies in AI: Uninformed Search: Breadth-First Search (BFS), Depth-First Search (DFS), Informed Search (Heuristic Search): A* Algorithm, Greedy Best-First Search

Unit 2: Knowledge Representation and Reasoning (8 Hours): Knowledge Representation Techniques: Representation of Facts, Knowledge, and Logic, Semantic Networks, Frames, and Scripts. Logic-Based Representation: Propositional Logic: Syntax and Semantics, First-Order Logic (FOL): Syntax, Semantics, and Inference. Reasoning in AI: Forward Chaining & Backward Chaining, Resolution in Logic, Handling Uncertainty in AI: Probability-Based Reasoning: Bayesian Networks Fuzzy Logic: Fuzzy Sets, Membership Functions, and Applications, Expert Systems: Definition and Structure of Expert Systems, Case Study of an AI-Based Expert System

Unit 3: Fundamentals of Machine Learning (9 Hours): Introduction to Machine Learning: Definition and Need, Types of ML: Supervised, Unsupervised, and Reinforcement Learning. Regression Techniques: Linear Regression, Polynomial Regression, Logistic Regression, Classification Techniques: Decision Trees, Naïve Bayes Classifier, k-Nearest Neighbors, Support Vector Machines (SVM). Model Evaluation Metrics: Overfitting & Underfitting, Bias-Variance Trade-off. Performance Metrics: Accuracy, Precision, Recall, F1-Score, ROC Curve. Unsupervised Learning: Clustering Techniques: k-Means Clustering, Hierarchical Clustering, DBSCAN.

Unit 4: Neural Networks & Deep Learning (9 Hours): Introduction to Neural Networks: Biological Neurons vs. Artificial Neurons, Perceptron Model. Multi-Layer Perceptron (MLP) and Backpropagation: Structure of a Multi-Layer Neural Network, Backpropagation Algorithm. Deep Learning Overview: Introduction to Deep Learning Architectures, Convolutional Neural Networks

(CNNs): CNN Architecture, Convolution and Pooling Layers Applications in Image Processing. Recurrent Neural Networks (RNNs): Basics of RNNs, Long Short-Term Memory (LSTM) and Gated Recurrent Units (GRU), Applications in Time-Series Forecasting.

Unit 5: Reinforcement Learning & Natural Language Processing (8 Hours)

Reinforcement Learning (RL): Basics of Reinforcement Learning, Markov Decision Process (MDP), Q-Learning and Deep Q-Networks, Applications of RL in Gaming and Robotics. Introduction to Natural Language Processing (NLP): NLP Overview and Applications. NLP Techniques and Applications: Sentiment Analysis using ML and Deep Learning. Text Generation using NLP Models (GPT, Transformers), Chatbots and Virtual Assistants.

Textbook:

1. Stuart Russell & Peter Norvig – Artificial Intelligence: A Modern Approach
2. Tom Mitchell – Machine Learning
3. Ian Goodfellow, Yoshua Bengio, Aaron Courville – Deep Learning

Reference Books:

1. Christopher Bishop – Pattern Recognition and Machine Learning
2. François Chollet – Deep Learning with Python
3. Sutton & Barto – Reinforcement Learning: An Introduction

Syllabus for Semester V, B. TECH CSE (Cyber Security)

Course Code: 24CS08PR0501 Course: Artificial Intelligence and Machine Learning Lab

L: 0Hrs, T: 0 Hr, P: 2 Hr, Per Week Total Credits: 01

Course Outcomes:

Upon successful completion of this practical lab, students will be able to:

1. Apply AI Search Algorithms for Problem Solving
2. Develop AI-Based Decision-Making Systems
3. Implement Machine Learning Models for Prediction
4. Perform Data Clustering and Classification
5. Apply Natural Language Processing (NLP) Techniques

List of Practical

1. Implement BFS and DFS algorithms.
2. Implement the A Algorithm* to find the optimal path in a grid-based environment.
3. Create a simple Expert System using IF-THEN rules for medical diagnosis.
4. Use basic NLP techniques to create a rule-based chatbot.
5. Implement Linear Regression for House Price Prediction
6. Implement Logistic Regression for Disease Prediction.
7. Implement k-Means Clustering for Customer Segmentation
8. Implement the Decision Tree Classifier for Iris Dataset
9. Implement Sentiment Analysis using Naïve Bayes

Syllabus for Semester V, B.TECH. CSE (Cyber Security)

Course Code: 24CS08TH0502 Course: Software Engineering and Project Management

L: 3 Hrs, T: 0 Hr, P: 0 Hr, Per Week Total Credits: 3

Course Objectives

1. To familiarize the prospective engineering graduates with the strong fundamental knowledge of software engineering and practices.
2. To facilitate development of interpersonal skills and practicing group dynamics with work ethics.
3. To enable the graduates to apply the theory in practice and to channelize solutions to challenging real-world problems.

Syllabus

Unit 1:

Introduction to Software Engineering, Software engineering principles, Software Myths, Software Engineering - a Layered Technology, Software Process Framework, Requirements Engineering Tasks, Requirement Engineering Process, Eliciting Requirement: Software Requirements Specification. Software Process Models: Waterfall Model, Incremental Process Models, Evolutionary Process Models, Specialized Process Models.

Unit 2:

Agile Process Models, Requirements Analysis, Analysis Modeling Approaches, Data Modeling, Object-Oriented Analysis, Scenario-Based Modeling, Flow-Oriented Modeling, Class-based Modeling, Behavioral Model. Design Engineering Concepts, Design Model.

Unit 3:

Software Project Management, The Business Case, Project Success and Failure, Project Evaluation, Cost-benefit evaluation technique, Project Planning-stepwise project Planning, Software Effort Estimation- Albrecht Function Point Analysis, COCOMO Model, COSMIC Function Point, Project Scheduling.

Unit 4:

Testing Life Cycle, Testing Strategies - Structural Testing, Functional Technique, Static testing, Dynamic testing, Unit Testing, Integration Testing, Validation Testing, System Testing, Debugging. Software Approaches - Black-Box Testing, White-Box Testing, Web Testing, Test case design, building and execution. Automated Testing.

Unit 5:

Software Quality, A Framework for Product Metrics, Metrics for Analysis and Design Models, Metrics for Source Code, Metrics for Testing and Maintenance. Metrics for process and project - Software

measurement, metrics for software quality, metrics for small organization, Managing people in software environment.

Risk management - Risk strategies, Software risk identification, Risk refinement, RMMM, Risk Response development and Risk Response Control, Risk Analysis, Agile risk management using Jira, Software Configuration Management, SCM Repository, SCM Process, Estimation, Software reengineering, Reverse engineering.

Course Outcomes:

After successful completion of this course, the student will be able to:

1. Use software engineering practices and various models.
2. Apply software engineering processes for modeling and solving real-world problems.
3. Analyze the impact of different software testing strategies on software products.
4. Estimate project cost and quality of a software prototype.

Text books and Reference Books:

1. Roger Pressman, Software Engineering - A Practitioner's Approach, Sixth Edition, McGraw Hill, 2010.
2. Ian Somerville, Software Engineering, Seventh Edition, Pearson Education, 2008.
3. Rajib Mall, Software Project Management, Fifth Edition, McGraw Hill, 2008.
4. Pankaj Jalote, Software Engineering: A Precise Approach, Wiley Publication, 2010.

