MOOGAMBIGAI CHARITABLE AND EDUCATIONAL TRUST

Rajarajeswari College of Engineering

(An Autonomous Institution under Visvesvaraya Technological University, Belagavi)
#14, Ramohalli Cross, Kumbalagodu, Mysore Road, Bengaluru–560074

Computer Science & Engineering

[IoT, Cybersecurity including Blockchain Technology]

V & VI Semester Scheme and Syllabus

(2024 Scheme)

VISION

To empower young minds through technology, research and innovation, to produce technically competent and socially responsible professionals in higher education.

MISSION

1. To deliver excellence in education through innovative teaching, impactful research, and continuous skill development, preparing students to meet global challenges with technical expertise and ethical responsibility.
2. To foster a transformative learning environment that integrates technology, research and practical experience, empowering students to become skilled professionals and socially conscious leaders.
3. To cultivate a culture of lifelong learning and professional excellence by encouraging creativity, research, and community engagement, equipping students with the skills to thrive in a dynamic world.
4. To provide a holistic educational experience that combines advanced technology, hands-on research, and community-focused learning, shaping students into competent, ethical professionals who contribute positively to society.

QUALITY POLICY

Rajarajeswari College of Engineering is committed to imparting quality technical education that nurtures competent, ethical professionals with global relevance. We ensure academic excellence through a dynamic, outcome-based curriculum, experienced faculty, and cutting-edge infrastructure. Continuous improvement is driven by innovation, research and strong industry collaboration. We foster holistic development and a progressive environment that supports lifelong learning, teamwork, and professional growth.

CORE VALUES

Academic Excellence, Integrity, Innovation, Global Competence, Continuous Improvement.

Computer Science & Engineering
[IoT, Cybersecurity including Blockchain Technology]

DEPARTMENT VISION

To empower students with the knowledge, skills, and ethical values to become pioneer in the dynamic fields of Internet of Things (IoT), Cybersecurity, and Blockchain, driving innovation, securing digital ecosystems, and shaping a trusted, decentralized future.

DEPARTMENT MISSION

To guide the education, Design & innovation in IoT, Cybersecurity, and Blockchain technology, preparing the next generation of engineers to make significant contributions to the society.

PROGRAM OUTCOMES (POs)

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems /components / processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modeling, analysis & interpretation of data to provide valid conclusions. (WK8).

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modeling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, WK7).

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the community and society at large, such as being able to comprehend and write effective

reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Skills-Graduates will exhibit a strong foundation in IoT, Cybersecurity, and Blockchain Technology, applying their knowledge to develop innovative solutions to real-world problems.

PEO2: Knowledge-Graduates will demonstrate continuous professional development through advanced studies, certifications, or active participation in professional societies, contributing to their career growth and the advancement of technology.

PEO3: Attitude- Graduates will take on leadership roles and effectively collaborate within multidisciplinary teams, showcasing strong communication, project management, and team-building skills.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: Graduates will be able to design and implement IoT systems that integrate various sensors, actuators, and communication networks to solve real-world problems.

PSO2: Graduates will be proficient in implementing cybersecurity measures to protect data integrity and privacy in IoT and blockchain systems.

PSO3: Graduates will demonstrate the ability to work collaboratively in interdisciplinary teams to develop comprehensive IoT and cybersecurity solutions.

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Rajarajeswari College of Engineering

(An Autonomous Institution under Visvesvaraya Technological University, Belagavi)

DEPARTMENT OF Computer Science & Engineering

[IoT, Cybersecurity including Blockchain Technology]

Scheme of Teaching and Examinations -2024 Scheme

Outcome based Education (OBE) and Choice Based Credit System (CBCS) Effective from the Academic Year 2026-27

V Semester

S. No	Course Category and Course Code		Course Title	TD / PSB	Teaching Hours / Week				Examination				Credits
					Lecture L	Tutorial T	Practical P	Self-Learning S	CIE Marks	SEE Duration in Hrs	SEE Marks	Total Marks	
1.	HSMC	B24CS501	Software Engineering and Project Management	IC	3	0	0	3	50	3	50	100	3
2.	IPCC	B24CS502	Computer Networks	IC	3	0	2	3	50	3	50	100	4
3.	PCC	B24CS503	Theory of Computation	IC	2	2	0	2	50	3	50	100	3
4.	PCC	B24IC504	Industrial IoT	IC	3	0	0	3	50	3	50	100	3
5.	PCCL	B24IC505L	Embedded System and IoT Lab	IC	0	0	2	0	50	3	50	100	1
6.	PEC	B24YY56X	Professional Elective Course - I	CS & Allied	3	0	0	3	50	3	50	100	3
7.	BSC	B24BEK507	Biology for Engineers	IC / Che	2	0	0	2	50	2	50	100	2
8.	AEC	B24YY58X	Ability Enhancement Course Lab - V	CS & Allied	0	0	2	0	50	3	50	100	1
9.	NCMC	B24NCK59X	NSS / NCC / PE / Yoga / Music	HSS	2	0	0	0	100	-	-	100	PP
10.	NCMC	B24ESK510	Environmental Science and E-Waste Management	IC / CV	2	0	0	0	100	-	-	100	PP
11.	SDC	B24ICP511	Mini-Project	IC	0	0	4	0	50	3	50	100	2
								TOTAL	650		450	1100	22

BSC: Basic Science Course, HSMC: Humanity Social sciences including Management courses, IPCC: Integrated Professional Core Course, PCC: Professional Core Course, PCCL: Professional Core Course laboratory, NCMC: Non-Credit Mandatory Course, AEC: Ability Enhancement Course, PEC: Professional Elective Course, SDC- Skill Development Course, L: Lecture, T: Tutorial, P: Practical S: Self-Learning, CIE: Continuous Internal Evaluation, SEE: Semester End Evaluation. K: Indicates common course to all the streams of engineering, PP/NP: Pass/ Not Pass, YY: Programme Code (EC, CS, IS etc.,), X: 1/2/3/4.

Professional Elective Courses (PEC) - I			
B24IC561	IoT System Processor	B24IC562	Database Security and Privacy
B24IC563	Ethical Hacking	B24IC564	Big Data Analytics
Ability Enhancement Course / Skill Enhancement Course (AEC/SEC) – V			
B24IC581	IoT System Processor Lab	B24IC582	Database and Security Lab
B24IC583	Ethical Hacking Lab	B24IC584	Big Data Analytics with Python Lab
Non-Credit Mandatory Courses (NCMC)			
B24NCK591	National Service Scheme	B24NCK592	National Cadet Corps
B24NCK593	Physical Education	B24NCK594	Yoga
B24NCK595	Music		

National Service Scheme /National Cadet Corps/Physical Education/Yoga/Music: All the students have to register the same course namely National Service Scheme (NSS), National Cadet Corps(NCC), Physical Education (PE), Yoga (YOG) and Music (MUS) during the first week of III/IV/V/VI semesters. However, the option is given to students to change the activity. He/she may opt for the change of the course in ensuing semester. If the student is opting new course in V semester first time, he/she may take the basic modules from the syllabus to complete and if they repeat the same course in ensuing semester, subsequent modules can be offered.
These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of degree.

Professional Elective Courses (PEC): A PEC is intended to enhance the depth and breadth of educational experience in the engineering and technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of engineering. Each group will provide an option to select one course. The minimum number of student's strength for offering a professional elective is 10. However, this condition shall not be applicable to cases where the admission to the programme is less than 10 students.

HoD **Dean-Academics** **Principal**

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Outcome based Education (OBE) and Choice Based Credit System (CBCS) Effective from the Academic Year 2026-27

VI Semester

S. No	Course Category and Course Code		Course Title	TD / PSB	Teaching Hours / Week				Examination				Credits
					Lecture	Tutorial	Practical	Self-Learning	CIE Marks	SEE Duration Hrs	SEE Marks	Total Marks	
					L	T	P	S					
1.	PCC	B24IC601	Blockchain Technology	IC	2	2	0	2	50	3	50	100	3
2.	IPCC	B24IC602	Cryptography and Network Security	IC	3	0	2	3	50	3	50	100	4
3.	PEC	B24YY63X	Professional Elective Course- II	CS & Allied	3	0	0	3	50	3	50	100	3
4.	OEC	B24YY64X	Open Elective Course - I	Any Dept	3	0	0	3	50	3	50	100	3
5.	PCCL	B24IC605L	Blockchain Technology Lab	IC	0	0	2	0	50	3	50	100	1
6.	AEC	B24RMK606	Research Methodology and IPR	IC / IC	1	0	0	1	50	1	50	100	1
7.	SDC	B24PRJ607	Capstone Project work : Phase - I	IC	0	0	4	0	100	-	-	100	2
8.	AEC	B24YY 68X	Ability Enhancement Course Lab – VI	CS & Allied	0	0	2	0	50	3	50	100	1
9.	NCMC	B24NCK69X	NSS / NCC / PE / Yoga / Music	HSS	2	0	0	0	100	-	-	100	PP
10.	HSMC	B24IKK610	Indian Knowledge System	IC	2	0	0	0	100	-	-	100	PP
								TOTAL	600		400	1000	18

HSMC: Humanity Social sciences including Management courses, IPCC: Integrated Professional Core Course, PCC: Professional Core Course, PCCL: Professional Core Course laboratory, NCMC: Non-Credit Mandatory Course, AEC: Ability Enhancement Course, PEC: Professional Elective Course, OEC: Open Elective Course, SDC- Skill Development Course, L: Lecture, T: Tutorial, P: Practical S: Self-Learning, CIE: Continuous Internal Evaluation, SEE: Semester End Evaluation. K: Indicates common course to all the streams of engineering, PP/NP: Pass/ Not Pass, YY: Programme Code (EC, CS, IS etc.,), X: 1/2/3/4

Professional Elective Courses (PEC) - II			
B24IC631	Sensors and Actuators for IoT Interfacing	B24IC632	Cyber Law and Digital Forensics
B24IC633	Principles of Cloud Computing	B24IC634	Security in IoT
Open Elective Course (OEC)- I			
B24CS641	Introduction to Data structures	B24IC642	Introduction to Cybersecurity
B24CS643	Fundamentals of Operating Systems	B24AI644	AI for Everyone
Ability Enhancement Course (AEC) – VI			
B24 IC681	Sensors and Actuators Lab	B24 IC682	Digital Forensics Lab
B24 IC683	Industrial Cyber Security Lab	B24 IC684	AI for IoT Lab
Non Credit Mandatory Course (NCMC)			
B24NCK691	National Service Scheme	B24NCK692	National Cadet Corps
B24NCK693	Physical Education	B24NCK694	Yoga
B24NCK695	Music		

PROJECT WORK: **Phase – I:** The objective of the Project work is (i) To encourage independent learning and the innovative attitude of the students. (ii) To develop interactive attitude, communication skills, organization, time management, and presentation skills. (iii) To impart flexibility and adaptability. (iv) To inspire team working. (v) To expand intellectual capacity, credibility, judgment and intuition. (vi) To adhere to punctuality, setting and meeting deadlines. (vii) To install responsibilities to oneself and others. (viii)To train students to present the topic of project work in a seminar without any fear, face the audience confidently, enhance communication skills, involve in group discussion to present and exchange ideas.

CIE Procedure for Project Work: The CIE marks shall be awarded by a committee consisting of the Head of the concerned department and two senior faculty members of the department, one of whom shall be the Guide. The CIE marks awarded for the project work shall be based on the evaluation of the **Project Work Report, Project Reviews and Viva-Voce.** The marks awarded for the project report shall be the same for all the batch mates.

SEE procedure for Project Work: SEE for project work will be conducted by the two examiners appointed by the Institution. The SEE marks awarded for the project work shall be based on the evaluation of **Project Demonstration, Project Presentation and Viva-Voce** in the ratio 20:60:20.

Open Elective Courses: Students belonging to a particular stream of Engineering are not entitled to the open electives offered by their parent department. However, they can opt for an elective offered by other departments, provided they satisfy the prerequisite condition if any. Registration to open electives shall be documented under the guidance of the Program Coordinator/ Mentor. The minimum number of students' for offering Open Elective Course is 10. However, this condition shall not be applicable to class where the admission to the program is less than 10.

HoD **Dean-Academics** **Principal**

Semester-V					
Software Engineering and Project Management **Category: HSMC** **(Common to CSE, CSD, CSE(IC), AIML, ISE)**					
Course Code	:	**B24CS501**	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	3:0:0:3	SEE	:	50 Marks
Total Hours	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To outline software engineering principles and activities involved in building large software programs. Identify ethical and professional issues and explain why they are of concern to Software Engineers.
2.	To describe the process of requirement gathering, requirement classification, requirement specification and requirements validation.
3.	To recognize the importance of Project Management with its methods and methodologies.
4.	To identify software quality parameters and quantify software using measurements and metrics.
5.	To list software quality standards and outline the practices involved.

Module – 1	**No.of Hrs**
Software and Software Engineering: The nature of Software, The unique nature of WebApps,Software Engineering, The software Process, Software Engineering Practice, Software Myths. **Process Models:** A generic process model, Process assessment and improvement, Prescriptive process models: Waterfall model, Incremental process models, Evolutionary process models,Concurrent models, Specialized process models. Unified Process , Personal and Team process models.	9
Module – 2	**No.of Hrs**
Understanding Requirements: Requirements Engineering, Establishing the ground work, Eliciting Requirements, Developing use cases, Building the requirements model, Negotiating Requirements,Validating Requirements. **Requirements Modeling Scenarios, Information and Analysis classes**: Requirement Analysis, Scenario based modeling, UML models that supplement the Use Case, Data modeling Concepts, Class-Based Modeling. **Requirement Modeling Strategies** : Flow oriented Modeling , Behavioral Modeling.	9
Module – 3	**No.of Hrs**
Agile Development: What is Agility?, Agility and the cost of change. What is an agile Process?, Extreme Programming (XP), Other Agile Process Models, A tool set for Agile process . **Principles that guide practice**: Software Engineering Knowledge, Core principles, Principles that guide each framework activity.	9
Module – 4	**No.of Hrs**
Introduction to Project Management: Introduction, Project and Importance of Project Management, Contract Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some ways of categorizing Software Projects, Stakeholders, Setting Objectives,Business Case, Project Success and Failure, Management and Management Control, Project Management life cycle, Traditional versus Modern Project Management Practices. **Project Evaluation:** Evaluation of Individual projects, Cost–benefit Evaluation Techniques, Risk Evaluation.	9
Module – 5	**No.of Hrs**
Software Quality: Introduction, The place of software quality in project planning, Importance of software quality, Defining software quality, Software quality models, product	9

versus process quality management. **Software Project Estimation:** Observations on Estimation, Decomposition Techniques, Empirical Estimation Models.	

Course Outcomes: At the end of the course, the students will be able to	
CO1	Differentiate process models to judge which process model has to be adopted for the given scenarios.
CO2	Derive both functional and nonfunctional requirements from the case study.
CO3	Analyze the importance of various software testing methods and agile methodology.
CO4	Illustrate the role of project planning and quality management in software development.
CO5	Identify appropriate techniques to enhance software quality.

Text Books	
1.	Roger S. Pressman: Software Engineering-A Practitioners approach, 7th Edition, Tata McGraw Hill.
2.	Bob Hughes, Mike Cotterell, Rajib Mall: Software Project Management, 6th Edition, McGraw Hill Education, 2018.
Reference Text Books	
1.	Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India.
2.	"Software Engineering: Principles and Practice", Hans van Vliet, Wiley India, 3rd Edition, 2010.

Web links and Video lectures (e-Resources)
1. https://onlinecourses.nptel.ac.in/noc20_cs68/preview
2. https://onlinecourses.nptel.ac.in/noc24_mg01/preview

ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	**Internal Assessment-1**	**50**	**30 (Average of Best two Assessments)**	**50**
	Internal Assessment-2	**50**		
	Internal Assessment-3	**50**		
AAT	**Two Assessments as per regulations**	**20**	**20**	
SEE	**Semester End Examination**	**100**	**50**	**50**
Total Marks				**100**

SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.

6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

CO-PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	-	-	-	-	-	-	-	1
CO2	2	3	3	2	-	-	-	-	1	-	1
CO3	2	3	2	2	2	-	-	-	-	-	1
CO4	2	2	3	-	1	1	-	2	1	3	1
CO5	2	2	3	2	2	1	1	-	-	-	2

Level 3 - High, Level 2 - Moderate, Level 1 - Low

Semester -V					
Computer Networks **Category: IPCC** **(Common to CSE, CSD, CSE(IC), AIML, ISE)**					
Course Code	:	**B24CS502**	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	3:0:2:3	SEE	:	50 Marks
Total Hours	:	45+30	Total	:	100 Marks
Credits	:	4	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To understand fundamental concepts of computer networks, including network applications, hardware, software, and reference models such as OSI and TCP/IP.
2.	To explain the functions and technologies of the Physical Layer**,** including transmission media, wireless communication, PSTN, and mobile communication systems.
3.	To analyze Data Link Layer mechanisms**,** covering error detection and correction, flow control, sliding window protocols, Ethernet, and wireless LAN technologies.
4.	To describe Network and Transport Layer operations, including routing algorithms, congestion control, IPv4/IPv6, Quality of Service (QoS), and transport protocols like TCP and UDP.
5.	To demonstrate knowledge of Application Layer protocols, such as DNS, HTTP, FTP, SMTP, SNMP, and Telnet, and understand how network services support real-world applications.

Module – 1	**No. of Hours**
Introduction: Network applications, network hardware, network software, reference models: OSI, TCP/IP, Internet, frame relay. **The Physical Layer:** Guided transmission media, wireless transmission, the public switched telephone networks, mobile telephone system.	9
Module – 2	**No. of Hours**
Data Link Layer: Design issues, error detection and correction, elementary data link protocols, sliding window protocols, example data link protocols - HDLC, the data link layer in the internet. THE **Medium Access Sub layer:** multiple access protocols, Ethernet, Data Link Layer switching, Wireless LAN, Broadband Wireless, Bluetooth	9
Module – 3	**No. of Hours**
Network Layer: Network layer design issues, routing algorithms, Congestion control algorithms, Internetworking, the network layer in the internet (IPv4 and IPv6), Quality of Service.	9
Module – 4	**No. of Hours**
Transport Layer: Transport service, elements of transport protocol, Simple Transport Protocol, Internet transport layer protocols: UDP and TCP.	9
Module – 5	**No. of Hours**
Application Layer: Domain name system, electronic mail, World Wide Web: architectural overview, dynamic web document and http. **Application Layer Protocols:** Simple Network Management Protocol, File Transfer Protocol, Simple Mail Transfer Protocol, Telnet.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Explain the fundamentals of computer networks, network models (OSI, TCP/IP), and different types of network applications.
CO2	Analyze the functions of the Physical Layer, including transmission media, wireless communication, PSTN and mobile communication systems.
CO3	Apply Data Link Layer concepts such as error detection and correction, flow control, sliding window protocols, and multiple access techniques.
CO4	Evaluate Network Layer and Transport Layer protocols, including routing algorithms, congestion control, IPv4/IPv6, TCP, and UDP.
CO5	Demonstrate the working of Application Layer services and protocols such as DNS, HTTP, FTP, SMTP, SNMP, and Telnet in real-world networking scenarios.

LABORATORY

Practical Component of IPCC (10 Experiments)

Sl. No	List Of Experiments
1.	Write a program to implement CRC (Cyclic Redundancy Check) for error detection.
2.	Write a program to implement Hamming Code for error detection and correction.
3.	Write a program to simulate Flow Control using Stop-and-Wait Protocol.
4.	Write a program to simulate Sliding Window Protocol.
5.	Write a program to implement Leaky Bucket Algorithm for traffic shaping
6.	Write a program to implement Token Bucket Algorithm.
7.	Write a program to Create a TCP server and client to exchange messages.
8.	Write a program to Implement connectionless communication between client and server.
9.	Write a program to Implement error detection using CRC.
10.	Write a program to Detect and correct single-bit errors
11.	Write a program to Basic error detection technique.
12.	Write a program to Control data transmission rate.

Reference Text Books	
1.	Behrouz A. Forouzan (2006), Data communication and Networking, 4th Edition, Mc Graw-Hill, India
2.	Kurose, Ross (2010), Computer Networking: A top down approach, Pearson Education, India

Text Books	
1.	1. A. S. Tanenbaum (2003), Computer Networks, 4th edition, Pearson Education/ PHI, New Delhi,

ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE)

Component	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	**Internal Assessment-1**	**50**	**30** (Average of Best Two Assessments)	**50/2 = 25**
	Internal Assessment-2	**50**		
	Internal Assessment-3	**50**		
AAT	Any One Assessments as per regulations	**20**	**20**	
Laboratory	**Lab conduction & Record**	Evaluating each expt. for 10	**05**	**25**

		marks.		
	Lab Internal Test	**50**	**20**	
Continuous Internal Evaluation (CIE)				**50**
SEE	**Semester End Examination**	**100**	**50**	**50**
Total Marks				**100**

SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice. Students should answer five full questions, selecting one full question from each module.
5. Students have to answer for 100 marks and marks scored out of 100 shall be proportionally reduced to 50 marks.
6. The maximum marks from the practical component to be included in the SEE question paper is **16 marks.**
7. Question papers to be set as per the Blooms Taxonomy levels.
8. The laboratory component of the **integrated course** shall be CIE only. However, in SEE, the questions from the practical component shall be included.