Syllabus for Semester V, B. TECH CSE (Cyber Security)

Course Code: 24CS08PR0502 Course: Software Engineering and Project Management Lab

L: 0 Hrs, T: 0 Hr, P: 2 Hr, Per Week Total Credits: 1

Course Objectives

The objective of this Lab is:

1. To familiarize students with UML modeling tool and processes.
2. To help students understand and model software solutions applying the best software engineering practices.
3. To introduce students to the state-of-the-art tools in testing and validation of standalone and web applications.

Practicals based on 24CS08TH0502 syllabus

Using UML 2.X Tools and Open-Source Testing Tools (JUnit, Selenium, Katalon, etc)

Course Outcomes:

After successful completion of this course, the student should be able to:

1. Create documentation of an effective approach by analyzing the software engineering problem.
2. Design different structural models for the underlying problem.
3. Construct behavioral models for the underlying problem.
4. Validate the software product using appropriate testing strategies.

Syllabus for Semester V, B. TECH CSE (Cyber Security)

Course Code: 24CS08TH0503 Course: Computer Security

L: 3 Hrs, T: 0Hr, P: 0 Hr, Per Week Total Credits: 3

Course Objectives

To introduce the structure of a network & role of cryptography in communication over an insecure channel

1. To explain & to compare how various attack scenarios work & how security principles work
2. To evaluate risks faced by computer systems
3. To summarize security mechanisms available in operating systems

Syllabus

Unit 1: Computer Security Foundations

History of Computer Crimes & Information System Security, Hardware Elements of Security, Data Communications, Network Topologies, Protocols & Design, Common Language for Computer Security Incident Information, Mathematical Models of Computer Security

Unit 2: Threats and Vulnerabilities

Understanding Studies & Surveys of Computer Crime, Psychology of Computer Criminals, Looming Threats – Insider Threat & Information Warfare, Computer System Penetration Malicious Code & Fooling Attacks, Mobile Code, Social Engineering & Low-Tech Attacks, Web-Based Vulnerabilities, Physical Threats to Computer Systems

Unit 3: Computer Security Technology and Principles

Cryptographic Tools, Identification & User Authentication, Access Control, Gateway Security Devices, Firewalls, Intrusion Detection & Intrusion Prevention Systems, Virtual Private Networks & Secure Remote Access, Securing Stored Data.

Unit 4: Operating System Security

System Security Requirements & Planning, Operating Systems Hardening, Linux/Unix Security, Windows Security, MAC Security, Virtualization Security, Software Security & Trusted Systems, File Sharing, Protection Mechanisms

Unit 5:

Computer Defense -The Human Factor

Ethical Decision Making & High Technology, Employment Practices & Policies, Vulnerability Assessment, Operations Security & Production Controls, Email & Internet Use Policies, Implementing a Security Awareness Program, Security Standards for Products

IT Security Management

Security Audits, Application Controls, Monitoring & Control Systems, Data Backups & Archives, Incident Response, Business Continuity & Disaster Recovery, Quantitative Risk Assessment & Risk Management.

Course Outcome

After the successful completion of the course, students shall be able to –

1. Identify & distinguish between different cyber-attack vectors.
2. Harden computer systems & upgrade cybersecurity in different operating systems.
3. Analyze and manage IT security in organizations by implementing multiple security controls.

Textbooks:

1. Computer Security Handbook, Sixth Edition. Edited by Seymour Bosworth, M.E. Kabay & Eric Whyne. Wiley Publishing.
2. Computer Security: Principles & Practice, Fourth Edition by William Stallings & Lawrie Brown. Pearson Publish

Syllabus for Semester V, B. TECH CSE (Cyber Security)

Course Code: 24CS08TH0504 Course: Basics of Ethical Hacking

L: 3 Hrs, T: 0 Hr, P: 0 Hr, Per Week Total Credits: 03

Course pre-requisite

- Basic concepts in networking and programming

Course Objectives

1. Learn about the hacker mindset and the history of hackers
2. Understand basic networking and security technologies
3. Gain a basic understanding of security policy
4. Explore various vulnerability analysis techniques.

Syllabus:

Unit-1: Introduction and Ethics: Ethical Hacking, Types of Hackers, Phases of Ethical Hacking, Fundamentals of computer networking. TCP/IP protocol stack, IP addressing and routing, Common Network Threats/Attacks

Unit-2: Cryptography: Introduction to cryptography, private-key encryption, public-key encryption, Key exchange protocols, cryptographic hash functions, applications, Digital signatures, Attacks on cryptosystems

Unit-3: Vulnerability Analysis & System Hacking: Vulnerability Analysis, Types of Vulnerability Analysis, Vulnerability Assessment Tools, System Hacking, Password Cracking, Penetration testing, Hiding Files, Clearing logs

Unit-4: DoS and Session Hijacking: DoS attack, DDoS attack, Common symptoms of DoS/DDoS attack Categories of DoS/DDoS Attack Vectors, session hijacking, Application and Network level session hijacking

Unit-5: Sniffing: Malware and its propagation ways, Malware components, Types of malware, Concept of sniffing, Types of sniffing, Types of sniffing attacks. IDS & Firewall: Intrusion Detection System (IDS), Types of Intrusion Detection Systems, Introduction to Firewalls, Types of Firewalls, Introduction to Honeypots, Case studies: various attacks scenarios and their remedies.

Course Outcome:

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

1. Develop the core foundations of ethics and cryptography in regards to computer security
2. Analyzing the vulnerability with respect to hacking, DDOS attack and session hijacking
3. Classify various types of malware and sniffing attacks on network
4. Analyzing various attacks scenario and remedies and detecting the attack with IDS.

Text Books:

1. The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy, 2nd Edition, Patrick Engebreston, ISBN: 0124116442

Reference Books:

1. Penetration Testing: A Hands-On Introduction to Hacking, Georgia Weidman, ISBN: 1593275641
2. ETHICAL HACKING: A Comprehensive Beginner's Guide to Learn and Master Ethical Hacking, Hein Smith, Hilary Morrison

Syllabus for Semester - V, B.TECH. CSE (Cyber Security)

Course Code:	**24CS08PR0505**	**Course Name:**	**Idea Lab**
L: 0 Hrs	**T: 0 Hrs P: 4 Hrs**	**Per Week**	**Total Credits: 2**

Course Objective:

1. The course aims to provide participants with a comprehensive understanding of design thinking principles, prototyping fundamentals, entrepreneurship essentials, and business development strategies.
2. Through a combination of theoretical learning and hands-on exercises, participants will gain the knowledge and skills necessary to identify market needs, develop innovative solutions, and successfully launch entrepreneurial ventures.

Syllabus:

Module 1: Introduction to Design Thinking and Ideation, Understanding the design thinking process, Empathy and user-centered design, Ideation techniques: brainstorming, mind mapping, etc., Identifying market needs and opportunities.

Module 2: Prototyping Fundamentals, Introduction to rapid prototyping tools and techniques, Hands-on exercises in prototyping using low-fidelity materials, Iterative design process: testing and refining prototypes

Module 3: Entrepreneurship Essentials, Introduction to entrepreneurship and lean startup methodology, developing a value proposition and business model canvas, Identifying target customers and validating market demand

Module 4: Business Development and Pitching, crafting persuasive pitches and presentations, Financial modeling and revenue projections, Pitching prototypes and business concepts to a panel of experts

Module 5: Project Implementation and Showcase, implementing prototypes and gathering user feedback, Iterating based on feedback and improving prototypes, Final showcase event: presenting prototypes and business ventures to peers, faculty, and industry, professionals.

Course Outcome:

After Completing this course students will be able to:

1. Gain a deep understanding of the design thinking process, generating creative ideas through ideation techniques, and translating ideas into actionable prototypes.
2. Acquire proficiency in rapid prototyping tools and techniques, enabling them to efficiently create and iterate low-fidelity prototypes.
3. Develop skills in testing and refining prototypes through an iterative design process.
4. Implement prototypes, gather user feedback, and iterate based on insights gained.

Syllabus for Semester V, B. TECH CSE (Cyber Security)

Course Code: 24CS08TH0506-1 Course: Incident Handling & Response

L: 3 Hrs, T: 0 Hr, P: 0 Hr Per Week Total Credits: 3

Course Objectives:

1. To critically analyze and assess the impact of security incidents & response initiation
2. To recognize the importance of forensics and to follow well-defined processes and procedures
3. To understand & interpret the various stages in the lifecycle of forensic activities
4. To examine the technical, communication, and coordination aspects involved in providing an incident response

Syllabus

Unit 1: Preparing for the Inevitable Incident

Real-World Incidents, IR Management Essentials, Pre-Incident Preparation, Incident Handling vs Incident Response, Security Incident vs Security Event & Breach, First Responder

Unit 2: Incident Response Initiation

Stages of Incident Response, Security Incident Response Team Members, Incident Evidence, Incident Response Tools, Incident Investigation, Initial Lead Development, Incident Scope Discovery

Unit 3: Role of Forensics

The Forensic Process, Forensics Team Member Requirements, Forensics Team Policies and Procedures, Management of Forensics Evidence Handling, Forensics Tools, Legalities of Forensics, Forensics Team oversight

Unit 4: Incident Containment, Data Collection & Analysis

Live Data Collection, Forensic Duplication, Network Evidence Collection, EnterpriseServices, Data Analysis Methodology, Investigating Windows, Linux and MAC Operating Systems, Investigating Applications, Malware Triage

Unit 5: Incident Eradication & Post-Incident Activities

Incident Analysis Report Writing, Remediation Team Forming, Remediation Plan Design, Remediation Implementation, Designing Strategic Recommendations, Employee Awareness & Training, Effective Stakeholder Communication

Incident Response Governance

Incident Response Policies and Procedures, Legal Requirements and Considerations, Governmental Laws, Policies and Procedures, General Team Management, Corporate IT- Related Security Relationship with SIR&FT, Relationship Management.

Course Outcomes:

After the successful completion of the course, students shall be able to –

1. Differentiate between cyber incidents and respond appropriately to them.
2. Use various digital forensic strategies and techniques to handle incidents and analyse them.
3. Conduct successful incident management activities in compliance with required standards.

Text Books:

1. Incident Response & Computer Forensics, Third Edition by Jason T. Luttgens, Matthew Pepe & Kevin Mandia, Mc Graw Hill Education.
2. Computer Incident Response and Forensics Team Management: Conducting a Successful incident Response by Leighton R. Johnson III. Syngress Publishing

Syllabus for Semester V, Track 8 B. Tech. CSE (Cyber Security)

Course Code: 24CS08TH0506-2 Course: Information Retrieval

L: 3Hrs, P: 0Hrs, Per Week Total Credits: 3

Syllabus

UNIT - I: Boolean retrieval, term vocabulary and postings lists, dictionaries and tolerant retrieval, index construction, index compression.

UNIT – II: Scoring, term weighting and the vector space model computing scores in a complete search system.

UNIT – III: Evaluation in information retrieval, relevance feedback and query expansion.

UNIT - IV: Probabilistic information retrieval, language models for information retrieval.

UNIT – V: Text classification and Naive Bayes, Vector space classification, Support vector machines and machine learning on documents. Web search basics, Web crawling and indexes, Link analysis.

Course Outcomes

On successful completion of the course, students will be able to:

1. Analyse various requirements in designing an information retrieval system.
2. Apply methods of metadata organization for effective information access.
3. Implement Machine learning and numerical methods in information retrieval.
4. Evaluate information retrieval Systems
5. Design web search system.

Text and Reference Books

1. An Introduction to Information Retrieval: Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze, Cambridge University Press.
2. Foundation of Statistical Natural Language Processing, Christopher D. Manning, Hinrich Schütze, The MIT Press.
3. Information Retrieval: Implementing and Evaluating Search Engines, Stefan Buttcher, Charles L. A. Clarke, Gordon V. Cormack, MIT Press.

Syllabus for Semester V, Track 8 B. Tech. CSE (Cyber Security)

Course Code: 24CS08TH0506-3 Course: Image Analytics

L: 3Hrs, P: 0Hrs, Per Week Total Credits: 3

Course Objectives:

1. To learn the core mathematical and computational principles of digital image processing and enhancement.
2. To understand various feature extraction techniques and descriptors used in pattern recognition and object detection.
3. To explore the application of machine learning and deep learning (CNNs) for large-scale image data analysis.
4. To impart knowledge on image forensic techniques for detecting digital tampering, deepfakes, and ensuring data integrity.

Syllabus:

- **Unit I: Digital Image Fundamentals:** Image sampling, quantization, basic relationships between pixels, Color models (RGB, HSV, CMYK).
- **Unit II: Image Enhancement & Filtering:** Histogram equalization, Spatial filtering (Smoothing/Sharpening), Frequency domain filtering (DFT).
- **Unit III: Image Segmentation:** Edge detection, Thresholding, Region-based segmentation, Watershed transform.
- **Unit IV: Feature Extraction:** Shape descriptors, Texture analysis, Principal Component Analysis (PCA) for images, SIFT and SURF.
- **Unit V: Deep Learning for Image Analytics:** Convolutional Neural Networks (CNNs), Object detection (YOLO, R-CNN), Image Forensics: detecting manipulated images/deepfakes.

Course Outcomes (COs):

- **CO1:** Explain the core principles of digital image formation, sampling, and color model representations.
- **CO2:** Apply spatial and frequency domain filtering techniques to perform image enhancement and noise reduction.
- **CO3:** Compare different image segmentation and feature extraction methods for automated pattern recognition.
- **CO4:** Assess the authenticity of digital images using forensic analytics to detect tampering or deepfake manipulations.

Textbooks:

1. Rafael C. Gonzalez and Richard E. Woods, *"Digital Image Processing"*, Pearson Education.
2. Anil K. Jain, *"Fundamentals of Digital Image Processing"*, Pearson.

Reference Books:

1. Richard Szeliski, *"Computer Vision: Algorithms and Applications"*, Springer.
2. William K. Pratt, *"Digital Image Processing: PIKS Scientific Inside"*, Wiley.

Syllabus for Semester V, Track 8 B. Tech. CSE (Cyber Security)

Course Code: 24CS08TH0506-4 **Course: Enterprise web application**

L: 3Hrs, P: 0Hrs, Per Week **Total Credits: 3**

Course Objectives:

1. To understand the design and architectural patterns of enterprise-level web applications, including microservices and multi-tier systems.
2. To gain proficiency in full-stack development using modern server-side frameworks and database technologies.
3. To learn the implementation of industrial security standards such as OAuth2, JWT, and Role-Based Access Control (RBAC).
4. To familiarize students with the DevOps lifecycle, containerization (Docker/K8s), and cloud-native deployment strategies for enterprise software.