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	-	-	-	-	-	-	-	1
CO2	3	2	2	1		-	-	-	-	-	1
CO3	2	3	2	1	1	-	-	-	-	-	1
CO4	2	3	2	2		-	-	-	-	-	1
CO5	2	2	3	1	2	-	-	-	-	-	1

Level 3 - High, Level 2 - Moderate, Level 1 - Low

Semester -V					
Theory of Computation **Category: PCC** **(Common to CSE, CSE(IC), CSD, ISE)**					
Course Code	:	**B24CS503**	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	2:2:0:2	SEE	:	50 Marks
Total Hours	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To explain the concepts of Deterministic and Non-Deterministic Finite Automata.
2.	To demonstrate the use of Regular Expressions for constructing DFA and NFA
3.	To illustrate the construction of Context-Free Grammar for a given language.
4.	To narrate advanced computing Machines such as PDA and Turing Machine

Module – 1	**No. of Hours**
Finite Automata (FA): Introduction, Alphabets; Languages; strings; Deterministic Finite Automata (DFA) -Formal definition, simpler notations (state transition diagram, transition table), language of a DFA. Nondeterministic Finite Automata (NFA) - Definition of NFA, language of an NFA, Equivalence of Deterministic	9
Module – 2	**No. of Hours**
Non-deterministic Finite Automata: Applications of Finite Automata, Finite Automata with Epsilon Transitions, Eliminating Epsilon transitions,. Regular Expressions (RE): Minimization of Deterministic Finite Automata, Introduction to Regular Expression, Identities of Regular Expressions, Finite Automata and Regular Expressions- Converting from DFA's to Regular Expressions,	9
Module – 3	**No. of Hours**
Converting Regular Expressions to Automata: Applications of Regular Expressions. Equivalence of finite automata and regular expressions; pumping lemma for regular languages; Regular Grammars, Context Free Grammars and Normal Forms: Definition, regular grammars and FA, FA for regular grammar, Regular grammar for FA.	9
Module – 4	**No. of Hours**
Context Free Grammars; Derivation Trees, Sentential Forms, Rightmost and Leftmost derivations of Strings. Ambiguity in CFG's; Normal forms-CNF and GNF.	9
Module – 5	**No. of Hours**
Push Down Automata (PDA): Definition, Model, Acceptance of CFL, Acceptance by Final State and Acceptance by Empty stack and its Equivalence, Equivalence of CFG and PDA. Turing Machines (TM): Formal definition and behavior, Languages of a TM, Problems.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Construct the Finite State Machine by applying the concepts of DFA, NFA and Epsilon-NFA.
CO2	Identify ambiguity in Grammar and Construct CFG for the given language in Normal Forms.
CO3	Apply the concepts of Push down Automata and Turing machine for a given Language.
CO4	Classify a problem for different models of Computation.
CO5	Recognize skills in formal reasoning and reduction of a problem to a formal model.

Text Books	
1.	John E Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Introduction to Automata Theory, Languages and Computation, 3rd Edition, Pearson Education, 2009.
2.	Peter Linz, An Introduction to formal Languages and Automata, 4th Edition, Jones and Bartlett Publishers, 2006.

Reference Text Books	
1.	Kamala Krithivasan, Rama R, Introduction to Formal Languages, Automata Theory and Computation,

	Pearson, 2009.
2.	B N Srinivasa Murthy, Formal Languages and Automata Theory, Sanguine Publishers, 2006.

ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	**Internal Assessment-1**	**50**	**30 (Average of Best two Assessments)**	**50**
	Internal Assessment-2	**50**		
	Internal Assessment-3	**50**		
AAT	**Two Assessments as per regulations**	**20**	**20**	
SEE	**Semester End Examination**	**100**	**50**	**50**
Total Marks				**100**

SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	3	3	3	-	-	-	2	-	3
CO2	2	2	3	3	3	-	-	-	2	-	3
CO3	2	2	3	3	3	-	-	-	2	-	3
CO4	2	2	3	3	3	-	-	-	2	-	3
CO5	2	2	3	3	3	-	-	-	2	-	3
CO6	2	2	3	3	3	-	-	-	2	-	3

Level 3 - High, Level 2 - Moderate, Level 1 - Low

Semester -V					
Industrial IoT **Category: PCC**					
Course Code	:	**B24IC504**	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	3:0:0:3	SEE	:	50 Marks
Total Hours	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To understand the foundational principles of IIoT and its role in revolutionizing industries.
2.	To familiarize with the key components and architecture of an IIoT system.
3.	To learn about different communication protocols like COAP, MQTT etc used in IIoT
4	To explore the applications and use cases of IIoT in various industrial sectors, including manufacturing, energy, healthcare, transportation, and more.
5	To identify security and privacy challenges specific to IIoT and strategies to mitigate risks for real-time applications.

Module – 1	**No. of Hours**
Introduction to IOT, IOT Vs. IIOT, History of IIOT, Components of IIOT - Sensors, Interface, Networks, Key terms – IOT Platform, Interfaces, API, clouds, Data Management Analytics, Mining &Manipulation; Role of IIOT in Manufacturing Processes Use of IIOT in plant maintenance practices, Challenges & Benefits in implementing IIOT.	9
Module – 2	**No. of Hours**
IOT components; Various Architectures of IOT and IIOT, Advantages & disadvantages, Industrial Internet - Reference Architecture; IIOT System components: Sensors, Gateways, Routers, Modem, Cloud brokers, servers and its integration, Overview of Industry 4.0	9
Module – 3	**No. of Hours**
Examining the Protocols, Software Design Concepts, Middleware Industrial Internet of Things Platforms, IIoT WAN Technologies and Protocols	9
Module – 4	**No. of Hours**
Introduction to web security, Conventional web technology and relationship with IIOT, Vulnerabilities of IoT, Privacy, Security requirements, Threat analysis, Trust	9
Module – 5	**No. of Hours**
IoT security tomography and layered attacker model, Identity establishment, Access control, Message integrity, Non-repudiation and availability, Smart Factories.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Outline foundational principles, key concepts, and components of the Industrial Internet of Things.
CO2	Interpret sensors and various protocols for industry standard solutions.
CO3	Summarize the layered architecture of IIoT systems, including edge devices, connectivity, data aggregation, processing, and visualization.
CO4	Identify the importance of interoperability and standardization in IIoT environments.
CO5	Analyze the security challenges and privacy concerns specific to IIoT deployments and learn about strategies and best practices to safeguard IIoT systems and data.

Text Books	
1.	Nilakshi Jain , Ramesh Menon “Cyber Security and Cyber Laws” Willey Publishers, 1st Edition, October 2020
2.	Pavan Duggal “Cyber Security Law”, 2nd Edition, 2019.

Reference Text Books	
1.	Veneri, Giacomo, and Antonio Capasso. Hands-on Industrial Internet of Things: Create a Powerful Industrial IoT Infrastructure Using Industry 4.0, 1st edition, Packt Publishing Ltd, 2018. 2017.
2.	Dr. OvidiuVermesan, Dr. Peter Friess, “Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems”, River Publishers, 2013.

ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	**Internal Assessment-1**	**50**	**30 (Average of Best two Assessments)**	**50**
	Internal Assessment-2	**50**		
	Internal Assessment-3	**50**		
AAT	**Two Assessments as per regulations**	**20**	**20**	
SEE	**Semester End Examination**	**100**	**50**	**50**
Total Marks				**100**

SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	2	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-
CO3	-	3	2	3	-	-	-	-	-	-	-
CO4	3	-	-	3	1	-	-	-	-	-	-
CO5	-	-	3	3	3	-	-	-	-	-	-

Level 3 - High, Level 2 - Moderate, Level 1 - Low

Semester-V					
Embedded System and IoT Lab **Category: PCCL**					
Course Code	:	**B24IC505L**	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	0:0:2:0	SEE	:	50 Marks
Total Hours	:	30	Total	:	100 Marks
Credits	:	1	SEE Duration	:	3 Hrs

Course Learning Objectives is	
1.	To learn the internal architecture and programming of an embedded processor
2.	To introduce interfacing, I/O devices to the processor
3.	To build a small low-cost embedded IoT system using Arduino/Raspberry Pi/ open platform.
4.	To apply the concept of the Internet of Things in real-world scenario

Sl. No.	**Title of the program / list of the experiment**
1.	Write 8051 Assembly Language experiments using simulator.
2.	Test data transfer between registers and memory.
3.	Perform ALU operations.
4.	Write Basic and arithmetic Programs Using Embedded C.
5.	Introduction to Arduino platform and programming.
6.	Explore different communication methods with IoT devices (Zigbee, GSM, Bluetooth)
7.	Introduction to Raspberry PI platform and python programming.
8.	Interfacing sensors with Raspberry PI.
	Communicate between Arduino and Raspberry PI using any wireless medium.
9	Setup a cloud platform to log the data.
10	Log Data using Raspberry PI and upload to the cloud platform.
11	Design an IOT based system.
12	Write 8051 Assembly Language experiments using simulator.

Course Outcomes: At the end of the course, the students will be able to	
CO1	Write embedded C programs.
CO2	Design simple embedded applications.
CO3	Compare the communication models in IOT
CO4	Design IoT applications using Arduino/Raspberry Pi /open platform
CO5	Explain the architecture of embedded processors.

ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).

A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Laboratory	Lab Conduction & Record	Evaluating each expt. for 10 marks	20	50
	Laboratory Test -1	50	15	
	Laboratory Test -2	50	15	
SEE	Semester End Examination	100	50	50
Total Marks				100

SEMESTER END EXAMINATION (SEE)

1. SEE marks for the practical course are 50 Marks. Practical examinations are to be conducted between the schedules mentioned in the academic calendar of the Institution.
2. All laboratory experiments are to be included for practical examination.
3. Evaluation of test write-up, conduction procedure, result and viva will be conducted jointly by examiners.
4. Rubrics suggested for SEE, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks.
5. Change of experiment is allowed only once and 15% of Marks allotted to the Conduction procedure part are to be made zero. The minimum duration of SEE is 03 hours.

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	1	1	-	-	-	3	2	3
CO2	1	3	2	2	2	-	-	-	3	2	2
CO3	3	2	1	2	1	-	-	-	2	3	1
CO4	3	3	1	2	1	-	-	-	1	3	2
CO5	3	3	3	3	2	-	-	-	1	2	3

Level 3 – High, Level 2 – Moderate, Level 1 -Low

Semester –V					
IoT System Processor **Category: PEC-I**					
Course Code	:	**B24IC561**	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	3:0:0:3	SEE	:	50 Marks
Total Hours	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To study the basics of an IOT based system with ESP32 processors for usage of the processor for real word problem.
2.	To learn to program the ESP32 processor for real time applications.
3.	To explore ESP32 for networking using WiFi devices for making real time applications.
4.	To illustrate the working of ESP32 with cloud for using it with real time problems.

Module – 1	**No. of Hours**
Introduction to IOT & ESP32 IoT as an emerging technology and its application areas with some examples , the basic structure of IoT solutions, including security considerations , An introduction to the ESP32 platform and modules, Available development platforms and frameworks	9
Module – 2	**No. of Hours**
Real-Time Operating System (RTOS) options for ESP32, Tool chain installation, programming, and debugging ESP32. Working with devices Warming up: Basic input/output (I/O) with buttons, potentiometers (pots), and light-emitting diodes (LEDs), Working with sensors	9
Module – 3	**No. of Hours**
Working with actuators Using LCDs, Interfacing with OLED displays, TFT displays for superior graphics, Using Free RTOS, UART communication, Adding a speaker with I2S, Developing a camera application, Power management, deep sleep, and ULP	9
Module – 4	**No. of Hours**
Working With Wi-Fi & Security Using Wi-Fi in station and access point modes , Using lwIP – a TCP/IP stack for embedded devices, Secure boot and over-the-air (OTA) updates, Securing communication with TLS/DTLS, Integrating with secure elements	9
Module – 5	**No. of Hours**
Working With cloud IoT protocols with ESP32, Understanding cloud IoT platforms, Developing on AWS IoT, Using voice assistants, Integrating with Amazon Alexa, Defining rules with IFTTT	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Demonstrate the basic concepts of internet of things using ESP32 for real time applications.
CO2	Illustrate the working principles of ESP32 internal components.
CO3	Experiment to interface ESP32 with different input / output devices.
CO4	Develop programs using ESP32 processor related to Wi-Fi and other networking standards.
CO5	Solve cloud related problem with ESP32 processor
CO6	Explain the use of ESP32 to solve real world problems like alexa.

Text Books	
1.	Developing IoT Projects with ESP32, Packt Publishing, Sept 2021.

Reference Text Books	
1.	Advanced IOT, Packt Publishing, Feb 2020.
2.	Internet of Things Projects with ESP32, Packt Publishing, Mar 2019

ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied

the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	**Internal Assessment-1**	**50**	**30 (Average of Best two Assessments)**	**50**
	Internal Assessment-2	**50**		
	Internal Assessment-3	**50**		
AAT	**Two Assessments as per regulations**	**20**	**20**	
SEE	**Semester End Examination**	**100**	**50**	**50**
Total Marks				**100**

SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	3	3	-	-	-	-	-	-	-	2
CO2	-	3	2	2	-	-	-	-	-	-	-
CO3	-	2	2	2	-	-	-	-	-	-	-
CO4	-	3	2	2	-	-	-	-	-	-	-
CO5	-	3	2	2	3	-	-	-	-	-	-
CO6	-	2	2		3	-	-	-	-	-	3

Level 3 - High, Level 2 - Moderate, Level 1 - Low

Semester -V					
Database Security and Privacy **Category: PEC-I**					
Course Code	:	**B24IC562**	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	3:0:0:3	SEE	:	50 Marks
Total Hours	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To understand the fundamentals of security, and how it relates to information systems.
2.	To identify risks and vulnerabilities in operating systems from a database perspective.
3.	To learn good password policies, and techniques to secure passwords in an organization.
4	To learn and implement administration policies for users.
5	To understand the various database security models and their advantages or disadvantages.
6	To learn to implement privacy preserving data mining algorithms.

Module – 1	**No. of Hours**
Security Architecture: Introduction-Information Systems- Database Management Systems-Information Security Architecture- Database Security–Asset Types and value-Security Methods. Operating System Security Fundamentals: Introduction-Operating System Overview-Security Environment – Components- Authentication Methods-User Administration-Password Policies Vulnerabilities-E-mail Security.	9
Module – 2	**No. of Hours**
Administration of Users: Introduction-Authentication-Creating Users, SQL Server User-Removing, Modifying Users-Default, Remote Users-Database Links-Linked Servers-Remote Servers-Practices for Administrators and Managers-Best Practices Profiles, Password Policies Privileges and Roles: Introduction-Defining and Using Profiles-Designing and Implementing Password Policies-Granting and Revoking User Privileges-Creating, Assigning and Revoking User Roles-Best Practices.	9
Module – 3	**No. of Hours**
Database Application Security Models: Introduction-Types of Users-Security Models- Application Types-Application Security Models-Data Encryption Virtual Private Databases: Introduction-Overview of VPD-Implementation of VPD using Views, Application Context in Oracle-Implementing Oracle VPD-Viewing VPD Policies and Application contexts using Data Dictionary, Policy Manager Implementing Row and Column level Security with SQL Server.	9
Module – 4	**No. of Hours**
Auditing Database Activities: Using Oracle Database Activities-Creating DLL Triggers with Oracle Auditing Database Activities with Oracle-Auditing Server Activity with SQL Server 2000-Security and Auditing Project Case Study.	9
Module – 5	**No. of Hours**
Privacy Preserving Data Mining Techniques: Introduction- Privacy Preserving Data Mining Algorithms General Survey-Randomization Methods-Group Based Anonymization -Distributed Privacy Preserving Data Mining-Curse of Dimensionality-Application of Privacy Preserving Data Mining.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Learn he concepts of security & information systems
CO2	To learn good password policies, and techniques to secure passwords in an organization
CO3	To learn database application security
CO4	To learn an auditing database
CO5	To learn to implement privacy preserving data mining algorithms.

Text Books	
1.	Hassan A. Afyouni, "Database Security and Auditing", 3rd Edition, Cengage Learning,2009.(UNIT 1 to IV)
2.	Charu C. Aggarwal, Philip S Yu, "Privacy Preserving Data Mining": Models and Algorithms, Kluwer Academic Publishers, 2008.(UNIT V).

Reference Text Books	
1.	Ron Ben Natan,"Implementing Database Security and Auditing", Elsevier Digital Press, 2005.

ASSESSMENT DETAILS BOTH (CIE AND SEE)

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	Internal Assessment-2	**50**		
	Internal Assessment-3	**50**		
AAT	**Two Assessments as per regulations**	**20**	**20**	
SEE	**Semester End Examination**	**100**	**50**	**50**
Total Marks				**100**

SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
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CO2	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	3	-	-	-	-	-	3
CO4	3	2	-	-	2	-	-	-	-	-	2
CO5	3	2	-	-	2	-	-	-	-	-	2

Level 3 - High, Level 2 - Moderate, Level 1 - Low

Semester-V					
Ethical Hacking **Category: PEC**					
Course Code	:	**B24IC563**	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	3:0:0:3	SEE	:	50 Marks
Total Hours	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3Hrs

Course Learning Objective is	
1.	To understand the basics of computer based vulnerabilities.
2.	To explore different foot printing, reconnaissance and scanning methods.
3.	To expose the enumeration and vulnerability analysis methods.
4.	To understand hacking options available in Web and wireless applications.
5.	To explore the options for network protection.
6.	To practice tools to perform ethical hacking to expose the vulnerabilities.

Module – 1	**No. of Hrs**
Introduction-Ethical Hacking Overview - Role of Security and Penetration Testers .- Penetration-Testing Methodologies- Laws of the Land - Overview of TCP/IP- The Application Layer - The Transport Layer - The Internet Layer - IP Addressing .- Network and Computer Attacks - Malware - Protecting Against Malware Attacks.- Intruder Attacks - Addressing Physical Security.	09
Module – 2	**No. of Hrs**
Foot Printing, Reconnaissance and Scanning Networks -Footprinting Concepts - Footprinting through Search Engines, Web Services, Social Networking Sites, Website, Email - Competitive Intelligence - Footprinting through Social Engineering - Footprinting Tools - Network Scanning Concepts - Port-Scanning Tools - Scanning Techniques - Scanning Beyond IDS and Firewall.	09
Module – 3	**No. of Hrs**
Enumeration and Vulnerability Analysis-Enumeration Concepts - NetBIOS Enumeration – SNMP, LDAP, NTP, SMTP and DNS Enumeration - Vulnerability Assessment Concepts - Desktop and Server OS Vulnerabilities - Windows OS Vulnerabilities - Tools for Identifying Vulnerabilities in Windows- Linux OS Vulnerabilities- Vulnerabilities of Embedded Oss..	09
Module – 4	**No. of Hrs**
System Hacking- Hacking Web Servers - Web Application Components- Vulnerabilities - Tools for Web Attackers and Security Testers Hacking Wireless Networks - Components of a Wireless Network – Wardriving- Wireless Hacking - Tools of the Trade.	09
Module – 5	**No. of Hrs**
Network Protection Systems - Access Control Lists. - Cisco Adaptive Security Appliance Firewall - Configuration and Risk Analysis Tools for Firewalls and Routers - Intrusion Detection and Prevention Systems – Network Based and Host-Based IDSs and IPSs - Web Filtering - Security Incident Response Teams – Honeypots.	09

Course Outcomes: At the end of the course, the students will be able to	
CO1	To express knowledge on basics of computer based vulnerabilities
CO2	To gain understanding on different foot printing, reconnaissance and scanning methods
CO3	To demonstrate the enumeration and vulnerability analysis methods
CO4	To gain knowledge on hacking options available in Web and wireless applications
CO5	To acquire knowledge on the options for network protection.

Text Books	
1.	Michael T. Simpson, Kent Backman, and James E. Corley, Hands-On Ethical Hacking and Network Defense, Course Technology, Delmar Cengage Learning, 2010.
2.	The Basics of Hacking and Penetration Testing - Patrick Engebretson, SYNGRESS, Elsevier, 2013.
3.	The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws, Dafydd Stuttard and Marcus Pinto, 2011.

Reference Text Books	
1.	Black Hat Python: Python Programming for Hackers and Pentesters, Justin Seitz , 2014.

ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	**Internal Assessment-1**	**50**	**30 (Average of Best two Assessments)**	**50**
	Internal Assessment-2	**50**		
	Internal Assessment-3	**50**		
AAT	**Two Assessments as per regulations**	**20**	**20**	
SEE	**Semester End Examination**	**100**	**50**	**50**
Total Marks				**100**

SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

CO-PO Mapping:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3	1	-	-	-	-	-	2	2
CO2	3	3	3	1	-	-	-	-	-	2	2
CO3	3	3	2	2	-	-	-	-	-	3	3
CO4	3	2	2	2	-	-	-	-	-	3	3
CO5	3	2	2	1	-	-	-	-	-	3	3

Level 3 - High, Level 2 – Moderate, Level 1 - Low

Semester -V					
Big Data Analytics **Category: PEC-I**					
Course Code	:	**B24IC564**	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	3:0:0:3	SEE	:	50 Marks
Total Hours	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To implement Map Reduce programs for processing big data.
2.	To realize storage and processing of big data using MongoDB, Pig, Hive and Spark.
3.	To analyze big data using machine learning techniques.