Syllabus:

- **Unit I: Enterprise Architecture:** Evolution of web apps, Multi-tier architecture, MVC (Model-View-Controller) pattern, Microservices vs Monoliths.
- **Unit II: Server-Side Development:** Working with Frameworks (Spring Boot/Django/Node.js), RESTful API design, Middleware and Interceptors.
- **Unit III: Data Management & Persistence:** ORM (Object-Relational Mapping), NoSQL databases, Caching strategies (Redis), Transaction management.
- **Unit IV: Enterprise Security:** OAuth2, JWT (JSON Web Tokens), Single Sign-On (SSO), CSRF/XSS protection, Role-Based Access Control (RBAC).
- **Unit V: Deployment & Scalability:** Containerization (Docker, Kubernetes), CI/CD pipelines for enterprise apps, Cloud-native deployment (AWS/Azure).

Course Outcomes (COs):

- **CO1:** Contrast various enterprise architectures, including multi-tier, monolithic, and microservices models.
- **CO2:** Build scalable server-side logic and business components using modern frameworks
- **CO3:** Examine web vulnerabilities and implement enterprise security standards like OAuth2, JWT, and RBAC.
- **CO4:** Design a complete CI/CD pipeline for the automated deployment of containerized enterprise applications on cloud platforms.

Textbooks:

1. Ian Sommerville, *"Software Engineering"*, Pearson (Focus on Enterprise Systems sections).
2. Antonio Goncalves, *"Beginning Java EE 7 (Expert Voice in Java)"*, Apress.

Reference Books:

1. Sam Newman, *"Building Microservices: Designing Fine-Grained Systems"*, O'Reilly Media.
2. OWASP, *"Web Security Testing Guide"*, (Available as an open-source community resource).

Syllabus for Semester VI, B. TECH CSE (Cyber Security)

Course Code: 24CS08TH0601 **Course: Introduction to Cloud Security**

L: 3 Hrs **T: 0 Hr** **P: 0 Hr** **Per Week** **Total Credits:03**

Pre-requisites: Operating Systems, Computer Security

Course Objectives

The objective of this course is to impart necessary and practical knowledge of components of Cloud computing and develop skills required to design real-life cloud-based projects by:

1. Learning basics of cloud and challenges in its implementation.
2. Understanding the cloud environment and its security issues.
3. Understanding the various ways to secure cloud programming environments.

Syllabus

UNIT I: Introduction. Evolution of Cloud Computing, Cloud Fundamentals: Cloud Definition, Evolution, Architecture, Cloud Characteristics – Elasticity in Cloud – On-demand Provisioning, Applications, deployment models - Public, Private and Hybrid Clouds, and service models - Infrastructure as a Service (IaaS) - Resource Virtualization: Server, Storage, Network. Platform as a Service (PaaS) - Cloud platform & Management: Computation, Storage. Software as a Service (SaaS) - Anything as a service (XaaS), Security as a service. Vulnerability Issues and Security Threats, Security Challenges.

UNIT II: Virtualization. Definition, Understanding and Benefits of Virtualization. Implementation Level of Virtualization, Virtualization Structure/Tools and Mechanisms, Issues with virtualization, virtualization technologies and architectures, introduction to Various Hypervisors, virtualization of data centers, and Virtual Machine level Security, Virtualization security Issues.

UNIT III: Resource Management and Load Balancing. Distributed Management of Virtual Infrastructures, Resource management, Load Balancing. Interoperability, Migration and Fault Tolerance: Issues with interoperability, Cloud Migration, Migration of virtual Machines and techniques. Fault Tolerance Mechanisms. Risk Assessment on Cloud Migration.

UNIT IV: Cloud Data Security and Storage. Cloud storage: Introduction to Storage Systems, Cloud Storage Concepts, Data in the cloud- Cloud file systems. Data level Security, Data

Protection (rest, at transit, in use), Data Information lifecycle, Cloud Data Audit, Multi-tenancy Issues.

UNIT V: Identity and Access Management. Introduction to Identity and Access Management, IAM Challenges, IAM Architecture, IAM Standards and Protocols for Cloud Services, Cloud Authorization Management. **Cloud Infrastructure Security.** The Network Level, Host Level, Application Level. Cloud Configuration & Patch Management, Cloud Change management. SLA Requirements, Cloud Compliance, Policy, Governance. Cloud Intrusion Detection, Cloud Forensics Challenges, Cloud Incident Response.

Course Outcomes

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

1. Articulate the concepts of cloud computing, its various deployment and service models and vulnerabilities.
2. Develop solutions based on the concept of virtualization, resource management and migration.
3. Design measures for cloud data security and identity management.
4. Provide recommendations for Cloud Infrastructure Security based on cloud compliance and policies.

Text Books:

1. Kai Hwang, Geoffrey C. Fox and Jack J. Dongarra, "Distributed and cloud computing from Parallel Processing to the Internet of Things", Morgan Kaufmann, Elsevier – 2012
2. Tim Mather, Subra Kumaraswamy, and Shahed Latif, "Cloud Security and Privacy An Enterprise Perspective on Risks and Compliance", O'Reilly 2009

Reference Books:

1. Barrie Sosinsky, " Cloud Computing Bible" John Wiley & Sons, 2010
2. "Cloud Security: A Comprehensive Guide to Secure Cloud Computing", Ronald L. Krutz,Russell Dean Vines, Wiley Publishers.
3. "Cloud Computing Principles and Paradigms", Rajkumar Buyya,James Broberg, Andrzej Gościński, Wiley Publishers,2011.

Syllabus for Semester VI, B. TECH CSE (Cyber Security)

Course Code: 24CS08PR0601 Course: Introduction to Cloud Security Lab

L: 0 Hrs T: 0 Hr P: 2 Hr Per Week Total Credits: 1

Course Objectives

The objective of this course is to impart necessary and practical knowledge of components of Cloud computing and develop skills required to build real-life cloud- based projects by:

1. Studying various cloud environments and challenges in its implementation.
2. Implementing various cloud programming concepts to secure the cloud.
3. Designing and developing processes involved in creation of a secure cloud-based application.

Syllabus

Practical based on 24CS08TH0601syllabus.

Course Outcomes

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

1. Configure various virtualization tools.
2. Design and deploy measures for cloud data security and identity management.
3. Install and use a generic cloud environment for Cloud Infrastructure Security.

Syllabus for Semester VI, B. TECH CSE (Cyber Security)

Course Code: 24CS08TH0602 Course: IoT Security

L: 3Hrs T: 0 Hr P: 0Hr Per Week Total Credits: 3

Course Objectives:

1. Ability to understand the Security requirements in IoT
2. Examine in detail IoT device vulnerabilities
3. Understand how these vulnerabilities should be addressed and mitigated
4. Understand the IoT authentication and Cloud Security.

Syllabus

Unit I: Introduction of IoT: Definition, Characteristics, Physical design, Logical design, Functional blocks, Components in internet of things, Sensors and Actuators, M2M and IoT Technology, Fundamentals Devices and gateways.

Unit II: Requirement of IoT Security: Security Requirements in IoT Architecture - Security in Enabling Technologies -Security Concerns in IoT Applications. Security Architecture in the Internet of Things, Security Requirements in IoT - Insufficient Authentication/Authorization – Insecure, Access Control - Threats to Access Control, Privacy, and Availability - Attacks Specific to IoT.