Module – 1	**No. of Hours**
Introduction: Dawn of the Big Data Era, Definition and Features of Big Data, Big Data Value, The Development of Big Data, Challenges of Big Data. RELATED TECHNOLOGIES: Cloud Computing - Cloud Computing Preliminaries, Relationship Between Cloud Computing and Big Data, IoT - IoT Preliminaries, Relationship Between IoT and Big Data, Data Center, Hadoop - Hadoop Preliminaries, Relationship between Hadoop and Big Data.	9
Module – 2	**No. of Hours**
Big Data Generation And Acquisition: Big Data Generation-Enterprise Data,IoT Data, Internet Data, BioSemester - VII 242 G V P College of Engineering (Autonomous) 2016 IT medical Data, Data Generation from Other Fields, Big Data Acquisition - Data Collection, Data Transportation, Data Pre-processing.	9
Module – 3	**No. of Hours**
Big Data Storage: Storage System for Massive Data, Distributed Storage System,Storage Mechanism for Big Data - Database Technology, Design Factors, Database Programming Model HADOOP & MAP REDUCE: Data Storage and Analysis, Comparison with Other Systems, A Brief History of Hadoop , Apache Hadoop and the Hadoop Ecosystem, A Weather Dataset, Analyzing the Data with Unix Tools, Analyzing the Data with Hadoop (Map and Reduce, Java MapReduce), Scaling Out, Hadoop Streaming, Hadoop Pipes.	9
Module – 4	**No. of Hours**
Big Data Analysis: Traditional Data Analysis, Big Data Analytic Methods, Architecture for Big Data Analysis - Real-Time vs. Offline Analysis, Analysis at Different Levels, Analysis with Different Complexity, Tools for Big Data Mining and Analysis.	9
Module – 5	**No. of Hours**
Big Data Applications: Application Evolution, Big Data Analysis Fields - Structured Data Analysis, Text Data Analysis, Web Data Analysis, Multimedia Data Analysis, Network Data Analysis, Mobile Traffic Analysis, Key Applications - Application of Big Data in Enterprises, Application of IoT Based Big Data, Application of Online Social Network-Oriented Big Data, Applications of Healthcare and Medical Big Data, Collective Intelligence, Smart Grid.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Understand big data analytics as the next wave for businesses looking for competitive advantage
CO2	Understand the financial value of big data analytics
CO3	Explore tools and practices for working with big data
CO4	Understand how big data analytics can leverage into a key component
CO5	Learn about stream computing

Text Books	
1.	Min Chen, Shiwen Mao, Yin Zhang,Victor C.M. Leung, “Big Data: Related Technologies, Challenges and Future Prospects”, Springer; 2014 edition.

Reference Text Books	
1.	Tom White, “Hadoop- The Definitive Guide”, O’reilly, 2nd Edition
2.	VigneshPrajapati,”Big Data Analytics with R and Hadoop”, PACKT Publishing, November 2013.

ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	**Internal Assessment-1**	**50**	**30 (Average of Best two Assessments)**	**50**
	Internal Assessment-2	**50**		
	Internal Assessment-3	**50**		
AAT	**Two Assessments as per regulations**	**20**	**20**	
SEE	**Semester End Examination**	**100**	**50**	**50**
Total Marks				**100**

SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	3	-	-	-	-	-	3
CO4	3	2	-	-	2	-	-	-	-	-	2
CO5	3	2	-	-	2	-	-	-	-	-	2

Level 3 - High, Level 2 - Moderate, Level 1 - Low

Semester-V					
IoT System Processor Lab **Category: AEC-V**					
Course Code	:	**B24IC581**	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	0:0:2:0	SEE	:	50 Marks
Total Hours	:	30	Total	:	100 Marks
Credits	:	1	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To study the fundamental of ESP32 microcontroller.
2.	To program to interface ESP32 with LED and other sensors.
3.	To develop a real world application by using the communication features of Wi-Fi.
4.	To create application involving the cloud network

Sl. No.	**Title of the program / list of the experiment**
1.	Create a program to interface LED's with ESP32 micro controller. The LED's should be glowing alternatively.
2.	Write a program using ESP32 micro controller to display a message moving curtail display using LCD
3.	Develop a ESP32 program to measure the humidity and temperature using sensors.
4.	Develop a ESP32 program to simulate smart garden maintenance.
5.	Develop a ESP32 program to create a smart room lighting system.
6.	Develop a ESP32 program to control the speed of a DC motor.
7.	Write a program to transfer a file from one device to another using Wi-Fi module and ESP32 device
8.	Develop a program using ESP32 device to interface the cloud network to access data in a mobile device.
	A simple mini project is expected end of the course using ESP32 module 1. IOT based traffic control system 2. IOT based web app 3. IOT based motion sensor 4. Micro card reader 5. Bluetooth based application

Course Outcomes: At the end of the course, the students will be able to	
CO1	Explain the fundamentals of ESP32 micro controller to interface different components/ devices.
CO2	Experiment ESP32 module with Display devices.
CO3	Build the programs using DHT and soil moisture sensor with ESP32.
CO4	Develop the programs to control the motor using ESP32.
CO5	Evaluate the solutions for existing cloud networking problems using ESP32.
CO6	Illustrate the learning outcome of IoT applications on the assigned projects/ experiments.

ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).

A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Laboratory	Lab Conduction & Record	Evaluating each expt. for 10 marks	20	50
	Laboratory Test -1	50	15	
	Laboratory Test -2	50	15	
SEE	Semester End Examination	100	50	50
Total Marks				100

SEMESTER END EXAMINATION (SEE)

1. SEE marks for the practical course are 50 Marks. Practical examinations are to be conducted between the schedules mentioned in the academic calendar of the Institution.
2. All laboratory experiments are to be included for practical examination.
3. Evaluation of test write-up, conduction procedure, result and viva will be conducted jointly by examiners.
4. Rubrics suggested for SEE, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks.
5. Change of experiment is allowed only once and 15% of Marks allotted to the Conduction procedure part are to be made zero. The minimum duration of SEE is 03 hours.

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	2	-	-	-	-	-	-
CO2	3	3	2	-	2	-	-	-	-	-	-
CO3	3	2	3	-	2	-	-	-	-	-	-
CO4	2	3	2	-	2	-	-	-	-	-	-
CO5	2	2	2	-	3	-	-	-	-	-	-
CO6	2	2	2	-	3	-	-	-	-	-	2

Level 3 – High, Level 2 – Moderate, Level 1 -Low

Semester-V					
Database and Security Lab **Category: AEC-V**					
Course Code	:	**B24IC582**	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	0:0:2:0	SEE	:	50 Marks
Total Hours	:	30	Total	:	100 Marks
Credits	:	1	SEE Duration	:	3Hrs

Course Learning Objective is	
1.	To learn and implement important commands in SQL.
2.	To learn the usage of nested and joint queries.
3.	To understand function as, procedures and procedural extensions of DB.
4.	To learn to store and retrieve encrypted data in DB.

Sl. No	Name of the Programs / List of the experiments
1.	Create a database table, add constraints (primary key, unique, check, not null), insert rows, update and delete rows using SQL DDL and DML commands.
2.	Create set of tables, add foreign key constraints and incorporate referential integrity.
3.	Query the database tables using different 'where' clause conditions and also implement aggregate functions.
4.	Query the database tables and explore sub queries and simple join operations.
5.	Write user define functions and stored procedures in SQL.
6.	Execute complex transactions and realize DCL and TCL commands.
7.	Use SQLi to authenticate as administrator, to get unauthorized access over sensitive data, to inject malicious statements into from filed.
8.	Write programs that will define against the SQLi attacks given in the previous exercise.
9.	Write queries to insert encrypted data into the database and to retrieve the data using decryption.

Course Outcomes: At the end of the course, the students will be able to	
CO1	Create databases with different types of key constraints.
CO2	Write simple and complex SQL queries using DML and DCL commands.
CO3	Realize database design using 3NF and BCNF.
CO4	Use advanced features such as stored procedures.
CO5	Secure database and mitigate attacks on DB.

ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).

A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Laboratory	**Lab Conduction & Record**	**Evaluating each expt. for 10 marks**	**20**	**50**
	Laboratory Test -1	**50**	**15**	

	Laboratory Test -2	**50**	**15**	
SEE	**Semester End Examination**	**100**	**50**	**50**
Total Marks				**100**

SEMESTER END EXAMINATION (SEE)

1. SEE marks for the practical course are 50 Marks. Practical examinations are to be conducted between the schedules mentioned in the academic calendar of the Institution.
2. All laboratory experiments are to be included for practical examination.
3. Evaluation of test write-up, conduction procedure, result and viva will be conducted jointly by examiners.
4. Rubrics suggested for SEE, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks.
5. Change of experiment is allowed only once and 15% of Marks allotted to the Conduction procedure part are to be made zero. The minimum duration of SEE is 03 hours.

CO-PO Mapping:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
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CO2	3	3	3	1	-	-	-	-	2	2	2
CO3	3	3	2	2	-	-	-	-	1	3	3
CO4	3	2	2	2	-	-	-	-	1	3	3
CO5	3	2	2	1	-	-	-	-	1	3	3

Level 3 - High, Level 2 – Moderate, Level 1 - Low

Semester-V					
Ethical Hacking Lab **Category: AEC-V**					
Course Code	:	**B24IC583**	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	0:0:2:0	SEE	:	50 Marks
Total Hours	:	30	Total	:	100 Marks
Credits	:	1	SEE Duration	:	3Hrs

Course Learning Objective is	
1.	To understand the basics of computer based vulnerabilities.
2.	To explore different foot printing, reconnaissance and scanning methods.
3.	To expose the enumeration and vulnerability analysis methods.
4.	To understand hacking options available in Web and wireless applications.
5.	To explore the options for network protection.
6.	To practice tools to perform ethical hacking to expose the vulnerabilities.

Sl. No	**Name of the Programs / List of the experiments**
1.	Install Kali or Backtrack Linux / Metasploitable/ Windows XP
2.	Practice the basics of reconnaissance.
3.	Using FOCA / Search Diggity tools, extract metadata and expanding the target list.
4.	Aggregates information from public databases using online free tools like Paterva's Maltego.
5.	Information gathering using tools likes Robtex.
6.	Scan the target using tools like Nessus.
7	View and capture network traffic using Wireshark.
8	Automate dig for vulnerabilities and match exploits using Armitage • Foca: http://www.informatica64.com/foca.aspx. • Nessus: http://www.tenable.com/products/nessus. • Wireshark: http://www.wireshark.org. • Armitage: http://www.fastandeasyhacking.com/. • Kali or Backtrack Linux, Metasploitable, Windows XP

Course Outcomes: At the end of the course, the students will be able to	
CO1	To express knowledge on basics of computer based vulnerabilities.
CO2	To gain understanding on different foot printing, reconnaissance and scanning methods.
CO3	To demonstrate the enumeration and vulnerability analysis methods.
CO4	To gain knowledge on hacking options available in Web and wireless applications.
CO5	To acquire knowledge on the options for network protection.

ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).

A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Laboratory	Lab Conduction & Record	Evaluating each expt. for 10 marks	20	50
	Laboratory Test -1	50	15	
	Laboratory Test -2	50	15	
SEE	Semester End Examination	100	50	50
Total Marks				100

SEMESTER END EXAMINATION (SEE)

1. SEE marks for the practical course are 50 Marks. Practical examinations are to be conducted between the schedules mentioned in the academic calendar of the Institution.
2. All laboratory experiments are to be included for practical examination.
3. Evaluation of test write-up, conduction procedure, result and viva will be conducted jointly by examiners.
4. Rubrics suggested for SEE, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks.
5. Change of experiment is allowed only once and 15% of Marks allotted to the Conduction procedure part are to be made zero. The minimum duration of SEE is 03 hours.

CO-PO Mapping:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3	1	-	-	-	-	2	2	2
CO2	3	3	3	1	-	-	-	-	2	2	2
CO3	3	3	2	2	-	-	-	-	1	3	3
CO4	3	2	2	2	-	-	-	-	1	3	3
CO5	3	2	2	1	-	-	-	-	1	3	3

Level 3 - High, Level 2 – Moderate, Level 1 - Low

Semester-V					
Big Data Analytics with Python Lab **Category: AEC-V**					
Course Code	:	**B24IC584**	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	0:0:2:0	SEE	:	50 Marks
Total Hours	:	30	Total	:	100 Marks
Credits	:	1	SEE Duration	:	3Hrs

Course Learning Objective is	
1.	To implement Map Reduce programs for processing big data.
2.	To realize storage of big data using MongoDB
3.	To analyze big data using machine learning techniques such as Decision tree

Sl. No	**Name of the Programs / List of the experiments**
1.	Install, configure and run python, numPy and Pandas.
2.	Install, configure and run Hadoop and HDFS.
3.	Visualize data using basic plotting techniques in Python
4.	Implement No SQL Database Operations: CRUD operations, Arrays using MongoDB.
5.	Implement Functions: Count – Sort – Limit – Skip – Aggregate using MongoDB.
6.	Implement word count / frequency programs using MapReduce.
7	Implement a MapReduce program that processes a dataset.
8	Implement clustering techniques using SPARK.
9	Implement an application that stores big data in MongoDB / Pig using Hadoop / R.
10.	Develop a MapReduce Programme to find the grades of students.
11.	Develop a MapReduce Programme to implement matrix multiplication.

Course Outcomes: At the end of the course, the students will be able to	
CO1	Learn to install & configuration
CO2	Learn to plot the graphs
CO3	Learn the database method like MongoDB
CO4	Learn to clustering and mapreduce
CO5	Learn to implement the real time applications

ASSESSMENT DETAILS BOTH (CIE AND SEE)

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A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE	**Type of Assessment**	**Max. Marks**	**Max. Marks Scaling Down to**	**Total Marks**
Laboratory	**Lab Conduction & Record**	**Evaluating each expt. for 10 marks**	**20**	**50**
	Laboratory Test -1	**50**	**15**	

	Laboratory Test -2	**50**	**15**	
SEE	**Semester End Examination**	**100**	**50**	**50**
Total Marks				**100**

SEMESTER END EXAMINATION (SEE)

1. SEE marks for the practical course are 50 Marks. Practical examinations are to be conducted between the schedules mentioned in the academic calendar of the Institution.
2. All laboratory experiments are to be included for practical examination.
3. Evaluation of test write-up, conduction procedure, result and viva will be conducted jointly by examiners.
4. Rubrics suggested for SEE, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks.
5. Change of experiment is allowed only once and 15% of Marks allotted to the Conduction procedure part are to be made zero. The minimum duration of SEE is 03 hours.

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PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
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CO2	3	3	3	1	-	-	-	-	2	2	2
CO3	3	3	2	2	-	-	-	-	1	3	3
CO4	3	2	2	2	-	-	-	-	1	3	3
CO5	3	2	2	1	-	-	-	-	1	3	3

Level 3 - High, Level 2 – Moderate, Level 1 - Low

Semester -V					
Mini - Project **Category: SDC**					
Course Code	:	**B24ICP511**	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	0:0:4:0	SEE	:	50 Marks
Total Hours	:	60	Total	:	100 Marks
Credits	:	2	SEE Duration	:	3 Hrs

Mini-Project Work Evaluation:

Mini Project is a hands on course that will provide a platform to students to enhance their practical knowledge and skills by the development of small applications etc. Based on the ability/abilities of the student/s and recommendations of the supervisor, a single discipline or a multidisciplinary Mini- project can be assigned to an individual student or to a group having not more than 4 students.

CIE procedure for Mini-project: (i) Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two faculty members of the Department, one of them being the Guide. The CIE marks awarded for the Mini-project work shall be based on the evaluation of the **Project Reviews, Project report and Viva-Voce in the ratio of 60:20:20**. The marks awarded for the project report shall be the same for all the batches mates.
(ii) Interdisciplinary: Continuous Internal Evaluation shall be group-wise at the college level with the participation of all the guides of the project.

CIE Evaluation: The CIE marks awarded for the Mini-project, shall be based on the evaluation of the **Project Reviews, Project report and Viva-Voce in the ratio of 60:20:20**. The marks awarded for the project report shall be the same for all the batches mates.

SEE Evaluation: SEE for project work will be conducted by the two examiners appointed by the Principal / CoE. The SEE marks awarded for the project work shall be based on the evaluation of **Write-up, Presentation Skills, Project Demonstration and Viva-Voce** in the ratio of 20:60:20

Rubrics for Mini-Project

Sl. No	**Criteria**	**Scale of Assessment**		
		Satisfactory (0-5)	**Good (6-8)**	**Excellent (9-10)**
1	Objective, Existing method with proposed method	Incomplete justification to the objectives proposed; Steps are mentioned but unclear; without justification to objectives	Good justification to the objectives; Methodology to be followed is specified but detailing is not done	All objectives of the proposed work are well defined. Steps to be followed to solve the defined problem are clearly specified.
2	Analysis/Description of the project	Incomplete explanation of the key concepts and in-sufficient description of the technical requirements of the project	Complete explanation of the key concepts but in-sufficient description of the technical requirements of the project	Complete explanation of the key concepts and strong description of the technical requirements of the project

3	Result Analysis	• All defined objectives are achieved. • Modules are working well in isolation and properly demonstrated • Modules of project are not properly integrated.	• All defined objectives are achieved. • Each module working well and properly demonstrated. • Integration of all modules not done and system working is not very satisfactory.	• All defined objectives are achieved. • Each module working well and properly demonstrated • All modules of project are well integrated and system working is accurate
4	Project Report	• Project report is according to the specified format but some mistakes. • In-sufficient references	• 1. Project report is according to the specified format. • References are appropriate but not mentioned well.	• Project report is according to the specified Format. • References are appropriate and well mentioned
5	Queries	Lacks sufficient knowledge and awareness	Fair knowledge and awareness related to the project.	Extensive knowledge and awareness related to the project

Semester-VI					
Blockchain Technology **Category: PCC**					
Course Code	:	**B24IC601**	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	2:2:0:2	SEE	:	50 Marks
Total Hours	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To understand basic concepts of blockchain.
2.	To provide knowledge about security mechanisms used in blockchain.
3.	To provide hands-on experience with the concepts

Module – 1	**No. of Hours**
Blockchain: Distributed systems, CAP theorem, Byzantine Generals problems, Consensus, Introduction to blockchain, various technical definitions of blockchains, Generic elements of a blockchain, The history of blockchain, Features of a blockchain, Applications of blockchain technology, Tiers of blockchain technology, Types of Blockchain Consensus in blockchain, CAP theorem and blockchain, Benefits and limitations of blockchain. SLT:	9
Module – 2	**No. of Hours**
Decentralization: Decentralization using blockchain, Blockchain and full ecosystem decentralization - Smart contract, organizations, autonomous organizations, autonomous corporations, autonomous societies, Platforms, Methods and Applications of decentralization. Cryptography and Technical Foundations: Mathematics, Cryptography, Cryptographic primitives: Symmetric cryptography, DES, AES.	9
Module – 3	**No. of Hours**
Cryptographic primitives: Asymmetric cryptography, Hash functions, Secure Hash Algorithms (SHAs), Merkle trees, Patricia trees, Distributed hash tables (DHTs), Digital signatures. Public and private keys- RSA.	9
Module – 4	**No. of Hours**
Bitcoin: Bitcoin definition, Transactions -life cycle, structure, Blockchain: The structure of a block, The structure of a block header, Wallets, Types of transaction Smart Contracts: History, Definition, Ricardian contracts.	9
Module – 5	**No. of Hours**
Ethereum 101: Introduction - Ethereum clients and releases, Ethereum blockchain, Elements of the Ethereum blockchain, Ethereum virtual machine (EVM)- Execution Environment, Accounts, Block, Ether, Messages, Mining, The Ethereum stack.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Understand the blockchain terminologies with its applications
CO2	Examine and apply the decentralization, asymmetric cryptographic primitives, and Bitcoin concept
CO3	Analyze the principles of Ethereum and its transactions in blockchain.
CO4	Apply ethical principles and demonstrate a private blockchain using Ethereum Tool.

ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	Internal Assessment-1	50	30 (Average of Best two Assessments)	50
	Internal Assessment-2	50		
	Internal Assessment-3	50		
AAT	Two Assessments as per regulations	20	20	
SEE	Semester End Examination	100	50	50
Total Marks				100

SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3	2	2	-	-	-	-	-	2
CO2	3	3	3	3	2	-	-	-	-	-	2
CO3	3	3	3	3	2	-	-	-	-	-	1
CO4	3	3	3	3	2	-	-	-	-	-	1
CO5	3	3	3	3	2	-	-	-	-	-	1

Level 3 - High, Level 2 - Moderate, Level 1 - Low

Semester-VI					
Cryptography and Network Security **Category: IPCC**					
Course Code	:	**B24IC602**	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	3:0:2:3	SEE	:	50 Marks
Total Hours	:	45+30	Total	:	100 Marks
Credits	:	4	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To explain the fundamental concepts of cryptography.
2.	To describe public key cryptography and message authentication
3.	To demonstrate the key distribution using Symmetric or Asymmetric encryption.
4.	To discuss security applications in the field of Information technology.