Unit III- IoT Vulnerabilities: Threats to Access Control, Privacy, and Availability - Attacks Specific to IoT. Vulnerabilities – Secrecy and Secret-Key Capacity-Authentication/Authorization for Smart Devices - Transport Encryption – Attack & Fault trees

Unit IV: Role of Cryptography in IoT Security: Cryptographic primitives and its role in IoT – Encryption and Decryption – Hashes – Digital Signatures – Random number generation – Cipher suites – key management fundamentals – cryptographic controls built into IoT messaging and communication protocols – IoT Node Authentication

Unit V: Attacks and Remedies: Basic attacks, User anonymity, Perfect forward secrecy, reply attack, offline password guessing attack, user impersonation attack, Man in middle attack, Smart card loss and stolen attack, Server spoofing attack, Denial of Service attack and Distributed DoS

IoT Authentication and Cloud Security: Authentication layered architecture- Physical layer authentication, Network layer authentication, data processing layer authentication, application layer authentication, IoT node authentication-introduction, architecture, Phases-System setup phase by gateway node, sensors and user registrations, key exchange phase, login phase and authentication, password update phase, device adding phase, Cloud services and IoT – offerings related to IoT from cloud service providers – Cloud IoT security controls – An enterprise IoT cloud security architecture – New directions in cloud enabled IoT computing

Course Outcomes

After the successful completion of the course, students shall be able to

1. Secure a connected IoT product from scratch.
2. Identify the main threats and attacks on IoT products and services.
3. Build and deploy secure IoT solutions
4. Examine End-to-End IoT Security in detail.

Textbooks

1. Practical Internet of Things Security (Kindle Edition) by Brian Russell, Drew Van Duren
2. Securing the Internet of Things Elsevier
3. Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations
4. Internet of Things Security- Challenges, Advances, and Analytics, Patel Chintan and Nishant Doshi, CRC Press, Taylor and Francis Group
5. IoT Security Issues, Alasdair Gilchrist, DEG Press.

Syllabus for Semester VI, B. TECH CSE (Cyber Security)

Course Code: 24CS08PR0602 **Course: Network Defender Lab**

L: 0Hrs T: 0Hr P: 2Hr Per Week **Total Credits: 1**

Course Objectives:

1. To provide hands-on experience in the configuration and management of defensive network infrastructure like firewalls, IDS, and IPS.
2. To develop skills in network traffic analysis and anomaly detection using industry-standard tools.
3. To enable students to implement proactive defense mechanisms, such as honeypots and secure VPN tunnels.
4. To practice network hardening techniques and vulnerability assessment on diverse network topologies.

List of Practicals:

1. Implementation of Packet Filtering using IP Tables/Windows Firewall.
2. Configuring and Tuning Snort as an Intrusion Detection System (IDS).
3. Network Traffic Analysis using Wireshark for detecting ARP Spoofing.
4. Setting up a Deceptive environment using Honeypots (e.g., Cowrie).
5. Configuring a Site-to-Site VPN using OpenVPN or IPsec.
6. Implementing Network Access Control (NAC) and 802.1X authentication.
7. Vulnerability scanning of network infrastructure using Nessus/OpenVAS.

Course Outcomes:

- Configure and manage firewalls and IDS/IPS systems.
- Perform network traffic analysis to detect anomalies.
- Implement secure VPN tunnels and network hardening.

Textbooks:

1. Sagar Rahalkar, *"Network Defender's Toolkit"*, Apress.
2. EC-Council, *"Certified Network Defender (CND) Study Guide"*, Cengage Learning.

Reference Books:

1. Chris Sanders, *"Practical Packet Analysis: Using Wireshark to Solve Real-World Network Problems"*, No Starch Press.
2. Richard Bejtlich, *"The Practice of Network Security Monitoring"*, No Starch Press.

Syllabus for Semester VI, B. TECH CSE (Cyber Security)

Course Code: 24CS08TH0603-1 Course: Application Security

L: 3 Hrs T: 0 Hr, P: 0 Hr Per Week Total Credits: 3

Course Objectives

1. To describe web-based applications and associated threats
2. To understand the security architecture in web-based applications
3. To evaluate vulnerabilities in web application security
4. To comprehend Android application security framework
5. To comprehend iOS application security framework

Syllabus

Unit 1: Introduction to Application Security

The History of Software Security, Introduction to Types of Modern-day Applications, Application Architectures-Web Apps, Android Apps, iOS Apps, Thick-Client Apps, Application Testing Methodologies, Application Security Testing Lab Setup

Unit 2: Web Application Security - I

Web App Reconnaissance, API Analysis, Third-Party Dependencies, Architecture Weak Points, OWASP Top 10 & SANS 25, Hacking Web Applications

Unit 3: Web Application Security – II

Securing Modern Web Applications, Secure Application Architecture, reviewing code for Security, Vulnerability Management, Defending Against Attacks, Securing Third- Party Dependencies

Unit 4: Android Application Security

Current State of Android Application Security, Android App Permissions, Basic Android Testing, OWASP Mobile Top 10, Hacking Android Applications. Application Security Essentials, Permissions & Policy File, Crypto APIs, Securing Application Data, Securing Server Interactions, Future of Android App Security

Unit 5: iOS Application Security

iOS Security Model, Debugging with LLDB, Networking & Interprocess Communication, Data Leakage & Injection Attacks, Encryption and Authentication, Mobile Privacy concerns.

Course Outcomes:

After the successful completion of the course, students shall be able to –

1. Discern the cyber-attack methods on applications and correlate them with application- specific technologies.

2. Perform ethical hacking procedures on applications to assess their cyber-risk level.
3. Use modern-day techniques to secure applications against cyber-attacks.

Text Books:

1. Web Application Security: Exploitation and Countermeasures for Modern Web Applications by Andrew Hoffman. O'Reilly Publishing.
2. OWASP Web Security Testing Guide v4.2 by OWASP Foundation
3. OWASP Mobile Security Testing Guide v1.4 by OWASP Foundation
4. Android Application Security Essentials by Pragati Ogal Rai. Packt Publishing.
5. iOS Application Security: The Definitive Guide for Hackers and Developers by David Thiel. No Starch Press.

Syllabus for Semester VI, B. TECH CSE (Cyber Security)

Course Code: 24CS08TH0603-2 Course: Business and Web Analytics

L: 3 Hrs, T: 0 Hr, P: 0 Hr, Per Week Total Credits: 03

Course Objectives

1. To familiarize students with the concepts of business and web analytics.
2. To enable students to deploy business and web intelligence to improve the outcomes of marketing or business plan.
3. Students will gain an understanding of the strategic and operational aspects of business and web analytics tools and technologies.

SYLLABUS

UNIT – I: Predictive Analytics: Trendlines and Regression analysis, Forecasting Techniques.

UNIT – II: Simulation and Risk Analysis: Monte Carlo simulation, Random Sampling from probability distributions, dynamic system simulation, spreadsheet modeling and analysis.

UNIT – III: Prescriptive Analytics: Linear Optimization, Interger and nonlinear optimization, optimization analytics.

UNIT – IV: Web Analytic fundamentals: Capturing data: Web logs or JavaScript's tags, Separate data serving and data capture, Type and size of data, Innovation, Integration, Selecting optimal web analytic tool, Understanding click stream data quality, Identifying unique page definition, Using cookies, Link coding issues.

UNIT – V: Web Metrics: Common metrics: Hits, Page views, Visits, Unique visitors, Unique page views, Bounce, Bounce rate, Page/visit, Average time on site, New visits; Optimization (e-commerce, non e-commerce sites): Improving bounce rates, Optimizing adwords campaigns; Real time report, Audience report, Traffic source report, Custom campaigns, Content report, Google analytics, Introduction to KPI, characteristics, Need for KPI, Perspective of KPI, Uses of KPI. Relevant Technologies: Internet & TCP/IP, Client / Server Computing, HTTP (Hypertext Transfer Protocol), Server Log Files & Cookies, Web Bugs.