Module – 1	**No. of Hours**
Introduction: Security trends, The OSI Security Architecture, Security Attacks, Security Services and Security Mechanisms, A model for Network security. **Classical Encryption Techniques:** Overview of Symmetric Cipher Modes, Substitute Techniques, Transposition Techniques, and Stenography. **Introduction to Number Theory:** Prime Numbers, Fermat's and Euler's Theorem, Testing for Primality, The Chinese Remainder Theorem, Discrete logarithms.	9
Module – 2	**No. of Hours**
Symmetric Key Cryptography: Block Cipher Principles, Data Encryption Standards, Advanced Encryption Standards, Block Cipher Modes of Operation, Stream Cipher and RC4. **Public Key Cryptography:** Principles Public key crypto Systems, RSA algorithm, Key Management, Diffie Hellman Key Exchange, Overview of Elliptic Curve Cryptography.	9
Module – 3	**No. of Hours**
Message Authentication and Hash Functions: Authentication Requirement, Authentication Function, Message Authentication Code, List of Hash Function, Secure Hash Algorithm, HMAC, CMAC, an overview of Digital Signature.	9
Module – 4	**No. of Hours**
Authentication Application: Kerberos, X.509 Authentication Service, Public Key Infrastructure. **E-mail Security:** Pretty Good Privacy (PGP) and S/MIME.	9
Module – 5	**No. of Hours**
Ip Security: Overview, IP Security Architecture. System Security: Intrusion Detection, Overview of Packet Sniffing, Penetration testing, Database testing, DoS attacks. Password Management, Virus, and threats, Virus Countermeasures. **Firewalls:** The Need for Firewalls, Firewall Characteristics, Types of Firewalls.	9

LABORATORY

Practical Component of IPCC (12 Experiments)

Sl. No	**Name of the experiments**
1.	Write a C program that contains a string (char pointer) with a value\Hello World'. The programs should XOR each character in thisstring with 0 and display the result.
2.	Write a C program that contains a string (char pointer) with a value \Hello World'. The program should AND or and XOR each character in this string with 127 and display the result.
3.	Write a Java program to perform encryption and decryption using the following algorithms: i. Ceaser Cipher ii. Substitution Cipher iii. Hill Cipher
4.	Write a Java program to implement the DES algorithm logic.
5.	Write a C/JAVA program to implement the Blowfish algorithm logic.

6.	Write a Java program to implement RSA Algorithm
7.	Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.
8.	Calculate the message digest of a text using the SHA-1 algorithm in JAVA.
9.	Calculate the message digest of a text using the MD5 algorithm in JAVA
10.	Write the RC4 logic in Java Using Java Cryptography, encrypt text "Hello world" usingBlowfish. Create your own key using Java key tool.

Course Outcomes: At the end of the course, the students will be able to	
CO1	Identify the fundamental concepts of cryptography
CO2	Use symmetric and asymmetric key algorithms for cryptography
CO3	Apply the key distribution technique using Symmetric or Asymmetric encryption
CO4	Develop real-world security applications in the field of Information technology.
CO5	Understanding of Authentication functions the manner in which Message Authentication Codes and Hash Functions works.

Text Books	
1.	William Stallings, "Cryptography and Network Security Principles and Practice", Pearson, Sixth edition, 2013
2.	Behrouz A. Forouzan, "Cryptography and Network Security", McGraw Hill, 2007.

Reference Text Books	
1.	William Stallings, "Network Security Essentials Applications and Standards", Fourth edition, Prentice Hall, 2011.
2.	Joseph MiggaKizza," Guide to Computer Security, Springer Science & Media Inc., Third edition, 2015
3.	Andrew S.Tanenbaum, "Computer Networks", Pearson, Fifth edition, 2015.
4.	AtulKahate, "Cryptography and Network Security", McGraw Hill, 2013.

ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	**Internal Assessment-1**	**50**	**30** (Average of Best Two Assessments)	**50/2 = 25**
	Internal Assessment-2	**50**		
	Internal Assessment-3	**50**		
AAT	Any One Assessments as per regulations	**20**	**20**	
Laboratory	**Lab conduction & Record**	Evaluating each expt. for 10 marks.	**05**	**25**
	Internal Test	**50**	**20**	
Total Marks				**50**
SEE	**Semester End Examination**	**100**	**50**	**50**
Total marks				**100**

SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice. Students should answer five full questions, selecting one full question from each module.
5. Students have to answer for 100 marks and marks scored out of 100 shall be proportionally reduced to 50 marks.
6. The maximum marks from the practical component to be included in the SEE question paper is **16 marks.**
7. Question papers to be set as per the Blooms Taxonomy levels.
8. The laboratory component of the **integrated course** shall be CIE only. However, in SEE, the questions from the practical component shall be included.

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	2	2	1	-	-	-	-	-	-
CO2	3	2	3	1	2	-	-	-	-	-	-
CO3	3	1	2	2	3	-	-	-	-	-	-
CO4	3	2	2	1	1	-	-	-	-	-	-
CO5	3	2	3	2	1	-	-	-	-	-	-

Level 3 - High, Level 2 - Moderate, Level 1 - Low

Semester –VI					
Sensors and Actuators for IoT **Category: PEC-II**					
Course Code	:	**B24IC631**	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	3:0:0:3	SEE	:	50 Marks
Total Hours	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To overview of Sensors and Actuators applied in sensing, measurement and a comprehensive understanding of its uses in developing IoT based applications.
2.	To illustrate Analog and Digital sensor and its difference on IoT Applications.
3.	To demonstrate the knowledge on actuators and its interfacing with sensors.
4.	To impart reasonable level of competence in the design and development of building broad IoT Systems.

Module – 1	**No. of Hours**
Introduction: Difference between sensor, transmitter and transducer - Primary measuring elements - selection and characteristics: Range; resolution, Sensitivity, error, repeatability, linearity and accuracy, impedance, backlash, Response time, Dead band. Signal transmission - Types of signal: Pneumatic signal; Hydraulic signal; Electronic Signal. Role of Sensors and Actuators in IoT.	9
Module – 2	**No. of Hours**
Analog Sensors: Introduction to Analog Sensor, Sensor Types and Selection, Resistance-based sensors, Voltage-based sensors, Current-based sensors, Signal Conditioning-Voltage Divider, Amplifiers, Filters, A to D Conversion, Interfacing a LM35 temperature sensor to the Arduino Digital Sensors: Introduction to Digital Sensor, Analog versus Digital Sensing, Sensor Types and Selection, Advantages of Digital Sensors.	9
Module – 3	**No. of Hours**
Buttons and Switches: On/Off Devices, I2C Devices, SPI Devices, RS-232 Devices. Interfacing MLX90614 contact-free thermometer to an Arduino UNO. **Actuators -** Definition, types and selection of Actuators; linear; rotary; Logical and Continuous Actuators, Pneumatic actuator- Electro-Pneumatic actuator; cylinder, rotary actuators	9
Module – 4	**No. of Hours**
Mechanical Actuating System: Hydraulic Actuator - Control valves; Construction, Characteristics and Types, Selection criteria. Electrical actuating systems: Solid-state switches, Solenoids, Electric Motors- Principle of operation and its application: D.C motors - AC motors - Single phase & 3 Phase Induction Motor; Synchronous Motor; Stepper motors - Piezoelectric Actuator Controlling speed and direction of a DC motor with Arduino.	9
Module – 5	**No. of Hours**
Micro Sensors and Micro Actuators: Micro Sensors: Principles and examples, Force and pressure micro sensors, position and speed micro sensors, acceleration micro sensors, chemical sensors, biosensors, temperature micro sensors and flow micro sensors. Micro Actuators: Actuation principle, shape memory effects-one way, two way and pseudo elasticity. Types of micro actuators- Electrostatic, Magnetic, Fluidic, Inverse piezo effect, other principles.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Illustrate the fundamentals of Transmitter, Transducer and Sensors, Sensing and Sensor Devices, Actuators.
CO2	Summarize IoT architecture for sensor applications.
CO3	Build any IoT applications with interfacing Sensors.
CO4	Summarize Micro Sensors and Micro architectures for IoT Technology.
CO5	Evaluate IoT platforms using embedded systems.
CO6	Analyse the uses and risks related to IoT devices.

Text Books	
1.	Volker Ziemann, A Hands-On Course in Sensors Using the Arduino and Raspberry Pi, CRC Press, Taylor & Francis Group 2018.
2.	Clarence W. de Silva, Sensors and Actuators, CRC Press Taylor & Francis Group, Edition 3,2018
3.	Patranabis.D, "Sensors and Transducers", Wheeler publisher, 1994.
4.	Sergej Fatikow and Ulrich Rembold, " Microsystem Technology and Microbotics", First edition, Springer –Verlag NEwyork, Inc, 1997.

Reference Text Books	
1.	Jacob Fraden, "Hand Book of Modern Sensors: Physics, Designs and Application" Fourth edition, Springer, 2010.
2.	Robert H Bishop, "The Mechatronics Hand Book", CRC Press, 2002. 2. Thomas. G. Bekwith and Lewis Buck.N, Mechanical Measurements, Oxford and IBH publishing Co. Pvt. Ltd.,
3.	Massood Tabib and Azar, "Microactuators Electrical, Magnetic, thermal, optical, mechanical, chemical and smart structures", First edition, Kluwer academic publishers, Springer, 1997.

ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	**Internal Assessment-1**	**50**	**30 (Average of Best two Assessments)**	**50**
	Internal Assessment-2	**50**		
	Internal Assessment-3	**50**		
AAT	**Two Assessments as per regulations**	**20**	**20**	
SEE	**Semester End Examination**	**100**	**50**	**50**
Total Marks				**100**

SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	2	1	-	-	-	-	-	-
CO2	3	2	1	1	1	-	-	-	-	-	-
CO3	3	3	2	2	1	-	-	-	-	-	2
CO4	3	3	3	2	2	-	-	-	2	-	2
CO5	3	3	3	2	2	-	-	-	2	-	2
CO6	3	2	2	1	1	-	-	-	3	-	3

Level 3 - High, Level 2 - Moderate, Level 1 - Low

Semester -VI					
Cyber Law and Digital Forensics **Category: PEC-II**					
Course Code	:	**B24IC632**	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	3:0:0:3	SEE	:	50 Marks
Total Hours	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To study various cyber laws and exclusively Indian evidence law.
2.	To analyze the effectiveness of cyber laws in various aspects of cybercrimes.
3.	To illustrate the need for computer forensics and apply tools in use.
4	To examine the cyber law application under a real time scenario.
5	To overview the type of attacks and challenges in present scenario.

Module – 1	**No. of Hours**
Introduction: Cyber Space: Fundamental definitions -Interface of Technology and Law – Jurisprudence and-Jurisdiction in Cyber Space - Indian Context of Jurisdiction - Enforcement agencies – Need for IT act. **Uncitral** – E-Commerce basics. Information Technology Act, 2000 - Aims and Objects — Overview of the Act – Jurisdiction.	9
Module – 2	**No. of Hours**
Tcyber Crimes And Indian Evidence Law: Meaning of Cyber Crimes –Different Kinds of Cybercrimes – Cybercrimes under IPC, Cybercrimes under the Information Technology Act,2000 - Cybercrimes under International Law - Hacking Child Pornography, Cyber Stalking, Software Piracy, Violation of Privacy on Internet - Data Protection and Privacy – Indian Court cases.	9
Module – 3	**No. of Hours**
Introduction To Computer Forensics: Understanding computer forensics, computer forensics versus other related disciplines, A brief History of computer Forensics, understanding case laws, developing computer forensics resources, Preparing for computer investigations, Understanding law enforcement agency investigations, Following the legal process, Understanding corporate investigations, Establishing company policies, Displaying warning Banners.	9
Module – 4	**No. of Hours**
Current Computer Forensics Tools: Evaluating Computer Forensics Tool Needs, Types of Computer Forensics Tools, Tasks Performed by Computer Forensics Tools, Tool Comparisons, Other Considerations for Tools, Computer Forensics Software Tools	9
Module – 5	**No. of Hours**
Command: Line Forensics Tools, UNIX/Linux Forensics Tools, Other GUI Forensics Tools, Computer Forensics Hardware Tools, Forensic Workstations, Using a Write-Blocker.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	llustrate the basic interface of technology and cyber law.
CO2	Infer various cyber laws and cybercrimes under Indian evidence law.
CO3	Analyze the need for computer forensics.
CO4	Analyze the utility of the cyber laws in different aspects of cybercrimes.
CO5	Apply a few computers forensic tools to any applications.

Text Books	
1.	Nilakshi Jain , Ramesh Menon “Cyber Security and Cyber Laws” Willey Publishers, 1st Edition, October 2020.
2.	Pavan Duggal “Cyber Security Law” ,2nd Edition,2019.
3.	Bill Nelson, Amelia Phillips, Frank Enfinger, Christopher Steuart, ―Computer Forensics and Investigations‖, Cengage Learning, India Edition, 2016.
4.	Cory Altheide, Harlan Carvey, Digital Forensics with Open Source Tools, Syngress imprint of Elsevier.

Reference Text Books	
1.	Nhien-An Le-Khac , Kim-Kwang Raymond Choo "Cyber and Digital Forensic Investigations: A Law Enforcement Practitioner's Perspective" 2020 Edition
2.	MarjieT.Britz, ―Computer Forensics and Cyber Crime‖: An Introduction‖, 3rd Edition, Prentice Hall, 2013.
3.	Chris Bernhardt, "Quantum Computing for Everyone (The MIT Press)",2019.

ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	**Internal Assessment-1**	**50**	**30 (Average of Best two Assessments)**	**50**
	Internal Assessment-2	**50**		
	Internal Assessment-3	**50**		
AAT	**Two Assessments as per regulations**	**20**	**20**	
SEE	**Semester End Examination**	**100**	**50**	**50**
Total Marks				**100**

SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	1	1	-	-	-	-	3	-	-	-
CO2	1	1	1	-	-	-	-	3	-	-	-
CO3	1	1	2	-	-	-	-	3	-	-	-
CO4	1	1	2	1	-	2	-	3	-	-	-
C05	1	1	2	1	-	2	-	2	-	-	-

Level 3 - High, Level 2 - Moderate, Level 1 - Low

Semester -VI					
Principles of Cloud Computing **Category: PEC-II**					
Course Code	:	**B24IC633**	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	3:0:0:3	SEE	:	50 Marks
Total Hours	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course learning Objective is	
1.	To discuss the various Cloud computing service models like Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS).
2.	To explain the working of cloud computing technologies like datacenter technology, web technology, multitenant technology and service technology.
3.	To illustrate the use of various cloud computing mechanisms like load balancer, automated scaled listener, failover system in real world applications.
4.	To categorize the cloud technology architecture formalize various functional domains within cloud.

Module – 1	**No. of Hours**
Introduction To Cloud Computing: Origins and Influences; Basic Concepts and Terminology; Goals and Benefits; Risks and Challenges. Fundamental Concepts and Models: Roles and Boundaries; Cloud Characteristics; Cloud Delivery Models; Cloud Deployment Models.	9
Module – 2	**No. of Hours**
Cloud Computing Technologies: Broadband Networks and Internet Architecture; Data Center Technology; Virtualization Technology; Web Technology; Multitenant Technology; Service Technology; Case study. Cloud Infrastructure Mechanisms: Logical Network Perimeter; Virtual Server; Cloud Storage Device; Cloud Usage Monitor; Resource Replication; Ready-made environment.	9
Module – 3	**No. of Hours**
Specialized Cloud Mechanisms: Automated Scaling Listener; Load Balancer; SLA Monitor;Pay-per-use Monitor; Audit Monitor; Failover System; Hypervisor; Resource cluster; Multi-device Broker; State Management. Cloud Management Mechanisms: Remote Administration System; Resource Management System; SLA Management System; Billing Management System.	9
Module – 4	**No. of Hours**
Fundamental Cloud Architectures: Workload Distribution Architecture; Resource Pooling Architecture; Dynamic Scalability Architecture; Elastic Resource Capacity Architecture; Service Load Balancing Architecture; Cloud Bursting Architecture; Elastic Disk Provisioning Architecture; Redundant Storage Architecture.	9
Module – 5	**No. of Hours**
Fundamental Cloud Architectures: Workload Distribution Architecture; Resource Pooling Architecture; Dynamic Scalability Architecture; Elastic Resource Capacity Architecture; Service Load Balancing Architecture; Cloud Bursting Architecture; Elastic Disk Provisioning Architecture; Redundant Storage Architecture.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Identify basic requirements related to cloud computing technologies.
CO2	Compare and contrast different services of cloud computing viz. Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS).
CO3	Summarize the Broadband Networks and Internet Architecture used in cloud
CO4	Shows the working of cloud computing technologies like data center technology, virtualization technology, web technology, multitenant technology and service technology.
CO5	Illustrate the cloud technology architecture formalize various functional domains.

Text Books	
1.	Thomas Erl, Ricardo Puttini, ZaighamMahmood, “Cloud Computing: Concepts, Technology& Architecture”, PHI, 2019.Cloud Computing: Concepts, Technology & Architecture (pearsoncmg.com)

2.	Kai Hwang, Geoffrey C. Fox, Jack J Dongarra, "Distributed and Cloud Computing", MK, 2012.
3	Dan C. Marinescu, Cloud Computing: Theory and Practice, MK
4	Michael Miller," Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online", Que Publishing, August 2008.

Reference Text Books	
1.	RajkumarBuyya, James Broberg, AndrzejGoscinski, "Cloud Computing- Principles and Pradigms", Wiley.
2.	Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, "Cloud Computing, A practical approach", TATA McGraw HILL.
3.	DharanipragadaJanakiram," Grid and Cloud Computing", McGraw-Hill 2016.

ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	**Internal Assessment-1**	**50**	**30 (Average of Best two Assessments)**	**50**
	Internal Assessment-2	**50**		
	Internal Assessment-3	**50**		
AAT	**Two Assessments as per regulations**	**20**	**20**	
SEE	**Semester End Examination**	**100**	**50**	**50**
Total Marks				**100**

SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3	2	2	-	-	-	-	-	-
CO2	3	3	3	3	2	-	-	-	-	-	-
CO3	3	3	3	3	2	-	-	-	-	-	-
CO4	3	3	3	3	2	-	-	-	-	-	-
CO5	3	3	3	3	2	-	-	-	-	-	-

Level 3 - High, Level 2 - Moderate, Level 1 - Low

Semester –VI					
Security In IoT **Category: PEC**					
Course Code	:	**B24IC634**	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	3:0:0:3	SEE	:	50 Marks
Total Hours	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To learn about the security issues in IoT and cloud computing.
2.	To learn about the cryptography solutions and issues in IoT.
3.	To learn about the security measures taken in IoT and Cloud systems to improve security.

Module – 1	**No. of Hours**
Fundamentals Of Iot Ecosystem: IoT security issues, how to design an IoT system, Hardware, software and network security related to IoT systems - Basics of cryptographic solutions to IoT systems.	9
Module – 2	**No. of Hours**
Overview Of Cloud Computing and Its Services: Cloud Computing Fundamental: Cloud computing definition, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS.	9
Module – 3	**No. of Hours**
Challenges In Cloud Computing: Benefits and challenges of cloud computing - Public vs. Private clouds, Role of virtualization in enabling the cloud.	9
Module – 4	**No. of Hours**
Security Concepts In Context To Iot Devices: Security Concepts: Confidentiality, privacy, integrity, authentication, non-repudiation, Virtualization.	9
Module – 5	**No. of Hours**
Iot Security Threats and Countermeasures: System-Specific Attacks: Guest hopping, attacks on the VM (delete the VM, attack on the control of the VM, code or file injection into the virtualized file structure), VM migration attack, hyper jacking.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Understand the fundamental security issues in Internet of things.
CO2	Analyze different IoT Protocols and Layer Functioning.
CO3	Protect and secure the network connecting IoT devices to back-end systems on the internet.
CO4	different authentication mechanism such as digital certificates, biometrics, etc.
CO5	Demonstrate collecting, aggregating, monitoring, and normalizing data from IoT devices and providing actionable reporting and alerting on specific activities or when activities fall outside established policies.

Text Books	
1.	David Etter, " IoT Security: Practical guide book " Create Space, 1st Edition, 2016.
2.	Drew Van Duren, Brian Russell, "Practical Internet of Things Security", Packt, 1st Edition, 2016.
3.	Sean Smith, "The Internet of Risky Things", O'Reilly Media, 1st Edition, 2017.

Reference Text Books	
1.	Brian Russell, Drew Van Duren, "Practical Internet of Things Security: Design a security framework for an Internet connected ecosystem", 2nd Edition, 2018.

ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	Internal Assessment-1	50	30 (Average of Best two Assessments)	50
	Internal Assessment-2	50		
	Internal Assessment-3	50		
AAT	Two Assessments as per regulations	20	20	
SEE	Semester End Examination	100	50	50
Total Marks				100

SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	2	1	-	-	-	-	-	2
CO2	3	2	1	1	1	-	-	-	-	-	2
CO3	3	3	2	2	1	-	-	-	-	-	2
CO4	3	3	3	2	2	-	-	-	-	-	2
CO5	3	3	3	2	2	-	-	-	-	-	2

Level 3 - High, Level 2 - Moderate, Level 1 - Low

Semester –VI					
Introduction to Data Structures **Category: OEC-I**					
Course Code	:	**B24CS641**	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	3:0:0:3	SEE	:	50 Marks
Total Hours	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To introduce primitive and non-primitive data structures
2.	To understand the various types of data structure along their operations
3.	To study various searching and sorting algorithms
4.	To assess appropriate data structures during program development / problem solving

Module – 1	**No. of Hours**
Arrays: Introduction, One-Dimensional Arrays, Two-Dimensional Arrays, Initializing Two Dimensional Arrays, Multidimensional arrays. **Pointers:** Introduction, Pointer Concepts, Accessing Variables through Pointers, Pointer Applications, Dynamic Memory Allocation Functions. **Structures and Unions:** Introduction, Declaring Structures, Giving Values to Members, Structure Initialization, Comparison of Structure Variables, Arrays of Structures, Arrays within Structures, Nested Structures, Unions, Size of Structures.	9
Module – 2	**No. of Hours**
Stacks: Introduction, Stack Operations, Stack Implementation using Arrays, Applications of Stacks. **Queues:** Introduction, Queue Operations, Queue Implementation using Arrays, Different Types of Queues: Circular Queues, Double-Ended Queues, Priority Queues, Applications of Queues.	9
Module – 3	**No. of Hours**
Linked Lists: Introduction, Singly Linked List, Self-Referential Structures, Operations on Singly Linked Lists: Insert-Delete-Display, Implementation of Stacks and Queues using Linked List, Concatenate two Lists, Reverse a List without Creating a New Node, Static Allocation Vs Linked Allocation. Circular Singly Linked List: Introduction, Operations: Insert-Delete-Display.	9
Module – 4	**No. of Hours**
Trees: Introduction, Basic Concepts, Representation of Binary Trees, Operations on Binary Trees: Insertion-Traversals-Searching-Copying a Tree, Binary Search Trees, Operations on Binary Search Trees: Insertion-Searching-Find Maximum and Minimum Value-Count Nodes, Expression Trees.	9
Module – 5	**No. of Hours**
Sorting: Introduction, Bubble Sort, Selection Sort, Insertion Sort. Searching: Introduction, Linear Search, Binary Search.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Develop C programs utilizing fundamental concepts such as arrays, pointers and structures.
CO2	Apply data structures like stacks and queues to solve problems.
CO3	Develop C programs using linked lists and their various types.
CO4	Explain the fundamental concepts of trees and their practical applications.
CO5	Demonstrate different sorting and searching algorithms and determine their algorithmic complexities.

Text Books	
1.	E Balagurusamy, “C Programming and Data Structures”, 4th Edition, McGraw-Hill, 2007.
2.	A M Padma Reddy, “Systematic Approach to Data Structures using C”, 9th Revised Edition, Sri Nandi Publications, 2009.

Reference Text Books	
1.	Ellis Horowitz and Sartaj Sahni, “Fundamentals of Data Structures in C”, 2nd Edition, Universities Press, 2014.

2.	Seymour Lipschutz, "Data Structures Schaum's Outlines", Revised 1st Edition, McGraw-Hill, 2014.

ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	**Internal Assessment-1**	**50**	**30 (Average of Best two Assessments)**	**50**
	Internal Assessment-2	**50**		
	Internal Assessment-3	**50**		
AAT	**Two Assessments as per regulations**	**20**	**20**	
SEE	**Semester End Examination**	**100**	**50**	**50**
Total Marks				**100**

SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	1	2	-	1	-	1	-	-	-	-
CO2	3	1		-	-	-	-	-	-	-	-
CO3	1	3	2	-	-	-	-	1	-	-	-
CO4	2			-	-	-	-	-	-	-	-
CO5	1	2	3	-	-	-	-	-	-	-	-

Level 3 - High, Level 2 - Moderate, Level 1 - Low

Semester -VI					
Introduction to Cybersecurity **Category: OEC-I**					
Course Code	:	**B24IC642**	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	3:0:0:3	SEE	:	50 Marks
Total Hours	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To understand the cybercrime terminologies and perspectives.
2.	To understand Cyber Offenses and Botnets.
3.	To gain knowledge on tools and methods used in cybercrimes.
4.	To understand phishing and computer forensics.

Module - 1	**No. of Hours**
Introduction to Cybercrime: Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? Classifications of Cybercrimes, An Indian Perspective, Hacking and Indian Laws, Global Perspectives.	9
Module - 2	**No. of Hours**
Cyber Offenses: How Criminals Plan Them-Introduction, How criminals plan the attacks, Social Engineering, Cyber Stalking, Cybercafé & cybercrimes. **Botnets:** The fuel for cybercrime, Attack Vector.	9
Module - 3	**No. of Hours**
Tools and Methods used in Cybercrime: Introduction, Proxy Servers, Anonymizers, Phishing, Password Cracking, Key Loggers and Spy ways, Virus and Worms, Trozen Horses and Backdoors, Steganography, DoS and DDOS Attacks, Attacks on Wireless networks.	9
Module - 4	**No. of Hours**
Phishing and Identity Theft: Introduction, methods of phishing, phishing, phishing techniques, spear phishing, types of phishing scams, phishing toolkits and spy phishing, counter measures, Identity Theft.	9
Module - 5	**No. of Hours**
Understanding Computer Forensics: Introduction, Historical Background of Cyber forensics, Digital Forensics Science, Need for Computer Forensics, Cyber Forensics and Digital Evidence, Digital Forensic Life cycle, Chain of Custody Concepts, network forensics.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Understanding the concepts of cybercrime terminologies.
CO2	Understanding the Cyber offenses and Botnets.
CO3	Illustrate Tools and Methods used on Cybercrime.
CO4	Explain Phishing and Identity Theft.
CO5	Justify the need of computer forensics.

Text Books	
1.	Sunit Belapure and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives", Wiley India Pvt Ltd, ISBN: 978-81- 265-21791, 2011, First Edition (Reprinted 2018)

Web links and Video lectures (e-Resources)
https://www.youtube.com/watch?v=yC_hFm0BX28&list= PLxApjaSnQGi6Jm7LLSxvmNQjS_rt9swsu https://www.youtube.com/watch?v=nzZkKoREEGo&list= PL9ooVrP1hQOGPQVeapGsJCktzIO4DtI4_ https://www.youtube.com/watch?v=6wi5DI6du-4&list=PL_uaeekrhGzJlB8XQBxU3z hDwT95xlk https://www.youtube.com/watch?v=KqSqyKwVuA8

ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	**Internal Assessment-1**	**50**	**30 (Average of Best two Assessments)**	**50**
	Internal Assessment-2	**50**		
	Internal Assessment-3	**50**		
AAT	**Two Assessments as per regulations**	**20**	**20**	
SEE	**Semester End Examination**	**100**	**50**	**50**
Total Marks				**100**

SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	1	-	2	-	-	-	-	2	-
CO2	2	2	2	-	2	-	-	-	-	2	-
CO3	2	2	2	-	2	-	-	-	-	2	-
CO4	2	2	2	-	2	1	-	-	-	2	-
CO5	2	2	2	1	2	1	-	1	-	2	-

Level 3 - High, Level 2 - Moderate, Level 1 - Low

Semester-VI					
Fundamentals of Operating Systems **Category: OEC- I**					
Course Code	:	**B24CS643**	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	3:0:0:3	SEE	:	50 Marks
Total Hours	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objective is	
1	Explain the need and different types of OS.
2	Discuss suitable techniques for management of different resources.
3	Analyze different memory, storage, and file system management strategies.
4	To understand the concept of deadlocks and analyse the Memory Management Techniques.
5	Understand and familiar with virtual memory management and files.

Module - 1	**No. of Hrs**
Introduction: What operating systems do; Computer System organization; Computer System Organization, Computer System architecture; Operating System operations; Resource Management Operating System Structures: Operating System Services, User and Operating System interface; System calls, Application Program Interface, Types of system calls.	9
Module - 2	**No. of Hrs**
Process Management: Process concept; Process scheduling; Operations on processes; Inter process Communication Multi-threaded Programming: Overview; Multithreading models, Thread Libraries	9
Module - 3	**No. of Hrs**
CPU Scheduling: Basic Concepts, Scheduling criteria, Scheduling algorithms, Thread Scheduling, Process Synchronization: Synchronization: The critical section problem; Peterson's solution; Semaphores; Classical problems of synchronization.	9
Module - 4	**No. of Hrs**
Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock. Memory Management: Background; Contiguous memory allocation; Paging; Structure of page table.	9
Module - 5	**No. of Hrs**
Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement; File System Interface: File concept; Access methods; Directory Structure, Protection, File System Implementation: File System Structure, File System Operations, File System Internals: File Systems, File System Mounting; Partition and Mounting, File sharing;	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Explain the fundamentals of operating systems.
CO2	Apply appropriate CPU scheduling algorithm for the given scenarios.
CO3	Analyze the various techniques for process synchronization and deadlock handling.
CO4	Apply the various techniques for memory management.
CO5	Analyze the importance of File System Mounting and File Sharing.

Text Books	
1	Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts" II, 10th Edition, John Wiley and Sons Inc., 2018.
2	Andrew S Tanenbaum, "Modern Operating Systems", Pearson, 5th Edition, 2022 New Delhi.
Reference Text Books	
1	RamazElmasri, A. Gil Carrick, David Levine, "Operating Systems – A Spiral Approach", Tata McGraw Hill Edition, 2010.
2	William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, Prentice Hall,

	2018.
3	T V Geetha, "Understanding Natural Language Processing – Machine Learning and Deep Learning Perspectives", Pearson, 2024.
Web links and Video lectures (e-Resources)	
1.	https://archive.nptel.ac.in/courses/106/105/106105214/
2.	https://archive.nptel.ac.in/courses/106/102/106102132/

ASSESSMENT DETAILS BOTH (CIE AND SEE)

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CONTINUOUS INTERNAL EVALUATION (CIE)

CIE	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	**Internal Assessment-1**	**50**	**30 (Average of Best two Assessments)**	**50**
	Internal Assessment-2	**50**		
	Internal Assessment-3	**50**		
AAT	**Two Assessments as per regulations**	**20**	**20**	
SEE	**Semester End Examination**	**100**	**50**	**50**
Total Marks				**100**

SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

CO-PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	–	1	–	–	–	1	–	1
CO2	3	3	2	2	2	–	–	–	–	–	1
CO3	3	3	2	2	2	1	–	–	–	–	1
CO4	3	3	2	2	3	1	–	–	–	–	1
CO5	2	3	2	1	2	2	1	–	1	–	1

Level 3 - High, Level 2 - Moderate, Level 1 - Low

Semester-VI					
AI for Everyone **Category: OEC -I**					
Course Code	:	**B24AI644**	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	3:0:0:3	SEE	:	50 Marks
Total Hours	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To understand fundamental AI concepts in a non-technical, interdisciplinary context.
2.	To analyze the impact of AI on industries, business processes, and society.
3.	To understand the lifecycle and workflow of AI-driven projects.
4.	To examine ethical, legal, and societal challenges in AI systems.
5.	To identify practical AI applications across diverse domains.

Module –1	**No. of Hours**
Foundations of Artificial Intelligence: Overview of artificial intelligence, historical evolution, types of AI, including narrow and general AI, key concepts such as machine learning, deep learning, and data science, comparison between AI-driven systems and traditional programming, and broad applications of AI across industries.	9
Module –2	**No. of Hours**
AI in Business and Industry: Role of AI in digital transformation, applications in healthcare, finance, retail, manufacturing, and smart services, automation and workforce transformation, AI-enabled decision-making, introduction to data-driven organizations, and case studies illustrating successful AI adoption.	9
Module –3	**No. of Hours**
AI Project Lifecycle and Workflow: Problem identification and formulation for AI solutions, data collection and labeling, data preparation and feature understanding, model selection and evaluation, deployment considerations, interaction between technical and non-technical stakeholders, and an overview of commonly used AI tools and platforms.	9
Module –4	**No. of Hours**
Ethics, Bias, and Governance in AI: Ethical principles in AI, sources of bias in datasets and models, fairness and accountability, transparency and explainability, privacy and data protection, regulatory considerations, responsible AI development, and governance frameworks.	9
Module –5	**No. of Hours**
AI Applications and Future Trends: Applications of AI in natural language processing, computer vision, robotics, and recommendation systems. Introduction to generative AI, AI for sustainability and smart systems, emerging trends in AI, challenges, risks, and opportunities in widespread AI adoption.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Explain fundamental concepts and types of artificial intelligence.
CO2	Analyze the impact of AI on business processes and societal transformation.
CO3	Understand and describe the workflow of AI projects and data-driven problem solving
CO4	Evaluate ethical, legal, and social implications of AI technologies.
CO5	Identify and assess opportunities for applying AI in real-world scenarios.

Text Books	
1.	Andrew Ng, *AI for Everyone*, DeepLearning.AI, 2019.
2.	Ajay Agrawal, Joshua Gans, and Avi Goldfarb, *Prediction Machines: The Simple Economics of Artificial Intelligence*, Harvard Business Review Press, 2018.

Reference Text Books	
1.	Melanie Mitchell, *Artificial Intelligence: A Guide for Thinking Humans*, Farrar, Straus and Giroux, 2019.
2.	Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach*, 4th Edition, Pearson

	Education, 2020.
3.	Kai-Fu Lee, *AI Superpowers: China, Silicon Valley, and the New World Order*, Houghton Mifflin Harcourt, 2018.

ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	**Internal Assessment-1**	**50**	**30 (Average of Best two Assessments)**	**50**
	Internal Assessment-2	**50**		
	Internal Assessment-3	**50**		
AAT	**Two Assessments as per regulations**	**20**	**20**	
SEE	**Semester End Examination**	**100**	**50**	**50**
Total Marks				**100**

SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	1	1	-	1	-	1	-	1
CO2	2	3	2	2	2	2	1	1	2	1	1
CO3	2	3	3	2	2	-	1	1	2	1	1
CO4	1	3	2	3	3	2	2	1	2	1	2
CO5	1	2	2	2	3	2	3	1	2	1	2

Level 3 - High, Level 2 - Moderate, Level 1 - Low

Semester-VI					
Blockchain Technology Lab **Category: PCCL**					
Course Code	:	**B24IC605L**	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	0:0:2:0	SEE	:	50 Marks
Total Hours	:	30	Total	:	100 Marks
Credits	:	1	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To understand basic concepts of blockchain.
2.	To provide knowledge about security mechanisms used in blockchain.
3.	To provide hands-on experience with the concepts.

Sl. No.	**Title of the program / list of the experiment**
1.	Generate public and private key using OpenSSL.
2.	To Create a simple Blockchain using Python.
3.	Develop and test smart contract on local Blockchain.
4.	Develop and test smart contract on Ethereum test networks.
5.	Design and develop Cryptocurrency for multiple user using python.
6.	Write and deploy chain code in Hyperledger Fabric.
7.	Write a smart contract using a solidity program to perform the balance transfer from contract to other accounts.
8.	To perform token Creation and Management on Ethereum.
9.	Setup Metamask in the System and Create a wallet in the Metamask with Test Network.
10.	Implement blockchain in Merkle Trees.
11.	Create multiple accounts in metamask and perform the balance transfer between the accounts and describe the transaction specification.
12.	Generate public and private key using Open SSL.

Course Outcomes: At the end of the course, the students will be able to	
CO1	To learn the basic concepts of blockchain.
CO2	To know the knowledge about security mechanisms used in blockchain.
CO3	To provide hands-on experience with the concepts

ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).

A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Laboratory	Lab Conduction & Record	Evaluating each expt. for 10 marks	20	50
	Laboratory Test -1	50	15	
	Laboratory Test -2	50	15	
SEE	Semester End Examination	100	50	50
Total Marks				100

SEMESTER END EXAMINATION (SEE)

1. SEE marks for the practical course are 50 Marks. Practical examinations are to be conducted between the schedules mentioned in the academic calendar of the Institution.
2. All laboratory experiments are to be included for practical examination.
3. Evaluation of test write-up, conduction procedure, result and viva will be conducted jointly by examiners.
4. Rubrics suggested for SEE, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks.
5. Change of experiment is allowed only once and 15% of Marks allotted to the Conduction procedure part are to be made zero. The minimum duration of SEE is 03 hours.

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	1	1	-	-	-	3	2	3
CO2	1	3	2	2	2	-	-	-	3	2	2
CO3	3	2	1	2	1	-	-	-	2	3	1
CO4	3	3	1	2	1	-	-	-	1	3	2
CO5	3	3	3	3	2	-	-	-	1	2	3

Level 3 – High, Level 2 – Moderate, Level 1 -Low

Semester-VI					
Sensors and Actuators Lab **Category: AEC-VI**					
Course Code	:	**B24 IC681**	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	0:0:2:0	SEE	:	50 Marks
Total Hours	:	30	Total	:	100 Marks
Credits	:	1	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To understand Transducer Principles: Grasp the physical, and electrical laws that govern energy conversion in various sensors (e.g., temperature, strain, pressure) and actuators (e.g., motors, relays)
2.	To signal Conditioning and Interfacing: Design and build circuits to amplify, filter, and convert raw sensor signals into readable digital data using platforms like Arduino or Raspberry Pi.
3.	To system Characterization: Evaluate the static and dynamic characteristics of sensing systems, including sensitivity, accuracy, resolution, and linearity.

Sl. No.	**Title of the program / list of the experiment**
1.	Temperature Measurement using LM35 Sensor
2.	Human Movement Detection Using PIR Sensor
3.	PWM Generation Using Arduino
4.	Proximity Sensing Using IR Sensor
5.	Drive LED Using Transistor Driver Circuit
6.	Audio Signal Amplification Using LM741
7.	DC Motor Speed Control Using PWM
8.	Interfacing 12V Relay with Arduino
9.	Controlling Servo Motor

Course Outcomes: At the end of the course, the students will be able to	
CO1	Able to understand the types, working and characteristics of different sensors, actuators and Transducers.
CO2	Able to perform different sensors and Actuators on Arduino-UNO board
CO3	Able to perform different sensors and Actuators on Raspberry-Pi

ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).

A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Laboratory	Lab Conduction & Record	Evaluating each expt. for 10 marks	20	50
	Laboratory Test -1	50	15	
	Laboratory Test -2	50	15	
SEE	Semester End Examination	100	50	50
Total Marks				100

SEMESTER END EXAMINATION (SEE)

1. SEE marks for the practical course are 50 Marks. Practical examinations are to be conducted between the schedules mentioned in the academic calendar of the Institution.
2. All laboratory experiments are to be included for practical examination.
3. Evaluation of test write-up, conduction procedure, result and viva will be conducted jointly by examiners.
4. Rubrics suggested for SEE, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks.
5. Change of experiment is allowed only once and 15% of Marks allotted to the Conduction procedure part are to be made zero. The minimum duration of SEE is 03 hours.

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	3	2	-	-	-	1	1	-
CO2	2	2	3	3	2	-	-	-	1	1	-
CO3	2	1	2	2	3	-	-	-	1	2	-

Level 3 – High, Level 2 – Moderate, Level 1 -Low

Semester-VI					
Digital Forensics Lab **Category: AEC-VI**					
Course Code	:	**B24 IC682**	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	0:0:2:0	SEE	:	50 Marks
Total Hours	:	30	Total	:	100 Marks
Credits	:	1	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To understand the principles and processes of cyber forensics and the role of digital evidence in investigations.
2.	To gain expertise in operating system forensics, including Windows, Linux, and Mac OS.
3.	To investigate forensic techniques for web attacks, emails, and solid-state devices.

Sl. No.	**Title of the program / list of the experiment**
1.	Study of Computer Forensics and different tools used for forensic investigation.
2.	Live Forensics Case Investigation using Autopsy.
3.	How to Recover Deleted Files using Forensics Tools.
4.	Find Last Connected USB on your system (USB Forensics)
5.	How to View Last Activity of Your PC.
6.	How to Extracting Browser Artifacts.
7.	Comparison of two Files for forensics investigation by Compare IT software.
8.	How to Collect Email Evidence in Victim PC.
9.	Study the steps for hiding and extract any text file behind an image file/ Audio file using Command Prompt.
10.	How to Extract Exchangeable image file format (EXIF) Data from Image Files using Exif reader Software.

Course Outcomes: At the end of the course, the students will be able to	
CO1	Concepts and processes in cyber forensics and digital evidence handling.
CO2	Analyze forensic artifacts across various operating systems and network environments.
CO3	Investigate and trace evidence related to web attacks, email crimes, and SSDs.

ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).

A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE	**Type of Assessment**	**Max. Marks**	**Max. Marks Scaling Down to**	**Total Marks**
Laboratory	**Lab Conduction & Record**	**Evaluating each expt. for 10 marks**	**20**	**50**
	Laboratory Test -1	**50**	**15**	
	Laboratory Test -2	**50**	**15**	

SEE	**Semester End Examination**	**100**	**50**	**50**
Total Marks				**100**

SEMESTER END EXAMINATION (SEE)

1. SEE marks for the practical course are 50 Marks. Practical examinations are to be conducted between the schedules mentioned in the academic calendar of the Institution.
2. All laboratory experiments are to be included for practical examination.
3. Evaluation of test write-up, conduction procedure, result and viva will be conducted jointly by examiners.
4. Rubrics suggested for SEE, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks.
5. Change of experiment is allowed only once and 15% of Marks allotted to the Conduction procedure part are to be made zero. The minimum duration of SEE is 03 hours.

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	2	2	2	-	-	-	2	-	-
CO2	2	2	2	1	1	-	-	-	2	-	-
CO3	2	1	1	1	1	-	-	-	1	-	-

Level 3 – High, Level 2 – Moderate, Level 1 -Low

Semester-VI					
Industrial Cyber Security Lab **Category: AEC-VI**					
Course Code	:	**B24 IC683**	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	0:0:2:0	SEE	:	50 Marks
Total Hours	:	30	Total	:	100 Marks
Credits	:	1	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To demonstrate network traffic analysis and intrusion detection
2.	To understand security for ICS and PLC environments.
3.	To gain knowledge on configuration files for firewalls and Web systems
4.	To conduct experiments for Incident Response Simulation and risk assessment.