Web Analytics 2.0: Web analytics 1.0, Limitations of web analytics 1.0, Introduction to analytic 2.0, Competitive intelligence analysis : CI data sources, Toolbar data, Panel data ,ISP data, Search engine data, Hybrid data, Website traffic analysis: Comparing long term traffic trends, Analyzing competitive site overlap and opportunities.

Google Analytics: Brief introduction and working, Adwords, Benchmarking, Categories of traffic: Organic traffic, Paid traffic; Google website optimizer, Implementation technology, Limitations, Performance concerns, Privacy issues.

Course Outcomes:

On completion of the course the student will be able to

1. Apply predictive analytic techniques on real time data.
2. Perform simulation and risk analysis.
3. Explain and discuss web metrics.
4. Examine how different industries across the globe are using web analytics analytics.

Text Books:

1. James R. Evans, Business Analytics Methods, Models and Decisions, Pearson.
2. Clifton B., Advanced Web Metrics with Google Analytics, Wiley Publishing, Inc.2nd ed.
3. Kaushik A., Web Analytics 2.0, The Art of Online Accountability and Science of Customer Centricity, Wiley Publishing, Inc. 1st ed.
4. Sterne J., Web Metrics: Proven methods for measuring web site success, John Wiley and Sons

References:

1. Mathew Ganis, Avinash Koihrkar-Social Media Analytics-IBM Press
2. Jim Sterne, Social Media Metrics, Wiley

Syllabus for Semester VI, B. TECH CSE (Cyber Security)

Course Code: 24CS08TH0603-3 Course: Computer Vision

L: 3Hrs, P: 0Hrs, Per Week Total Credits: 3

Course Objectives

1. To Learn the core principles of computer vision, image formation, transformations, camera geometry, including stereo vision and depth estimation.
2. To gain proficiency in image alignment techniques, feature detection and feature matching for object recognition and tracking.
3. To explore motion analysis, optical flow methods, and object tracking using algorithms such as Lucas-Kanade, Kalman filter, and background subtraction.
4. To utilize classification and clustering techniques for pattern analysis, along with dimensionality reduction methods.

Unit I: Introduction to Computer Vision & Image Formation: Introduction to computer vision, Digital Image Formation and Camera Geometry: Fundamentals of Image Formation, Transformations in 2D: translation, rotation, scaling, shearing; affine and rigid transformations, Transformations in 3D: translation, rotation about X,Y,Z axis, rotation about arbitrary axis, 3D affine, homogeneous coordinates in 2D and 3D, Concept of pinhole camera, camera calibration, Homography, Stereo Geometry, Binocular Stereopsis: Camera and Epipolar Geometry, Depth estimation.

Unit II: Image Alignment & Feature Detection: Image Alignment: Physically and digitally corresponding points, Feature detection and description: Line detectors (Hough Transform), Corners - Harris and Hessian Affine, SIFT, SURF, HOG, Feature matching and model fitting, RANSAC, Control point based image alignment using least squares - derivation for pseudo-inverse, Applications of image alignment.

Unit III: Motion Analysis & Object Tracking: Motion and Optical Flow: Motion Analysis: Background Subtraction and Modeling, Horn and Shunck method, Lucas-Kanade algorithm, Feature Point Tracking, moving object detection and tracking; Kalman filter

Unit IV: Object Detection & Recognition: Adaboost algorithm: binary classification, face detection, Adaboost for Computation of Haar-like features; Image Segmentation; Object

recognition and shape representation, Viola Jones algorithm for face detection and Boosting: Features, Integral images, Boosting, cascade; Activity Recognition in videos.

Unit V: Pattern Analysis & Dimensionality Reduction: Pattern Analysis: Clustering: K-Means, K-Medoids, Classification: Supervised, Un-supervised, Semi-supervised; Classifiers: KNN, ANN models. Dimensionality Reduction: PCA, LDA; Non-parametric methods; deep neural architectures and applications.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Use the fundamental concepts of computer vision to solve different problems.
2. Apply feature detection, image alignment, motion analysis, and object tracking techniques to solve real-world problems.
3. Analyze the different object detection and recognition techniques to determine their effectiveness in different real-world scenarios.
4. Apply machine learning based techniques to perform pattern analysis and dimensionality reduction.

Text Books

1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer, 2nd edition, 2022.
2. R. C. Gonzalez, R. E. Woods, Digital Image Processing, Pearson Education; Fourth edition, 2018.
3. D. Forsyth and J. Ponce, Computer Vision: A modern approach, Pearson Education India, 2nd ed., 2015.
4. E. Trucco and A. Verri, Introductory Techniques for 3D Computer Vision, Pearson, 1998.

Reference Books

1. Simon J. D. Prince, Computer Vision: Models, Learning, and Inference, Cambridge University Press, 2012.
2. D. H. Ballard, C. M. Brown. Computer Vision. Prentice-Hall, 1982.
3. E. R. Davies, Computer & Machine Vision: Theory, Algorithms, Practicalities, Academic Press, Fourth Edition, 2012.

Syllabus for Semester VI, B. TECH CSE (Cyber Security)

Course Code: 24CS08TH0603-4 **Course: Mobile Application on Development**

L: 3Hrs, P: 0Hrs, Per Week **Total Credits: 3**

Course Outcomes

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

1. Understand the different aspects of Mobile app development
2. Design mobile apps using Android as development platform
3. Apply the concepts of hardware, software co-design in building mobile applications
4. Perform testing signing, packaging and distribution of mobile apps

Syllabus:

Unit I

Getting started with Mobility: Mobility landscape, Mobile platforms, Mobile apps development, Overview of Android platform, setting up the mobile app development environment along with an emulator, acase study on Mobile app development.

Unit II

Building blocks of mobiles apps: App user interface designing –mobile UI resources (Layout, UI elements, Draw-able, Menu), Activity-state and life cycle, interaction amongst activities. App functionality beyond user interface – Threads, Async task, Services – States and life cycle, Notification, Broadcast receivers, Telephony and SMS APIs.

Unit III

Native data handling: On device file I/O, shared preferences, Mobile databases such as SQLite, and enterprise data access (via Internet /Internet)

Unit IV

Sprucing up mobile apps: Graphics and animation – custom views, canvas, animation APIs, multimedia – audio/video playback and record, location awareness and native hardware access (sensors such as accelerometer and gyroscope)

Unit V

Testing of Mobile App: Different levels of testing, different types of testing, Static Testing types, Dynamic Testing types, Debugging mobile apps , Test automation of mobile apps, JUnit for Android, Publishing Mobile Apps: Robotium, Monkey Talk ,Taking apps to market, Versioning, signing and packaging mobile apps, distributing apps on mobile market place, Localization, Prework for publishing app

Text Books

1. Mobile Apps Development: Anubhav Pradhan, Anil V. Deshpande, 1st Edition, Wiley India
2. Android Application Development all in one for Dummies - Barry Burd, 1st Edition, John Wiley & Sons.
3. Foundations of Software Testing: Dorothy Graham, Erik van Veenendaal, Isabel Evans, Rex Black, 2nd Revised Edition, Cengage Learning

Reference Books

1. Teach Yourself Android Application Development 24 Hours- Lauren Darcy, 1st Edition, Pearson.

Syllabus for Semester VI, B. TECH CSE (Cyber Security)

Course Code: 24CS08TH0604-1 Course: Auditing IT Infrastructure for Compliance

L: 3 Hrs, T: 0 Hr, P: 0 Hr, Per Week Total Credits: 03

Course Objectives

1. Learn about the importance of information security auditing and different auditing standards.
2. Understand audit scoping and perform standard-specific security audits in different types of organizations.
3. Explore higher level security governance concepts like CMMI, Quality Assurance etc.