Sl. No.	**Title of the program / list of the experiment**
1.	Network Traffic Analysis in ICS/SCADA Systems Scenario: A manufacturing plant experiences intermittent communication issues between its SCADA system and field devices. IT suspects abnormal traffic patterns are overwhelming the network. Objective: Use Wireshark to capture and analyze network traffic to detect anomalies such as unauthorized Modbus commands or excessive network scanning. Tools : Wireshark Deliverables: A detailed report of the traffic analysis, highlighting malicious or unusual traffic patterns and recommendations for mitigation.
2.	Configuring and Testing an Intrusion Detection System (IDS) Scenario: An oil refinery has deployed an IDS in its control room but has not tested its effectiveness. Simulated attacks are needed to evaluate the IDS's detection capability. Objective: Configure Snort with custom rules to detect unauthorized login attempts, PLC command injections, or DoS attacks on the refinery's network. Tools: Snort Deliverables: A configured IDS, attack simulation results, and a performance evaluation report.
3.	Vulnerability Assessment of a Simulated ICS Network Scenario: A power plant is transitioning to a new ICS network. The cybersecurity team must perform a vulnerability assessment before the network goes live. Objective: Scan the simulated ICS network for open ports, outdated software, and misconfigurations. Tools: Nmap, OpenVAS Deliverables: A vulnerability assessment report listing critical issues, potential exploitation risks, and suggested fixes.
4.	Securing a PLC Environment Scenario: A water treatment facility reports unauthorized access to its PLCs, leading to erroneous water treatment settings. Students are tasked to secure the PLC environment. Objective: Simulate unauthorized PLC access, implement secure configurations, and monitor PLC traffic for anomalies. Tools: OpenPLC, Wireshark Deliverables: A secured PLC configuration and a log of identified unauthorized commands.
5.	Simulating Cyber Attacks on ICS and Designing Defenses Scenario: An attacker compromises an engineering workstation and uses it to issue malicious commands to ICS devices. Students must simulate this attack and propose defenses. Objective: Perform simulated attacks such as PLC logic manipulation and denial-of-service, then implement measures like firewall rules or intrusion prevention systems. Tools: Metasploit Framework, Security Onion Deliverables: A report describing the attack, its impact, and the defense mechanisms implemented.
6.	Web Application Security for Industrial Systems Scenario: The web-based interface of a chemical plant's ICS is suspected to have vulnerabilities that attackers could exploit to alter chemical mix ratios. Objective: Conduct a security assessment of the web interface for vulnerabilities like SQL injection, crosssite scripting, and improper authentication mechanisms. Tools: OWASP ZAP Deliverables: A vulnerability scan report with remediation recommendations for the ICS web application.

7.	Firewall and Access Control Configuration for ICS Scenario: An unauthorized laptop connects to the ICS network at a steel factory and issues shutdown commands to operational systems. Objective: Implement access control policies and configure firewalls to block unauthorized devices and restrict communication to trusted sources. Tools: pfSense, ModSecurity Deliverables: Firewall and access control configuration files, along with a report on unauthorized device mitigation.
8.	Risk Assessment and Mitigation Planning for ICS Scenario: A renewable energy plant wants to evaluate cybersecurity risks before connecting its wind turbines to the grid. Objective: Conduct a risk assessment considering hardware vulnerabilities, communication protocols, and environmental factors. Propose a mitigation plan. Tools: Custom scripts, risk assessment frameworks Deliverables: A comprehensive risk assessment report and a prioritized mitigation strategy
9.	Securing ICS Protocols and Communication Channels Scenario: A logistics company faces unauthorized Modbus/TCP communication between its control system and conveyor belt motors, disrupting operations. Objective: Configure secure communication using encryption and analyze normal vs. malicious protocol traffic. Tools: OpenSSL, Wireshark Deliverables: Secured Modbus/TCP communication setup and a comparative analysis of traffic logs.

Course Outcomes: At the end of the course, the students will be able to	
CO1	Experiment with network traffic analysis and intrusion detection.
CO2	Demonstrate ICS and PLC environment security.
CO3	Develop configuration files for firewall and Web systems.
CO4	Experiment with risk assessment and incident response in ICS environment

ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).

A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Laboratory	**Lab Conduction & Record**	**Evaluating each expt. for 10 marks**	**20**	**50**
	Laboratory Test -1	**50**	**15**	
	Laboratory Test -2	**50**	**15**	
SEE	**Semester End Examination**	**100**	**50**	**50**
Total Marks				**100**

SEMESTER END EXAMINATION (SEE)

1. SEE marks for the practical course are 50 Marks. Practical examinations are to be conducted between the schedules mentioned in the academic calendar of the Institution.
2. All laboratory experiments are to be included for practical examination.
3. Evaluation of test write-up, conduction procedure, result and viva will be conducted jointly by examiners.
4. Rubrics suggested for SEE, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks.
5. Change of experiment is allowed only once and 15% of Marks allotted to the Conduction procedure part are to be made zero. The minimum duration of SEE is 03 hours.

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	3	3	-	-	-	1	1	-
CO2	3	2	3	3	2	-	-	-	1	1	-
CO3	3	2	2	2	3	-	-	-	1	2	-

Level 3 – High, Level 2 – Moderate, Level 1 -Low

Semester-VI					
AI for IoT Lab **Category: AEC-VI**					
Course Code	:	**B24 IC684**	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	0:0:2:0	SEE	:	50 Marks
Total Hours	:	30	Total	:	100 Marks
Credits	:	1	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To fundamentals of numpy, pandas, matplotlib
2.	To fundamentals of machine learning, regression and decision tree learning, cluster analysis
3.	To fundamentals of instance based learning, Bayesian learning and deep learning
4.	To convolutional neural network, recursive neural networks and deep learning application

Sl. No.	**Title of the program / list of the experiment**
1.	Programs on Numpy: Numpy array and operations on arrays(indexing, masking, filtering, transposing, sorting, ordering, concatenating and aggregating)
2.	a. install and setup pandas and matplotlib environment b. programs on pandas: i. create a series from an n-d array. ii. read data from various files(.csv,xsl etc) using pandas iii. indexing and selecting data iv. data frame
3.	Note: consider your own data set or download public data set of machine learning Use the following scenarios for visualizing the data: a. Budget a long drive b. Compare unemployment rates with gains in stock market c. Compare salaries of batsmen with the average runs they c=score per game d. Compare the dates in a month with monthly salary i. Develop a program to draw a simple line plot ii. Develop a program to draw a histogram plot iii. Customize plots and experiment with different maps plots
4.	a. Develop a python code using machine learning clustering algorithm b. installation of keras, tensorflow, scikit-learning and data visualization libraries consider your own examples or ideas to develop a python code using neural networks (examples ideas are image recognition, object detection, image classification etc)
5.	Demonstrate convolutional neural networks with suitable example
6.	Develop python code to demonstrate CNN algorithm with suitable example
7.	Develop python code to demonstrate RNN algorithm with suitable example
8.	Demonstrate the handling video and audio files with suitable example

Course Outcomes: At the end of the course, the students will be able to	
CO1	Develop python code for implementing numpy, pandas, matplot lib libraries
CO2	Develop python code for implementing regression and cluster analysis algorithm use in IoT applications
CO3	Develop python code for implementing CNN, RNN and image processing application used in IoT application

ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).

A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Laboratory	**Lab Conduction & Record**	**Evaluating each expt. for 10 marks**	**20**	**50**
	Laboratory Test -1	**50**	**15**	
	Laboratory Test -2	**50**	**15**	
SEE	**Semester End Examination**	**100**	**50**	**50**
Total Marks				**100**

SEMESTER END EXAMINATION (SEE)

1. SEE marks for the practical course are 50 Marks. Practical examinations are to be conducted between the schedules mentioned in the academic calendar of the Institution.
2. All laboratory experiments are to be included for practical examination.
3. Evaluation of test write-up, conduction procedure, result and viva will be conducted jointly by examiners.
4. Rubrics suggested for SEE, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks.
5. Change of experiment is allowed only once and 15% of Marks allotted to the Conduction procedure part are to be made zero. The minimum duration of SEE is 03 hours.

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	2	2	2	-	-	1	1	1	-
CO2	2	2	2	2	2	-	-	1	1	1	-
CO3	2	2	2	2	2	-	-	1	1	1	-
CO4	2	2	2	2	2	-	-	1	1	1	-

Level 3 – High, Level 2 – Moderate, Level 1 -Low

MOOGAMBIGAI CHARITABLE AND EDUCATIONAL TRUST

Rajarajeswari College of Engineering

(An Autonomous Institution under Visvesvaraya Technological University, Belagavi)
#14, Ramohalli Cross, Kumbalagodu, Mysore Road, Bengaluru–560074

Common Courses

V & VI Semester

UG – B.E (2024 Scheme)

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5.	B24IKK610	Indian Knowledge System	12
6.	B24NCK591/691	National Service Scheme (NSS)	14
7.	B24NCK592/692	National Cadet Corps (NCC)	16
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Semester-V					
Biology for Engineers **Category: BSC** **(Common to All)**					
Course Code	:	**B24BEK507**	CIE	:	50 Marks
Teaching Hours L : T : P : S	:	2:0:0:2	SEE	:	50 Marks
Total Hours	:	30	Total	:	100 Marks
Credits	:	2	SEE Duration	:	2 Hrs

Course Learning Objective is	
1.	To familiarize the students with the basic biological concepts and their engineering applications.
2.	To enable the students with an understanding of biodesign principles to create novel devices and structures.
3.	To provide the students an appreciation of how biological systems can be re-designed as substitute products for natural systems.
4.	To motivate the students to develop interdisciplinary vision of biological engineering.

Module– 1	**No. of Hours**
Introduction to Biology: The cell: the basic unit of life, Structure and functions of a cell. The Plant Cell and animal cell, Prokaryotic and Eukaryotic cell, Stem cells and their application. **Biomolecules:** Properties and functions of Carbohydrates, Nucleic acids, proteins, lipids. Importance of special biomolecules; Enzymes (Classification (with one example each), Properties and functions), vitamins and hormones.	6
Module– 2	**No. of Hours**
Application of Biomolecules: Carbohydrates in cellulose-based water filters production, PHA and PLA in bio plastics production, Nucleic acids in vaccines and diagnosis, Proteins in food production.	6
Module– 3	**No. of Hours**
Adaptation of Anatomical Principles for Bioengineering Design: Brain as a CPU system. Robotic arms for prosthetics. Engineering solutions for Parkinson's disease. Eye as a Camera system, bionic eye. Heart as a pump system, pace makers, defibrillators. Lungs as purification system, Heart-lung machine. Kidney as a filtration system, dialysis systems.	6
Module– 4	**No. of Hours**
Nature-Bioinspired Materials and Mechanisms: Echolocation, Photosynthesis. Bird flying, Lotus leaf effect, Shark skin, Kingfisher beak. Human Blood substitutes - hemoglobin-based oxygen carriers (HBOCs) and perflourocarbons (PFCs).	6
Module– 5	**No. of Hours**
Trends in Bioengineering: DNA origami and Biocomputing, Bioprinting techniques and materials. Bioimaging and Artificial Intelligence for disease diagnosis. Bioconcrete. Biomining.	6

Course Outcomes: At the end of the course, the students will be able to	
CO1	Elucidate the basic biological concepts via relevant industrial applications and case studies.
CO2	Evaluate the principles of design and development, for exploring novel bioengineering projects.
CO3	Corroborate the concepts of biomimetics for specific requirements.
CO4	Think critically towards exploring innovative biobased solutions for socially relevant problems.

Text Books	
1.	Biology for Engineers, Rajendra Singh C and Rathnakar Rao N, Rajendra Singh C and Rathnakar Rao N Publishing, Bengaluru, 2023.
2.	Human Physiology, Stuart Fox, Krista Rompolski, McGraw-Hill eBook. 16th Edition, 2022

Web links and Video Lectures (E-Resources)

- https://nptel.ac.in/courses/121106008
- https://freevideolectures.com/course/4877/nptel-biology-engineers-other-non-biologists
  https://ocw.mit.edu/courses/20-020-introduction-to-biological-engineering-design-spring-2009

• https://ocw.mit.edu/courses/20-010j-introduction-to-bioengineering-be-010j-spring-2006 • https://www.coursera.org/courses?query=biology	
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning	
1.	Group Discussion of Case studies.
2.	Model Making and seminar/poster presentations.
3.	Design of novel device/equipment like Cellulose-based water filters, Filtration system.

ASSESSMENT DETAILS (BOTH CIE AND SEE)

The assessment in each course is divided equally between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage. To qualify and become eligible to appear for SEE, in the CIE, a student must score at least 40% of 50 marks, i.e., 20 marks. To pass the SEE, a student must score at least 35% of 50 marks, i.e., 18 marks. Notwithstanding the above, a student is considered to have passed the course, provided the combined total of CIE and SEE is at least 40 out of 100 marks.

CONTINUOUS INTERNAL EVALUATION (CIE):

CIE	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	**Internal Assessment1**	**50**	**30 (Average of Best two Assessments)**	**50**
	Internal Assessment2	**50**		
	Internal Assessment3	**50**		
AAT	**Any Two Assessments as per Regulations**	**20**	**20**	
SEE	**Semester End Examination**	**50**	**50**	**50**
Total Marks				**100**

SEMESTER END EXAMINATION (SEE):

1. The Question paper shall be set for 50 marks and duration of SEE is 2 Hours.
2. Two questions of 10 marks (with minimum two sub questions) from each module with internal choice.
3. Students should answer five full questions, selecting one full question from each module.
4. Mention COs, POs, Bloom's Taxonomy levels in the question paper.

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO8	PO11
CO1	1	-	-	-	-	1	1	-	1	1	1
CO2	1	-	-	-	-	1	-	1	-	1	1
CO3	1	-	-	-	-	1	-	1	-	1	1
CO4	1	-	-	-	-	1	2	-	2	1	1
CO5	1	-	-	-	-	1	2	2	1	2	1

Level 3 - High, Level 2 - Moderate, Level 1 - Low

Semester-V					
Environmental Science and E-Waste Management **Category: NCMC** **(Common to All)**					
Course Code	:	**B24ESK510**	CIE	:	100 Marks
Teaching Hours L : T : P : S	:	2:0:0:0	SEE	:	-
Total Hours/Semester	:	30	Total	:	100 Marks
Credits	:	PP	SEE Duration	:	-

Course Learning Objective is	
1.	To identify the major challenges of environment issues.
2.	To develop skills, critical thinking and demonstrate socio-economic skills for Environmental protection.
3.	To analyze the impact of issues w. r. t. waste management.

Module– 1	**No. of Hours**
Ecosystem and Sustainability: Ecosystems: Structure of Ecosystem, Types: Forest, Desert, Wetlands, Riverine, Oceanic ecosystems. **Sustainability:** 17SDG targets and possible actions.	6
Module– 2	**No. of Hours**
Natural Resources and Energy: Natural Resources: Water resources-Availability & Quality aspects, Water borne diseases & water induced diseases, Fluoride problem in drinking water. **Energy:** Different types of energy, Conventional sources & Non-Conventional sources of energy, solar energy. Wind energy, Hydrogen as an alternative energy.	6
Module– 3	**No. of Hours**
Environmental Pollution: Water Pollution, Noise pollution, Air pollution (Sources, Impacts, Preventive measures and public Health Aspects. **Global Environmental Concerns (Concept, policies and case-studies):** Ground water depletion/recharging, Climate Change; Acid Rain; Ozone Depletion; Radon and Fluoride problem in drinking water; Resettlement and rehabilitation of people, Environmental Toxicology.	6
Module– 4	**No. of Hours**
Waste management: Solid Waste Management, types and sources, functional elements of SWM, Biomedical Waste Management-Sources, Characteristics. **Environmental Legislation:** Solid Waste Management Rules, 2016, Biomedical Waste Management Rules, 2016.	6
Module– 5	**No. of Hours**
E-Waste Management: E-waste; composition and generation. Global context in e-waste; E-Waste pollutants, E-waste hazardous properties, Effects of pollutant (E-waste) on human health and surrounding environment, domestic e-waste disposal, Basic principles of E waste management, Component of E Waste management. E-waste (Management and Handling) Rules, 2011; and E-waste (Management) Rules, 2022-Salient Features and its implications.	6

Course Outcomes: At the end of the course, the students will be able to	
CO1	Comprehend the principles of ecology and environmental issues pertaining to air, land and water on a global scale.
CO2	Acquire observation skills for solving problems related to the environment.
CO3	Conduct survey to describe the realities of waste management system.

Text Books	
1.	S M Prakash, "Environmental Studies" 3rd Edition, Elite Publishing House, Mangalore, 2018.
2.	Hester R.E., and Harrison R.M, Electronic Waste Management. Science, 2009.

Reference Text Books	
1.	Benny Joseph (2005), "Environmental Studies" , Tata McGraw – Hill Publishing Company Limited.
2.	Johri R., E-waste: implications, regulations, and management in India and current global best practices, TERI Press, New Delhi.

Web links and Video Lectures (e-Resources):	
1.	https://www.youtube.com/playlist?list=PLXTQoJ3yDR1Tp9O8R7RZGmm_GdheHqM2w
3.	https://sdgs.un.org/goals
4.	https://kspcb.karnataka.gov.in/waste-management/biomedical-waste
5.	E Waste (Management) Rules, 2022: https://kspcb.karnataka.gov.in/sites/default/files/inlinefiles/ E%20Waste%20%28Management%29%20Rules%2C%202022.pdf

ASSESSMENT DETAILS (CIE only)

The weightage of Continuous Internal Evaluation (CIE) is 100%. The minimum passing mark for the CIE is 40% of the maximum marks (40 marks out of 100).

CONTINUOUS INTERNAL EVALUATION (MCQs)

CIE	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	**Internal Assessment-1**	**50**	**50 (Average of Best two Assessments)**	**100**
	Internal Assessment-2	**50**		
	Internal Assessment-3	**50**		
AAT	**Two Assessments as per Regulations**	**50**	**50**	
Total Marks				**100**

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	0	0	0	0	3	2	0	0	0	0
CO2	0	0	0	0	0	1	1	0	0	0	1
CO3	0	0	0	0	0	2	2	0	0	0	2

Level 3 - High, Level 2 - Moderate, Level 1 - Low

Semester-V					
Research Methodology & IPR (RMIPR) **Category: AEC**					
Course Code	:	**B24RMK606**	CIE	:	50 Marks
Teaching Hours L:T: P : S	:	1 : 0 : 0 : 3	SEE	:	50 Marks
Total Hours/Semester	:	15	Total	:	100 Marks
Credits	:	1	SEE Duration	:	1 Hours

Course Learning Objective is	
1.	To understand the fundamentals of research, types of research methodologies, and ethical practices involved in engineering research.
2.	To develop the ability to conduct effective literature review, technical reading, and identify research gaps for problem formulation.
3.	To design research methodologies, apply appropriate sampling techniques, and perform data collection and hypothesis testing.
4.	To analyze, interpret, and present research findings through structured technical reports and research papers using standard tools and formats.
5.	To understand Intellectual Property Rights (IPR), patenting processes, and their role in innovation, society, and sustainable development.

Module – 1	**No. of Hours**
Introduction to Research & Research Methodology: Meaning, Objectives of Engg. Research & Characteristics of good research, Research Methods v/s Research Methodology, Types of engineering research, Descriptive v/s Analytical, Applied v/s Fundamental, Quantitative v/s Qualitative, Conceptual v/s Empirical, Research, Criteria of good research, Developing a research plan, Ethics & plagiarism in Engineering Research with Research Practice for different types of Research Misconducts, Case Study and Practice Sessions	3
Module – 2	**No. of Hours**
Literature Review and Technical Reading: What is literature review or survey, New & Existing Knowledge, Bibliographic Databases, Search Engines, Google & Google Scholar, Effective Search, Conceptualizing Research Reviews, Gaps in research, Critical and Creative Reading, Taking Notes While Reading, Defining research problems, Datasheets, Importance of literature review in defining a problem, Primary and secondary sources of info - Review articles, treatise, monographs, papers from conferences & journals, case-studies, reports, patents, web and net searching ; Identifying gap areas from literature review, Citations, Acknowledgments, Case Studies and Practice sessions.	3
Module – 3	**No. of Hours**
Research Design and Methods: Research design, Basic Principles, Need for research design, Features of good design, Development of Models, Developing a research plan, Exploration, Description, Diagnosis, Simulation and Experimentations, Determining experimental and sample designs, Sampling design, Steps in sampling design, Characteristics of a good sample design, Types of sample designs, Measurement and scaling techniques, Methods of data collection, Collection of primary & secondary data, Data collection instruments, Hypothesis - Basic Concepts, Testing of hypotheses, flow diagram for hypotheses testing, Case Study and Practice Sessions.	3
Module – 4	**No. of Hours**
Technical Report & Paper Writing: Interpretation and report writing, Techniques of interpretations, Structure and components of scientific reports, Different steps in the report preparation – Layout, organization, structure and language of the report, Illustrations and tables with result analysis (simulation or experimentation), Types of reports, technical reports, project reports (mini & major) and research thesis, Research tools for writing, Conclusions, Future works, Flow of a research article, Research paper writing for conference & journals, text-books, Case Study and Practice Sessions.	3
Module – 5	**No. of Hours**
IPRs & Copyrights: Intellectual Property, what are patents & copyrights in IP? Role of IP in the Economic and Cultural Development of the Society, IP Governance, Invention and Creativity, Importance and Protection of Intellectual Property Rights (IPRs), A brief summary of - Patents, Monographs, Copyrights ©, Registered Firms ®, Trademarks ™, Industrial Designs (Design Patent,	3

Utility Patent, Granted Patent, Commercialized Patent) – Indian &Foreign Patents, Steps in Patenting — Application and Procedures with Searches, Case Study and Practice Sessions.	

Course Outcomes: At the end of the course, the students will be able to	
CO1	Explain research fundamentals, methodologies, and ethical practices in engineering research.
CO2	Perform literature review, identify research gaps, and formulate research problems.
CO3	Design research experiments, collect data, and apply hypothesis testing methods.
CO4	Analyze results and prepare technical reports and research papers.
CO5	Apply IPR concepts including patents, copyrights, and trademarks in research and innovation.

Research Papers & Technical References (Web-links & Video Resources)

- IEEE Xplore – https://ieeexplore.ieee.org
- Scopus – https://www.scopus.com
- Science Direct – https://www.sciencedirect.com
- Google Scholar – https://scholar.google.com
- Research Gate – https://www.researchgate.net

ASSESSMENT DETAILS (BOTH CIE AND SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CONTINUOUS INTERNAL EVALUATION (MCQs)

CIE	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	Internal Assessment-1	50	30 (Average of Best two Assessments)	50
	Internal Assessment-2	50		
	Internal Assessment-3	50		
AAT	Two Assessments as per regulations	20	20	
SEE	Semester End Examination	50		50
Total Marks				100

SEMESTER END EXAMINATION (SEE)

SEE paper shall be set for 50 questions, each of the 01 marks. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 01 hour. The student has to secure a minimum of 35% of the maximum marks meant for SEE.

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	1	-	-	2	-	-	-	2
CO2	3	3	-	2	1	-	1	1	1	-	2
CO3	2	3	3	3	2	-	1	2	-	-	2
CO4	2	2	3	3	3	-	1	2	3	1	2
CO5	1	1	-	-	1	3	3	1	2	2	2

L = Low (**1**), M = Medium (**2**), H = High (**3**) - Blank = No significant mapping correlation levels

Semester - VI					
Capstone Project Work: Phase - I **Category: SDC**					
Course Code	:	**B24PRJ607**	CIE	:	100 Marks
Teaching Hours L:T:P:S	:	0:0:4:0	SEE	:	-
Total Hours	:	60	Total	:	100 Marks
Credits	:	2	SEE Duration	:	-

Capstone Project: Phase -I and Phase - II

The Capstone project is a comprehensive, year-long project carried out in two phases during **6th and 7th** semesters of the undergraduate program. It integrates knowledge and skills acquired from multiple courses and disciplines to address a complex, real-world problem.

This project provides students with an opportunity to apply scientific principles, engineering methodologies, and technological tools to conceive, design, implement and evaluate an engineering solution.

It serves as a culminating academic experience to demonstrate program outcomes, including problem-solving ability, teamwork, communication skills, and practical application of engineering principles. Students can take up project individually or in a group not exceeding 4 students. The group may have students from the same discipline and drawn from different disciplines.

Types of Capstone Projects: Capstone projects undertaken for one year may fall into one or more of the following categories:

a) Research-Oriented Projects :
   • Focus on investigating new concepts, theories, or technologies.
   • Aim to generate new knowledge or contribute to academic research.
b) Experimental/Analytical Projects
   • Based on laboratory or field experiments to validate a hypothesis or study a phenomenon.
   Simulation/ Modelling Projects
   • Including detailed data collection, analysis, and interpretation.
   • Use computational tools to model, simulate, and predict system behavior.
   • Reduce the need for physical prototyping in the initial stages.
c) Industrial/Industry-Sponsored Projects
   • Carried out in collaboration with an industry partner.
   • Address real-world engineering problems faced by the organization.
d) Interdisciplinary/Multidisciplinary Projects
   • Combine knowledge and techniques from multiple engineering domains or other fields such as management, medicine, or environmental sciences.
e) Entrepreneurial/Innovation Projects
   • Focus on product or service innovation with potential for commercialization.

- Phase I Evaluation: Capstone Project Phase-I shall have only Continuous Internal Evaluation (CIE).
- In case disciplinary capstone project, the CIE shall be conducted by the Departmental Project Review Committee, which consists of a Senior Professor, the Project Guide, and one additional faculty member appointed by the principal for projects within the parent discipline.
- For Interdisciplinary Projects, the Project Review Committee will consist of one Senior Professor, the department and interdepartmental Project Guides and one faculty member from a department related to the interdisciplinary project. The committee members are appointed by the principal of the college.
- Phase I evaluation shall be based on rubrics designed to measure graduate attributes defined by NBA. Successful completion of Phase-I allows the student to proceed to Phase-II.
- Phase II Evaluation: CIE of Phase shall be evaluated as indicated with phase -I evaluation. The SEE shall be conducted by two examiners. The assessment shall be based on rubrics designed to measure graduate attributes.

Review #	**Agenda**	**Assessment**	**Review Assessment Weightage**
Review1	Project Synopsis / Proposal Evaluation	Rubric R1	15
Review2	Mid-Term Project Evaluation	Rubric R2	30
Review3	End Semester Project Evaluation	Rubric R3	30
Review4	Project Report Evaluation	Rubric R4	15
Review5	Evaluation by Guide	Rubric R5	10
Continuous Internal Evaluation (CIE)			100
Total Marks			100

Rubric #R1: Project Synopsis / Proposal Evaluation Maximum Marks: 15

		Excellent (5 Marks)	Good (4 Marks)	Average (3 Marks)	Acceptable (2 Marks)	Unacceptable (1 Marks)
a	**Identification of Problem Domain and Detailed Analysis**	Detailed and extensive explanation of the purpose and need of the project	Good explanation of the purpose and need of the project	Average explanation of the purpose and need of the project	Moderate explanation of the purpose and need of the project	Minimal explanation of the purpose and need of the project
b	**Study of the Existing Systems and Feasibility of Project Proposal**	Detailed and extensive explanation of the specifications and the limitations of the existing systems	Collects a great deal of information and good study of the existing systems	Moderate study of the existing systems; collects some basic information	Explanation of the specifications and the limitations of the existing systems not very satisfactory; limited information	Minimal explanation of the specifications and the limitations of the existing systems; incomplete information
c	**Objectives and Methodology of the Proposed Work**	All objectives of the proposed work are well defined; Steps to be followed to solve the defined problem are clearly specified	Good justification to the objectives; Methodology to be followed is specified but detailing is not done	Incomplete justification to the objectives proposed; Steps are mentioned but unclear; without justification to objectives	Only Some objectives of the proposed work are well defined; Steps to be followed to solve the defined problem are not specified properly	Objectives of the proposed work are either not identified or not well defined; Incomplete and improper specification

Rubric #R2: Mid-term Project Evaluation Maximum Marks: 30

Level of Achievement						
		Excellent(10)	**Good (8)**	**Average(6)**	**Acceptable(4)**	**Unacceptable (2)**
a	**Design Methodology**	• Division of problem in to modules and good selection of computing framework. • Appropriate design methodology and properly justification.	• Division of problem into modules and good selection of computing frame work. • Design methodology not properly justified.	• Division of problem into modules but in appropriate selection of computing framework. • Design methodology not defined properly.	• Partial division of problem into modules and inappropriate selection of computing framework. • Design methodology not defined properly.	• Modular approach not adopted. • Design methodology not defined.
b	**Planning of Project Work and Team Structure**	• Time frame properly specified and being followed. • Appropriate distribution of project work.	• Time frame properly specified and being followed. • Distribution of project work inappropriate.	• Time frame properly specified, but not being followed. • Distribution of project work un-even.	• Time frame properly specified, but not being followed. • Un-even distribution of Project work and no synchronization.	• Time frame not properly specified. • In-appropriate distribution of project work.

c	**Demonstration and Presentation**	• Objectives achieved as per time frame. • Contents of presentations are appropriate and well arranged. • Proper eye contact with audience and clear voice with good spoken language.	• Objectives achieved as per time frame • Contents of presentations are appropriate but not well arranged Satisfactory demonstration, clear voice with good spoken language but eye contact not proper	• Objectives achieved as per time frame. • Contents of presentations are appropriate but not well arranged. • Presentation not satisfactory and average demonstration	• Objectives not achieved as per time frame. • Contents of presentations are not appropriate. • Eye contact with few people and unclear voice.	• No objectives achieved. • Contents of Presentations are not appropriate and not well delivered. • Poor delivery of presentation.

Rubric #R3: End Semester Internal Project Evaluation Maximum Marks: 30

		Excellent(10)	Good (8)	Average(6)	Acceptable(4)	Unacceptable (2)
a	**Incorporation of Suggestions**	Changes are made as per modifications suggested during midterm evaluation and new innovations added	Changes are made as per modifications suggested during mid-term evaluation and good justification	All major changes are made as per modifications suggested during midterm evaluation	Few changes are made as per modifications suggested during midterm evaluation	Suggestions during mid-term evaluation are not incorporated
b	**Project Demonstration**	• All defined objectives are achieved. • Each module working well and properly demonstrated. • All modules of project are well integrated and system working is accurate.	• All defined objectives are achieved. • Each module working well and properly demonstrated. • Integration of all modules not done and system working is not very satisfactory.	• All defined objectives are achieved. • Modules are working well in isolation and properly demonstrated. • Modules of project are not properly integrated.	• Some of the defined objectives are achieved. • Modules are working well in isolation and properly demonstrated • Modules of project are not properly integrated.	• Defined objectives are not achieved. • Modules are not in proper working form that further leads to failure of integrated system.
c	**Presentation**	• Contents of presentations are appropriate and well delivered. • Proper eye contact with audience and clear voice with good spoken language	• Contents of presentations are appropriate and well delivered. • Clear voice with good spoken language but less eye contact with audience	• Contents of presentations are appropriate but not well delivered . • Eye contact with few people and unclear voice	• Contents of presentations are not appropriate. • Eye contact with few people and unclear voice	• Contents of presentations are not appropriate and not well delivered . • Poor delivery of presentation

Rubric #R4: Project Report Evaluation Maximum Marks: 15

Level of Achievement						
		Excellent(5)	**Good (4)**	**Average(3)**	**Acceptable(2)**	**Unacceptable (1)**
a	**Project Report**	• Project report is according to the specified format. • References and citations are appropriate and well mentioned.	• Project report is according to the specified format. • References and citations are appropriate but not mentioned well.	• Project report is according to the specified format but some mistakes. • In-sufficient references and citations.	• Project report is not fully according to the specified format. • In-sufficient references and citations	• Project report not prepared according to the specified format. • References and citations are not appropriate
b	**Description of Concepts and Technical Details**	• Complete explanation of the key concepts. • Strong description of the technical requirements of the project.	• Complete explanation of the key concepts. • In-sufficient description of the technical requirements of the project.	• Complete explanation of the key concepts but little relevance to literature. • In-sufficient description of the technical requirements of the project.	• All key concepts are not explained and very little relevant to literature. • In-sufficient description of the technical requirements of the Project.	• Inappropriate explanation of the key concepts. • Poor description of the technical requirements of the project.
c	**Conclusion and Discussion**	• Results are presented in very appropriate manner • Project work is well summarized and concluded. • Future extensions in the project are well specified.	• Results are presented in good manner. • Project work summary and conclusion not very appropriate. • Future extensions in the project are specified.	• Results presented are not much Satisfactory. • Project work summary and conclusion not very appropriate. • Future extensions in the project are specified.	• Results presented are not much satisfactory. • Project work summary and conclusion not very appropriate. • Future extensions in the project are not specified.	• Results are not presented properly. • Project work is not summarized and concluded. • Future extensions in the project are not specified.

Rubric #R5: Evaluation by Guide Maximum Marks: 10

Level of Achievement				
		Excellent (5)	**Satisfactory(3)**	**Unsatisfactory(2)**
a	**Self-Motivation, Determination and Regularity**	• Approaches the project with self-motivation and follows it through to completion. • Reports to the guide regularly and consistent in work.	• Completes the project but sometimes lacks self-motivation. • Reports to the guide but lacks consistency	• Lacks self-motivation and determination. • Irregular in attendance and in consistent in work.
b	**Working with in a Team & Technical Knowledge and Awareness related to the Project**	• Collaborates and communicates in a group situation and integrates the views of others. • Extensive knowledge related to the project.	• Exchanges some views but requires guidance to collaborate with others. • Fair knowledge related to the project	• Makes little or no attempt to collaborate in a group situation. • Lack sufficient knowledge.

Semester-VI					
Indian Knowledge Systems **Category: HSMC** **(Common to All)**					
Course Code	:	**B24IKK610**	CIE	:	100 Marks
Teaching Hours L:T:P:S	:	1:0:0:0	SEE	:	-
Total Hours/Semester	:	15	Total	:	100 Marks
Credits	:	PP	SEE Duration	:	-

Course Learning Objective is	
1.	To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.
2.	To make the students understand the traditional knowledge and analyse it and apply it to their day-to-day life.

Module– 1	**No. of Hours**
Introduction to Indian Knowledge Systems (IKS): Overview, Vedic Corpus, Philosophy, Character scope and importance, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge vs. western knowledge.	5
Module– 2	**No. of Hours**
Traditional Knowledge in Humanities and Sciences: Lingistics, Number and measurements-Mathematics, Chemistry, Physics, Art, Astronomy, Astrology, Crafts and Trade in India and Engineering and Technology.	5
Module– 3	**No. of Hours**
Traditional Knowledge in Professional domain: Town planning and architecture-Construction, Health, wellness and Psychology-Medicine, Agriculture, Governance and public administration, United Nations Sustainable development goals.	5

Course Outcomes: At the end of the course, the students will be able to	
CO1	Provide an overview of the concept of the Indian Knowledge System and its importance.
CO2	Appreciate the need and importance of protecting traditional knowledge.
CO3	Recognize the relevance of Traditional knowledge in different domains.
CO4	Establish the significance of Indian Knowledge systems in the contemporary world.

Text Books	
1.	Introduction to Indian Knowledge System- concepts and applications, B Mahadevan, Vinayak Rajat Bhat, Nagendra Pavana R N, 2022, PHI Learning Private Ltd, ISBN-978-93- 91818-21-0
2.	Traditional Knowledge System in India, Amit Jha, 2009, Atlantic Publishers and Distributors (P) Ltd., ISBN-13: 978-8126912230,
3	Knowledge Traditions and Practices of India, Kapil Kapoor, Avadesh Kumar Singh, Vol. 1, 2005, DK Print World (P) Ltd., ISBN 81-246-0334,

ASSESSMENT DETAILS (CIE only)
The weightage of Continuous Internal Evaluation (CIE) is 100%. The minimum passing mark for the CIE is 40% of the maximum marks (40 marks out of 100).

CONTINUOUS INTERNAL EVALUATION (MCQs)

CIE	Type of Assessment	Max. Marks	Max. Marks	Total Marks
Theory	Internal Assessment-1	50	100 (Sum of Best two Assessments)	100
	Internal Assessment-2	50		
	Internal Assessment-3	50		
Total Marks				**100**

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	0	0	0	0	3	2	0	0	0	0
CO2	0	0	0	0	0	1	1	0	0	0	1
CO3	0	0	0	0	0	2	2	0	0	0	2

Level 3 - High, Level 2 - Moderate, Level 1 - Low

SEMESTER-V & VI					
NATIONAL SERVICE SCHEME (NSS) **Category: NCMC**					
Course Code	:	B24NCK591/691	CIE	:	100 Marks
Teaching Hours L : T : P	:	1:0:0	SEE	:	---
Total Hours	:	50	Total	:	100 Marks
Credits	:	--	SEE Duration	:	--

Course Objectives	
1.	Understand the community in which they work
2.	Identify the needs and problems of the community and involve the min problem-solving
3.	Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems
4.	Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes
5.	Develop capacity to meet emergencies and natural disasters & practice national integration and social harmony

CONTENT	**No. of Hours**
1. Organic farming, Indian Agriculture (Past, Present and Future) Connectivity for marketing. 2. Waste management–Public, Private and Govt. organization. 3. Setting of the information imparting club for women leading to contribution in social and economic issues. 4. Water conservation techniques–Role of different take holders–Implementation. 5. Preparing an actionable business proposal for enhancing the village income and approach for implementation. 6. Helping local schools to achieve good results and enhance their enrolment in Higher/ technical/ vocational education. 7. Developing Sustainable Water management system for rural areas and implementation approaches. 8. Contribution to any national level initiative of Government of India.Digital India, Skill India, Swachh Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc. 9. Spreading public awareness under rural outreach programs.(minimum 5 programs). 10. Social connect and responsibilities. 11. Plantation and adoption of plants. Know your plants. 12. Organize National integration and social harmony events/ workshops / seminars. (Minimum 02 programs). 13. Govt. school Rejuvenation and helping them to achieve good infrastructure. **NOTE:** Students have to take up any one activity on the above said topics and have to prepare content for awareness and technical contents for implementation of the projects and have to present strategies for implementation of the same. Compulsorily students have to attend one camp. CIE will be evaluated based on their presentation, approach and implementation strategies.	50

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the importance of his/her responsibilities towards society.
CO2	Analyze the environmental and societal problems/issues and will be able to design solutions for the same.
CO3	Evaluate the existing system and to propose practical solutions for the same for sustainable development.
CO4	Implement government or self-driven projects effectively in the field.

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO12
CO1	3	2	-	-	3	-	-	-	-	-	-
CO2	3	2	-	-	3	-	-	-	-	-	-
CO3	3	2	-	-	3	-	-	-	-	-	-
CO4	3	2	-	-	3	-	-	-	-	-	-

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

SEMESTER-V & VI					
NATIONAL CADET CORPS (NCC) **Category: NCMC**					
Course Code	:	B24NCK592/692	CIE	:	100 Marks
Teaching Hours L : T : P	:	1:0:0	SEE	:	--
Total Hours	:	50	Total	:	100 Marks
Credits	:	--	SEE Duration	:	--

Course Objectives	
1.	To develop character, camaraderie, discipline, secular outlook, the spirit of adventure, sportsman spirit, and ideals of selfless service amongst cadets by working in teams, honing qualities such as self-discipline, self-confidence, self-reliance, and dignity of labour in the cadets.
2.	To create a pool of organized, trained, and motivated youth with leadership qualities from all walks of life, who will serve the Nation regardless of which career they choose
3.	To provide a conducive environment to motivate young Indians to choose the Armed Forces as a career

Content	No. of Hours
Unit 1. Personality Development: Group Discussions - Change your Mindset, Public Speaking. **Unit 2.LeadershipDevelopment:** Case Studies– APJ Abdul Kalam, DeepaMalik, Maharana Pratap, N Narayan Murthy etc. **Unit 3. Disaster management:** Disaster Management Capsule, Organization, Types of Disasters, Essential Services, Assistance, Civil Defense Organization. **Unit 4.Adventure:**AdventureActivities **Unit 5. Border & Coastal Areas:** History, Geography &Topography of Border/ Coastal Areas. **Unit 6. Drill:** Arm Drill, Rifle ke saath Savdhan, Vishram aur Aram se, Rifle ke saath Parade Paraur Saj, Riflekesaath Visarjan, LineTod, Bhumi Shastra aur Uthao Shastra, BagalShastra aur Baju Shastra. **Unit 7.WeaponTraining**: Short Range firing. **Unit 8.MapReading:**SettingofMap,FindingsNorthandOwnPosition **Unit 9.Field Craft & Battle Craft:** Observation, Camouflage, Concealment. **Unit 10. Obstacle Training:** Obstacle training - Introduction, Safety-measures, Benefits. Obstacle Course- Straight balance, Clear Jump, Gate Vault, Zig- Zag Balance, High Wall	50

SEMESTER-V & VI					
PHYSICAL EDUCATION(PE) **Category: NCMC**					
Course Code	:	B24NCK593/693	CIE	:	100 Marks
Teaching Hours L : T : P	:	1:0:0	SEE	:	--
Total Hours	:	--	Total	:	100 Marks
Credits	:	--	SEE Duration	:	--

Semester	Course
III	Fitness Components Kabaddi / KhoKho
IV	Athletics Volleyball Throw ball
V	Athletics Football / Hockey
V	Athletics Cricket / Base ball
VI	Athletics Netball / Basketball
VI	Individual Games Handball / Badminton

Notes:

- One Hour of Lecture is equal to 1 Credit
- One Hour of Tutorial is equal to1 Credit (Except Languages)
- Two Hours of Practical is equal to 1 Credit
- SEE: Semester End Examination
- CIE: Continuous Internal Examination
- L+T+P: Lecture + Tutorial + Practical

Guideline for Athletic and Sports

Semester & Course Code	Course Title	Content	No. of Hours
3rd Semester B24NCK393	**Fitness Components**	Meaning and Importance, Fit India Movement, Definition of fitness, Components of fitness, Benefits of fitness, Types of fitness and Fitness tips. ***Practical Components: Speed, Strength, Endurance, Flexibility, and Agility*** **KABADDI** **A. Fundamental skills** ➢ Skills in Raiding: Touching with hands, Use of leg-toe touch, squat leg thrust, side kick, mule kick, arrow fly kick, crossing of baulk line. Crossing of Bonus line. ➢ Skills of holding the raider: Various formations, catching from particular position, different catches, catching formation and techniques. ➢ Additional skills in raiding: Escaping from various holds, techniques of escaping from chain formation, offense and defense. ➢ Game practice with application of Rules and Regulations. **B. Rules and their interpretations and duties of the officials.**	Total-32 hours 2 hours / week
	Speed Strength Endurance Agility Flexibility		
	Kho kho	**A. Fundamental skills** ➢ Skills in Chasing: Sit on the box (Parallel & Bullet toe method), Get up from the box (Proximal & Distal foot method), Give Kho (Simple, Early, Late & Judgment), Pole Turn, Pole Dive, Tapping, Hammering, Rectification of foul. ➢ Skills in running: Chain Play, Ring play and Chain & Ring mixed play. ➢ Game practice with application of Rules and Regulations. **B. Rules and their interpretations and duties of the officials.**	
	Kabaddi	**A. Fundamental skills** 1. Skills in Raiding: Touching with hands, Use of leg-toe touch, squat leg thrust, side kick, mule kick, arrow fly kick, crossing of baulk line. Crossing of Bonus line. 2. Skills of holding the raider: Various formations, catching from particular position, different catches, catching formation and techniques. 3. Additional skills in raiding: Escaping from various holds, techniques of escaping from chain formation, offense and defense. 4. Game practice with application of Rules and Regulations. **B. Rules and their interpretations and duties of the officials**	

4th Semester **B24NCK493**	**Athletics** **Track-**Sprints **Jumps-**Long Jump **Throws-**Shot Put	**Track Events** ➢ Starting Techniques: Standing start and Crouch start (its variations) use of Starting Block. ➢ Acceleration with proper running techniques. ➢ Finishing technique: Run Through, Forward Lunging and Shoulder Shrug. **Long Jump**: Approach Run, Take-off, Flight in the air (Hang Style / Hitch Kick) and Landing **Shot put:** Holding the Shot, Placement, Initial Stance, Glide, Delivery Stance and Recovery (Perry O'Brien Technique)	Total-32 hours 2 hours / week
	Volleyball	**A. Fundamental skills** Service: Under arm service, Side arm service, Tennis service, Floating service. Pass: Under arm pass, Over head pass. Spiking and Blocking. Game practice with application of Rules and Regulations **B. Rules and their interpretation and duties of officials.**	
	Throw ball	**A. Fundamental skills** Overhand service, Side arm service, two hand catching, one hand overhead return, side arm return. **B. Rules and their interpretations and duties of officials**	

5th Semester **B24NCK593**	**<u>Athletics</u>** **Track-11**0&400 Meters Hurdles **Jumps-**High Jump **Throws-**Discuss Throw	**110 Meters and 400 Meters:** Hurdling Technique: Lead leg Technique, Trail leg Technique, Side Hurdling, Over the Hurdles Crouch start (its variations) use of Starting Block. Approach to First Hurdles, In Between Hurdles, Last Hurdles to Finishing. **High jump**: Approach Run, Take-off, Bar Clearance (Straddle) and Landing. **Discus Throw**: Holding the Discus, Initial Stance Primary Swing, Turn, Release and Recovery (Rotation in the circle).	