Syllabus

Unit I: Introduction to COBIT, Using COBIT to Assess Internal Controls, COBIT Assurance Framework Guidance, ISACA IT Auditing Standards Overview, Risk Management Fundamentals, Quantitative Risk Analysis Techniques, IT Audit Risk and COSO ERM, Performing Effective IT Audits

Unit II: General Controls in Today's IT Environments, ITIL Service Management Best Practices, Systems Software and IT Operations General Controls, Evolving Control Issues: Wireless Networks, Cloud Computing, and Virtualization

Unit III: IT Application Control Elements, Selecting Applications for IT Audit Reviews, Auditing Applications under Development, Application Review Case Study: Client-Server Budgeting System, Importance of Reviewing IT Application Controls, Micro Project - IT Application Auditing

Unit IV: Software Engineering Concepts, CMMI: Capability Maturity Model for Integration, IT Audit, Internal Control, and CMMI, IT Auditing in SOA Environments, Computer-Assisted Audit Tools and Techniques (CAATTs)

Unit V: IT Controls and the Audit Committee, Role of the Audit Committee for IT Auditors, Audit Committee Review and Action on Significant IT Audit Findings, Compliance with IT-Related Laws and Regulations, Understanding and Reviewing Compliance with ISO Standards, Controls to Establish an Effective IT Security Environment.

Auditing Telecommunications and IT Communications Networks, Building an Effective IT Internal Audit Function, Quality Assurance Auditing and ASQ Standards, Live Project - IT Security Auditing

Course Outcomes:

On successful completion of the course, students will be able to:

1. Understand and identify different information security audit standards and frameworks.
2. Differentiate between the compliance requirements of different audit frameworks.
3. Carry out standard IT auditing procedures in organizations.
4. Perform analysis on audit findings and calculate cyber risk.
5. Generate quality audit reports and effectively communicate them to organizations.

Textbooks

1. IT Audit, Control, and Security by Robert R. Moeller. Wiley Publishing.

Reference Books

1. Auditing Information and Cyber Security Governance – A Controls-Based Approachby Robert E. Davis|2021 Edition. CRC Press.

Syllabus for Semester VI, B. Tech. CSE (Cyber Security)

Course Code: 24CS08TH0604-2 **Course: Time Series Analysis**

L: 3Hrs, P: 0Hrs, Per Week **Total Credits: 3**

Course Objectives

1. To understand Time Series Analysis.
2. To introduce the tools and Models for basic concepts of Time Series Analysis.
3. To apply the Time Series Model Selection research models to solve problems.

Unit I

TIME SERIES DATA: EXAMPLES AND BASIC CONCEPTS: Introduction, Examples of Time Series Data, Understanding Autocorrelation, The Wold Decomposition, The Impulse Response Function, Superposition Principle ,Parsimonious Model.

Unit II

VISUALIZING TIME SERIES DATA STRUCTURES: GRAPHICAL TOOLS: Introduction, Graphical Analysis of Time Series, Graph Terminology, Graphical Perception, Principles of Graph Construction, Aspect Ratio, Time Series Plots, Bad Graphics.

Unit III

STATIONARY MODELS: Basics of Stationary Time Series Models, Autoregressive Moving Average (ARMA) Models, Stationarity and Invertibility of ARMA Models, Checking for Stationarity using Variogram, Transformation of Data.

Unit IV

NONSTATIONARY MODELS: Introduction, Detecting Nonstationarity , Autoregressive Integrated Moving Average (ARIMA) Models, Forecasting using ARIMA Models, Concentration Measurements from a Chemical Process, The EWMA Forecast.

SEASONAL MODELS: Seasonal Data, Seasonal ARIMA Models, Forecasting using Seasonal ARIMA Models.

Unit V

TIME SERIES MODEL SELECTION: Introduction, Finding the "BEST" Model, Internet Users Data, Model Selection Criteria, Impulse Response Function to Study the Differences in Models, Comparing Impulse Response Functions for Competing Models.

Course Outcomes:

On successful completion of the course, students will be able to:

1. The students should get acquainted with the main concepts of Time Series theory and methods of analysis.
2. Students should master traditional methods of Time Series analysis, intended mainly for working with time series data.
3. Understanding the underlying concepts in the time series and frequency domains
4. Demonstrate advanced understanding of the concepts of time series and their application.

Text Books

1. Murat Kulahci Technical University of DenmarkA JOHN WILEY & SONS, INC., PUBLICATION "TIME SERIES ANALYSIS AND FORECASTING BY EXAMPLE".

Reference Books

1. George E. P. Box, Gwilym M. Jenkins, Gregory C. Reinsel, Freta M. Ljung "Time Seies Analysis Forecasting and Control".

Syllabus for Semester VI, B. Tech. CSE (Cyber Security)

Course Code: 24CS08TH0604-3 **Course: Robotics and Automation**

L: 3Hrs, P: 0Hrs, Per Week **Total Credits: 3**

Course Objectives:

1. To introduce the fundamentals of robotic systems and their kinematics.
2. To understand sensors and actuators used in automation.
3. To explore security implications in autonomous and industrial robots.

Syllabus:

- **Unit I: Introduction to Robotics:** History, types of robots (Industrial, Service, Mobile), Laws of Robotics, Robot anatomy and Coordinate systems.
- **Unit II: Sensors and Actuators:** Internal and External sensors, Vision systems, DC Motors, Stepper motors, Hydraulic and Pneumatic systems.
- **Unit III: Robot Kinematics:** Direct and Inverse kinematics, Homogeneous transformations, Jacobian and Trajectory planning.
- **Unit IV: Robot Control & Programming:** Control loops, PID control, Introduction to Robot Operating System (ROS), Programming languages for automation.
- **Unit V: Security in Automation:** Threats to Industrial Control Systems (ICS), Robot hijacking, Sensor spoofing, Secure Human-Robot Collaboration.

Course Outcomes (COs):

- **CO1:** Understand the fundamental components, laws of robotics, and various classifications of automated systems.
- **CO2:** Compute direct and inverse kinematics for different robotic manipulator configurations using DH parameters.
- **CO3:** Analyze various sensor and actuator technologies based on specific industrial automation requirements.
- **CO4:** Learn secure control logic for a robotic system using the Robot Operating System (ROS) environment.

Textbooks:

1. S.K. Saha, *"Introduction to Robotics"*, McGraw Hill Education.
2. John J. Craig, *"Introduction to Robotics: Mechanics and Control"*, Pearson Education.

Reference Books:

1. Saeed B. Niku, *"Introduction to Robotics: Analysis, Control, Applications"*, Wiley India.
2. Morgan Quigley, Brian Gerkey, and William D. Smart, *"Programming Robots with ROS"*, O'Reilly Media.

Syllabus for Semester VI, B. Tech. CSE (Cyber Security)

Course Code: 24CS08TH0604-4 Course: Natural Language Processing

L: 3Hrs, P: 0Hrs, Per Week Total Credits: 3

Course Objectives

1. To familiarize the concepts and techniques of natural language processing.
2. To learn computational techniques that enable machines to process, understand, and generate human language efficiently.
3. To apply the statistical learning methods and cutting-edge research models to solve natural language processing problems.
4. To integrate natural language processing into real-world systems to develop, evaluate, and enhance applications.