5th Semester **B24NCK593**	Football	**A. Fundamental Skills** ➢ Kicking: Kicking the ball with inside of the foot, Kicking the ball with Full Instep of the foot, Kicking the ball with Inner Instep of the foot, Kicking the ball with Outer Instep of the foot and Lofted Kick. ➢ Trapping: Trapping-the Rolling ball, and the Bouncing ball with sole of the foot. ➢ Dribbling: Dribbling the ball with Instep of the foot, Dribbling the ball with Inner and Outer Instep of the foot. ➢ Heading: In standing, running and jumping condition. ➢ Throw-in: Standing throw-in and Running throw-in. ➢ Feinting: With the lower limb and upper part of the body. ➢ Tackling: Simple Tackling, Slide Tackling. ➢ Goal Keeping: Collection of Ball, Ballclearance-kicking, throwing and deflecting. ➢ Game practice with application of Rules and Regulations. **B. Rules and their interpretation and duties of officials.**	Total-32 hours 2 hours / week
	Hockey	**A. Fundamental Skills** ➢ Passing: Short pass, Long pass, push pass, hit ➢ Trapping. ➢ Dribbling and Dozing. ➢ Penalty stroke practice. ➢ Penalty corner practice. ➢ Tackling: Simple Tackling, Slide Tackling. ➢ Goal Keeping, Ball clearance-kicking, and deflecting. ➢ Game practice with application of Rules and Regulations. **B. Rules and their interpretation and duties of officials.**	
	Athletics **Track**-Relays **Jumps**-Triple Jump **Throws**-Javelin Throw	**Relay Race**: Starting, Baton Holding / Carrying, Baton Exchange in between zone, and Finishing. **Triple Jump**: Approach Run, Take-off, Flight in the Hop, Step, Jump and Landing. **Javelin Throw**: Grip, Carry, and Recovery (3/5 Impulse stride). Release.	Total-32 hours 2 hours / week
	CRICKET	**A. Fundamental Skills** ➢ Batting-Forward Defense Stroke, Backward Defense Stroke, Off Drive, On Drive, Straight Drive, Cover Drive, Square Cut. ➢ Bowling-Out-swing, In-swing, Off Break, Leg Break and Googly. ➢ Fielding: Catching - The High Catch, The Skim Catch, The Close Catch and throwing at the stumps from different angles. Long Barrier and Throw, Short Throw, Long Throw, Throwing on the Turn. ➢ Wicket Keeping **B. Rules and their interpretation and duties of officials.**	

	BASEBALL	**A. Fundamental Skills** Player Stances–walking, extending walking, L stance, cat stance. Grip – standard grip, choke grip. Batting – swing and bunt. Pitching. Baseball: Slider, fast pitch, curve ball, drop ball, rise ball, change up, knuckle ball, screw ball. **B. Rules and their interpretation and duties of officials.**	

6th Semester **B24NCK693**	**Athletics** Combined Events-Heptathlon & Decathlon **Jumps**- Pole Vault **Throws**-Hammer Throw	Combined Events: Heptathlon all the7 events Decathlon: All10Events **Pole Vault**: Approach Run, Planting the Pole, Take-off, Bar Clearance and Landing. **Hammer Throw**: Holding the Hammer, Initial Stance Primary Swing, Turn, Release and Recovery (Rotation in the circle).	Total-32 hours 2 hours / week
	Basketball	**A. Fundamental Skills** ➢ Passing: Two hands Chest Pass, Two hands Bounce Pass, One hand Base ball Pass, Side arm Pass, Overhead Pass, Hook Pass. ➢ Receiving: Two hand receiving, one hand receiving, Receiving in stationary position, receiving while jumping and Receiving while Running. ➢ Dribbling: How to start dribble, drop dribble, High Dribble, Low Dribble, Reverse Dribble, Rolling Dribble. ➢ Shooting: Lay-up shot and its variations, one hand set shot, two hands jump shot, Hook shot, Free Throw. ➢ Rebounding: Defensive rebound and Offensive rebound. ➢ Individual Defence: Guarding the player with the ball and without the ball, pivoting. ➢ Game practice with application of Rules and Regulations. **B. Rules and their interpretation and duties of officials.**	
	Netball	**A. Fundamental skills** ➢ Catching: one handed, two handed, with feet grounded and in flight. ➢ Throwing (Different passes and their uses): One hand passes (shoulder, high shoulder, underarm, bounce, lob), two hand passes (Push, overhead and bounce). ➢ Footwork: Landing on one foot, landing on two feet, Pivot, Running pass. ➢ Shooting: One hand, forward step shot, and back ward step shot.	

		➢ Techniques of free dodge and sprint, sudden sprint, sprint and stop, sprinting with change at speed. ➢ Defending: Marking the player, marking the ball, blocking, inside the circle, outside the circle. Defending the circle edge against the passing. ➢ Intercepting: Pass and shot. ➢ Game practice with application of Rules and Regulations. **B. Rules and their interpretation and duties of officials.**	
	Individual games Shuttle Badminton	**A. Fundamental skills** ➢ Basic Knowledge: Various parts of the Racket and Grip. ➢ Service: Short service, Long service, Long-high service. ➢ Shots: Over head shot, Defensive clear shot, Attacking clear shot, Drop shot, Net shot, Smash. ➢ Game practice with application of Rules and Regulations. **B. Rules and their interpretation and duties of officials.**	Total-32 hours 2 hours / week
	Table Tennis	**A. Fundamental skills** ➢ Basic Knowledge: Various parts of the Racket and Grip (Shake Hand & Pen Hold Grip). ➢ Stance: Alternate & Parallel. ➢ Push and Service: Backhand & Forehand. ➢ Chop: Backhand & Forehand. ➢ Receive: Push and Chop with both Backhand & Forehand. ➢ Game practice with application of Rules and Regulations. **B. Rules and their interpretation and duties of officials.**	
	Hand ball	**A. Fundamental skills** ➢ Catching, Throwing and Ball control, ➢ Goal Throws: Jump shot, Center shot, Dive shot, Reverse shot. ➢ Dribbling: High and low. ➢ Attack and counter attack, simple counter attack, counter attack from two wings and center. ➢ Blocking, Goal Keeping and Defensive skills. ➢ Game practice with application of Rules and Regulations. **B. Rules and their interpretation and duties of officials.**	
	Ball Badminton	**A. Fundamental skills** ➢ Basic Knowledge: Various parts of the Racket and Grip. ➢ Service: Short service, Long service, Long-high service. ➢ Shots: Over head shot, Defensive clear shot, Attacking clear shot, Drop shot, Net shot, Smash. ➢ Game practice with application of Rules and Regulations. **B. Rules and their interpretation and duties of officials.**	

REFERENCES

1. Saha, A. K. Sarir Siksher Ritiniti, Rana Publishing House, Kalyani.
2. Bandopadhyay, K. Sarir Siksha Parichay, Classic Publishers, Kolkata.
3. Petipus, et al. Athlete's Guide to Career Planning, Human Kinetics.
4. Dharma, P. N. Fundamentals of Track and Field, Khel Sahitya Kendra, New Delhi.
5. Jain, R. Play and Learn Cricket, Khel Sahitya Kendra, New Delhi.
6. Vivek Thani, Coaching Cricket, Khel Sahitya Kendra, New Delhi.
7. Saha, A. K. Sarir Siksher Ritiniti, Rana Publishing House, Kalyani.
8. Bandopadhyay, K. Sarir Siksha Parichay, Classic Publishers, Kolkata
9. Naveen Jain, Play and Learn Basketball, Khel Sahitya Kendra, New Delhi.
10. Dubey, H. C. Basketball, Discovery Publishing House, New Delhi.
11. Rachana Jain, Teach Yourself Basketball, Sports Publication.
12. Jack Nagle, Power Pattern Of fences for winning basketball, Parker Publishing Co., New York. 13 Renu Jain, Play and Learn Basketball, Khel Sahitya Kendra, New Delhi.
13. Sally Kus, Coaching Volleyball Successfully, Human Kinetics.
14. Saha, A. K. Sarir Siksher Ritiniti, Rana Publishing House, Kalyani.
15. Bandopadhyay, K. Sarir Siksha Parichay, Classic Publishers, Kolkata

SEMESTER-V & VI					
YOGA **Category: NCMC**					
Course Code	:	B24NCK594/694	CIE	:	100 Marks
Teaching Hours L : T : P	:	1:0:0	SEE	:	--
Total Hours	:	--	Total	:	100 Marks
Credits	:	--	SEE Duration	:	--

Semester	Course
III Semester	1) Introduction of Yoga, Aim and Objectives of yoga, Prayer 2) Brief introduction of yogic practices for common man 3) Rules and regulations 4) Misconceptions of yoga 5) Suryanamaskara 6) Different types of Asanas a. Sitting b. Standing c. Prone line d. Supine line
IV Semester	1) Patanjali's Ashtanga Yoga 2) Suryanamaskara 3) Different types of Asanas a. Sitting b. Standing c. Prone line d. Supine line 4) Kapalbhati 5) Pranayama
V Semester	1) Patanjali's Ashtanga Yoga 2) Surya namaskara 3) Different types of Asanas a. Sitting b. Standing c. Proneline d. Supineline 4) Kapalbhati 5) Pranayama

	1) Patanjali's Ashtanga Yoga 2) Suryanamaskara 3) Different types of Asanas a. Sitting b. Standing c. Prone line d. Supine line 4) Kapalbhati 5) Pranayama
VI Semester	1) Patanjali's Ashtanga Yoga 2) Suryanamaskara 3) Different types of Asanas a. Sitting b. Standing c. Prone line d. Supine line 4) Kapalbhati 5) Pranayama
	1) Patanjali's AshtangaYoga 2) Suryanamaskara 3) Different types of Asanas a. Sitting b. Standing c. Prone line d. Supine line 4) Kapalbhati 5) Pranayama 6) Shat Kriyas

Notes:

- One Hour of Lectureisequalto1Credit
- One Hour of Tutorial is equal to 1Credit (Except Languages)
- Two Hours of Practical is equal to 1Credit
- SEE: Semester End Examination
- CIE: Continuous Internal Examination
- L+T+P: Lecture + Tutorial + Practical

Guidelines for Yoga Syllabus

Semester & Course Code	Course Title	Content	No. of Hours
3rd Semester B24NCK394	Introduction of Yoga, Aim and Objectives of yoga, Prayer	Yoga, its origin, history and development. Yoga, its meaning, definitions. Different schools of yoga, importance of prayer	Total-32 hours 2 hours / week
	Brief introduction of yogic practices for common man	Yogic practices for common man to promote positive health	
	Rules and regulations	Rules to be followed during yogic practices by practitioner	
	Misconceptions of yoga	Yoga its misconceptions, Difference between yogic and non yogic practices.	
	Suryanamaskara	Suryanamaskar prayer and its meaning, Need, importance and benefits of Suryanamaskar12 count, 2 rounds	
	Different types of Asanas Sitting ➢ Padmasana ➢ Vajrasana Standing ➢ Vrikshana ➢ Trikonasana Prone line ➢ Bhujangasana ➢ Shalabhasana Supine line ➢ Utthitadvipadasana ➢ Ardhahalasana	Asana, Need, importance of Asana. Different types of asana. Asana its meaning by name, technique, precautionary measures and benefits of each asana.	

4th Semester **B24NCK494**	Patanjali's Ashtanga Yoga ➢ Yama ➢ Niyama	Patanjali's Ashtanga Yoga its need and importance. <u>Yama:</u> Ahimsa, satya, asteya, brahmacarya, aparigraha. <u>Niyama:</u> shoucha, santosh, tapa, svaadhyaya, Eshvara pranidhan	Total-32 hours 2 hours / week
	Suryanamaskara	Suryanamaskar 12 count, 4 rounds	
	Different types of Asanas Sitting ➢ Sukhasana ➢ Paschimottanasana Standing ➢ Ardhakati Chakrasana ➢ Parshva Chakrasana Prone line ➢ Dhanurasana Supine line ➢ Halasana ➢ Karna Peedasana	Asana, Need, importance of Asana. Different types of asana. Asana its meaning by name, technique, precautionary measures and benefits of each asana.	
	Kapalabhati	Meaning, importance and benefits of Kapalabhati. 40 strokes/min, 3 rounds	
	Pranayama ➢ Suryanuloma–Viloma ➢ Chandranuloma-Viloma ➢ Suryabhedana ➢ ChandraBhedana ➢ Nadishodhana	Meaning, Need, importance of Pranayama. Different types. Meaning by name, technique, precautionary measures and benefits of each Pranayama	

5th Semester **B24NCK594**	Ashtanga Yoga ➢ Asana ➢ Pranayama	Patanjali's Ashtanga Yoga its need and importance.	Total-32 hours 2 hours / week
	Suryanamaskara	Suryanamaskar 12 count, 6 rounds	
	Different types of Asanas Sitting ➢ Ardha Ushtrasana ➢ Vakrasana Standing ➢ Urdhva Hastothanasana ➢ Hastapadasana Prone line ➢ Padangushtha Dhanurasana Supine line ➢ Sarvangasana ➢ Chakraasana	Asana, Need, importance of Asana. Different types. Asana its meaning by name, technique, precautionary measures and benefits of each asana.	
	Kapalabhati	Revision of practice 50 strokes/min, 3 rounds	
	Pranayama ➢ Surya Bhedana ➢ Ujjayi	Meaning, Need, importance of Pranayama. Different types. Meaning by name, technique, Precautionary measures and benefits of each Pranayama.	
	Ashtanga Yoga ➢ Pratyahara ➢ Dharana	Patanjali's Ashtanga Yoga its need and importance.	Total-32 hours 2 hours / week
	Suryanamaskara	Revisionofpractice12count, 8 rounds	
	Different types of Asanas Sitting ➢ AakarnaDhanurasana ➢ YogamudrainPadmasana Standing ➢ ParivrittaTrikonasana ➢ Utkatasana Prone line ➢ PoornaBhujangasana/	Asana, Need, importance of Asana. Different types, Asana by name, technique, precautionary measures and benefits of each asana.	

	Rajakapotasana Supine line ➢ Navasana/Noukasana ➢ Pavanamuktasana		
	Kapalabhati	Revision of practice 60 strokes/min, 3 rounds	
	Pranayama ➢ Sheetali ➢ Sheektari	Meaning, Need, importance of Pranayama. Different types. Meaning by name, technique, precautionary measures and benefits of each Pranayama	

6th Semester **B24NCK694**	Ashtanga Yoga ➢ Dhyana (Meditation) ➢ Samadhi	Patanjali's Ashtanga Yoga its need and importance.	Total-32 hours 2 hours / week
	Suryanamaskara	Revision of practice 12count, 10rounds.	
	Different types of Asanas Sitting ➢ Vibhakta Paschimottanasana ➢ Yogamudra inVajrasana Standing ➢ Parshvakonasana ➢ Ekapadbaddhapadmottanasana Prone line balancing ➢ Mayurasana Supine line ➢ Sarvangasana ➢ Setubandhasana ➢ Shavasanaa (Relaxation poisture)	Asana, Need, Importance of Asana. Different types, Asana by name, technique, precautionary measures and benefits of each asana.	
	Kapalabhati	Revision of practice 80 strokes/min, 3 rounds	

	Pranayama ➢ Bhastrika ➢ Bhramari	Meaning, Need, importance of Pranayama. Different types. Meaning by name, technique, Precautionary measures and benefits of each Pranayama.	
	Suryanamaskara	Revision of practice 12count, 12 rounds.	Total-32 hours 2 hours / week
	Different types of Asanas Sitting ➢ Bakasana ➢ Hanumanasana ➢ Ekapada Rajakapotasana Standing ➢ Vatayanasana ➢ Garudasana ➢ Natarajasana Balancing ➢ Sheershasana Supine line ➢ 1.Setubandha Sarvangasana ➢ Shavasanaa (Relaxation poisture)	Asana, Need, importance of Asana. Different types, Asana by name, technique, precautionary measures and benefits of each asana.	
	Kapalabhati	Revision of practice 100 strokes/min, 3 rounds.	
	Pranayama ➢ Nadishodhana ➢ Ujjai ➢ Bhramari	Revision of practices	
	ShatKriyas ➢ Jalaneti & sutraneti ➢ Nouli (only for men) ➢ Sheetkarma Kapalabhati	Meaning, Need, importance of Shatkriya. Different types. Meaning by name, technique, precautionary measures and benefits of each Kriya	

Book for Reference:

- Swami Kuvulyananda: Asma (Kavalyadhama, Lonavala)
- Tiwari, O P: Asana Why and How

- Ajitkumar: Yoga Pravesha (Kannada)
- Swami Satyananda Saraswati: Asana Pranayama, Mudra, Bandha (Bihar School of yoga, Munger)
- Swami Satyananda Saraswati: Surya Namaskar (BiharSchoolofyoga,Munger)
- Nagendra H R: The art and science of Pranayama
- Tiruka: Shatkriyegalu (Kannada)
- Iyengar B K S: Yoga Pradipika (Kannada)
- Iyengar B K S: Light on Yoga (English)

SEMESTER-V & VI					
MUSIC **Category: NCMC**					
Course Code	:	B24NCK595/695	CIE	:	100 Marks
Teaching Hours L : T : P	:	1:0:0	SEE	:	--
Total Hours	:	--	Total	:	100 Marks
Credits	:	--	SEE Duration	:	--

Course Objectives	
1.	Identify the major traditions of Indian music, both through notations and aurally.
2.	Analyze the compositions with respect to musical and lyrical content
3.	Demonstrate an ability to use music technology appropriately in a variety of setting.

Module – 1	**No. of Hours**
Preamble: Contents of the curriculum intend to promote music as language to develop an analytical, Creative, and intuitive Understanding. For this the student must experience music through study and direct participation in improvisation and composition. Origin of the Indian Music: Evolution of the Indian music system, Understanding of Shruthi, Nada, Swara, Laya, Raga Tala, Mela.	3
Module – 2	**No. of Hours**
Compositions: Introduction to the types of composition in Carnatic Music- Geethe, Jath i, Swara, Swarajathi, Varna, Krithi, and Thillana, Notation System.	3
Module – 3	**No. of Hours**
Composers: Biography and contributions of Purandaradasa, Thyagaraja, Mysoro Vasudevacharya.	3
Module – 4	**No. of Hours**
Music Instruments: Classification and construction of string instruments, wind instrurments, percussion instruments, Idiophones (Ghana Vaadya), Examples of each class of Instrum ents	3
Module – 5	**No. of Hours**
Abhyasa Gana: Singing the swara exercises (Sarale Varase Only), Botation writing for Sarale Varase and Suladi Saptha Tala (Only in Mayamalavagowla Raga), Singing 4 Geethe in M alahari, and one jathi Swara, One Krithi in a Mela raga	14

Course Outcomes: At the end of the course, the students will be able to	
CO1	Discuss the Indian system of music and relate it to other genres (Cognitive DOmain)
CO2	Experience the emotions of composer and develop empathy (Affective Domain)
CO3	Respond to queries on various patterns in a composition (Psycho Motor Domain)

Text Books	
1.	Vidushi Vasantha Madhavi, "Theory of Music", Prism Publication, 2007.
2.	T Sachidevi and T Sharadha (Thirumalai Sisters), Karnataka Sangeetha Dharpana- Vol. 1 (English), Shreenivaas Prakaashana, 2018.

Reference Text Books	
1.	Lakshminarayana Subramaniam, Viji Subramanaim, "Classical Music of India: A Practical Guige", Tranqueber 2018.
2.	R. Rangaramanuja Ayyangar, "History of South Indian (Carnatic) Music", Vipanci Charitable Trust; Third edition, 2019.
3.	Ethel Rosenthal, "The Story of Indian Music and Its Istruments: A Study of the Present and a Record of the Past", Pilgrims Publishing, 2007.
4.	Carnatic Music, National Institute of Open Schooling, 2019.