UNIT I

Introduction to NLP, Definition and Scope, A Brief History, Importance, Challenges, Tasks, Significance, NLP Pipeline and Applications, Morphological Analysis and Generation using Finite State Automata, Finite State Transducer, Hidden Markov model, Viterbi Algorithm.

UNIT II

Lexical Analysis, Part-of-Speech (POS) Tagging, Approaches for POS Tagging, Rule-Based, Stochastic, Hybrid Approach, Taggers Evaluations, Applications of Tagging.

Syntax and Parsing, Types of Constituents in Sentences, Context-Free Grammar (CFG), CFG Parsing, Top-Down Parser, Bottom-Up Parser, Shallow Parsing and Chunking, Thematic Roles, Conditional Random Fields, Maximum Likelihood Estimation, Lexical and Probabilistic Parsing, Probabilistic Context Free Grammars, Inside-Outside Algorithm, CKY Parsing.

UNIT III

Semantic Analysis, Lexical Vs Compositional Semantic Analysis, Word Senses and Relations, Types of Lexical Semantics, Word Sense Disambiguation, WordNet and Online Thesauri, Word Similarity and Thesaurus Methods, Text Representation, Word Embedding, TF-IDF, Bag of Words, Word2Vec, Skip-Gram.

Pragmatic Analysis and Discourse, Discourse Phenomena, Coherence and Coreference, Importance of Coreference Relations, Discourse Segmentation, Algorithms for Coreference Resolution.

UNIT IV

N-Gram Language Model, Language Modeling and Chain Rule, Markov Chain in N-Gram Model, Shannon's Method in N-Gram Model, Smoothing Techniques, Extrinsic Evaluation Scheme, Zero Counts Problems, Smoothing Techniques, Laplace (Add-One) Smoothing, Add-k Smoothing, Backoff and Interpolation Smoothing, Good Turing Smoothing, The Transformer, Large Language Models, Language Model Evaluation, Entropy, Perplexity, ROUGE, BLEU.

UNIT V

Major NLP Applications, Information Retrieval Systems, Social Network Analysis, Sentiment Analysis, Information Extraction, Named Entity Recognition, Text Classification, Text Summarization Systems, Machine Translation, Word Alignment, Content Recommendation System, Answering Questions, Applications in Finance, E-Commerce, Travel and Hospitality, Marketing, Insurance, Healthcare, Law, Supply Chain, Telecommunication, Education and Research.

Course Outcomes

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

1. Understand core NLP concepts and techniques.
2. Apply various POS tagging approaches and parsing techniques to analyze sentence structure and utilize probabilistic models for syntactic analysis.
3. Analyze various semantic and pragmatic analysis techniques and discourse phenomena to enhance text representation and understanding.
4. Implement N-Gram language models and Transformer-based models for effective language modeling and text generation.
5. Design and develop innovative NLP solutions to address real-world challenges across industries like finance, healthcare, e-commerce, education and research.

Textbooks

1. Daniel Jurafsky and James H. Martin, Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition with Language Models, Third Edition, 2025, https://web.stanford.edu/~jurafsky/slp3.
2. Raymond ST. Lee, Natural Language Processing: A Textbook with Python Implementation, Springer Nature Singapore Pte Ltd. 2024, ISBN: 978-9819919987.
3. Sowmya Vajjala, Bodhisattwa Majumder, Anuj Gupta, and Harshit Surana, Practical Natural Language Processing: A Comprehensive Guide to Building Real-World NLP Systems, O'Reilly Media, Inc., USA, First edition, 2020, ISBN: 978-1492054054.
4. Dipanjan Sarkar, Text Analytics with Python: A Practitioner's Guide to Natural Language Processing, Second Edition, Apress Media, LLC, California, 2019, ISBN: 978-1484243534.

Reference Books

1. Natural Language Processing with Python: From Basics to Advanced Projects, Second Edition, 2024, Cuantum Technologies LLC. Plano, ISBN: 979-8894968483.
2. Jyotika Singh, Natural Language Processing in the Real World: Text Processing, Analytics, and Classification, First edition, 2023, CRC Press is an imprint of Taylor & Francis Group, LLC, ISBN: 978-1003264774.
3. Gerhard Paaß and Sven Giesselbach, Foundation Models for Natural Language Processing: Pre-trained Language Models Integrating Media, Artificial Intelligence: Foundations, Theory, and Algorithms, Springer Nature Switzerland Pte Ltd. 2022, ISBN: 978-3031231896.
4. Lewis Tunstall, Leandro von Werra, and Thomas Wolf, Natural Language Processing with Transformers: Building Language Applications with Hugging Face, O'Reilly Media, Inc., USA, Revised First edition, May 2022, ISBN: 978-1098136796.

Syllabus for Semester VI, B. Tech. CSE (Cyber Security)

Course Code: 24CS08TH0604-5 Course: DevOps

L: 3Hrs, P: 0Hrs, Per Week Total Credits: 3

Course Outcomes

At the end of the course students will be able to

1. Understand the principles and concepts of DevOps.
2. Implement automation and collaboration techniques in software development and IT operations.
3. Exhibit skills in using popular DevOps tools and technologies.
4. Explore best practices for developing and managing software applications.
5. Understand the cultural aspects and organizational implications of adopting DevOps practices.

Syllabus:

Unit 1: Introduction to DevOps

Definition and evolution of DevOps, Key principles and goals of DevOps

- Benefits and challenges of adopting DevOps practices
- Cultural and organizational aspects of DevOps adoption

Unit 2: Continuous Integration (CI)

- Introduction to continuous integration (CI) concepts
- Setting up CI pipelines with Jenkins or GitLab CI
- Automating builds, tests, and code quality checks
- Best practices for CI, including version control and automated testing

Unit 3: Continuous Deployment and Delivery (CD)

- Introduction to continuous deployment and delivery (CD)
- Implementing CD pipelines with tools like Jenkins, GitLab CI, or CircleCI
- Automating deployment processes and release management
- Implementing blue-green deployments and canary releases

Unit 4: Infrastructure as Code (IaC)

- Introduction to infrastructure as code (IaC) concepts
- Managing infrastructure with tools like Terraform or AWS CloudFormation
- Automating provisioning, configuration, and management of infrastructure
- Benefits of IaC for scalability, repeatability, and reliability

Unit 5: Configuration Management

- Introduction to configuration management concepts
- Managing configuration with tools like Ansible, Puppet, or Chef
- Automating configuration tasks, such as software installation and updates
- Ensuring consistency and compliance across infrastructure environments

Unit 6: Monitoring and Logging

- Importance of monitoring and logging in DevOps practices
- Implementing monitoring solutions with tools like Prometheus or Grafana
- Collecting and analyzing metrics to identify performance bottlenecks
- Implementing centralized logging and log aggregation for troubleshooting

Text Books:

1. Rojas, C. (2019). Building Progressive Web Applications with Vue. js: Reliable, Fast, and Engaging Apps with Vue. js. Apress.
2. Ater, T. (2017). Building progressive web apps: bringing the power of native to the browser. " O'Reilly Media, Inc.".

24CS08PR0605	Comprehensive Viva
24HS02TH0601	Business Communication
24HS02PR0601	Business Communication Lab
24CS08PR0606	Mini Project