DAYANANDA SAGAR ACADEMY OF TECHNOLOGY & MANAGEMENT

(Autonomous Institute under VTU)

CURRICULUM

Scheme and Syllabus V to VI Semester

Outcome Based Education

(Academic Year 2025-2026)

DEPARTMENT OF CSE IN IOT & CYBER SECURITY INCLUDING BLOCKCHAIN

5th & 6th Semester B.E

ABOUT THE INSTITUTE

Dayananda Sagar Academy of Technology and Management- DSATM was established in 2011 with 5 UG Programs and 1 PG Program, currently there are 10UG courses, BArch course, and 2 PG courses the programs are approved by All India Council for Technical Education (AICTE) New Delhi, Affiliated to Visvesvaraya Technological University (VTU), Belagavi and DSATM is an autonomous institute from 2023-2024, (10 years), with NAAC A+ Grade,5 courses NBA Accredited.

The Dayananda Sagar Institutions is one of pioneer institutions in India and abroad with six decades of excellence in Academic and Research. The newer campuses were necessary to accommodate the growing need of the technology and innovation.

DSATM nurtures the students in academic, research, sports, cultural and extracurricular activities.

- Creating an academic environment to nurture and develop competent entrepreneurs, leaders and professionals who are socially sensitive and environmentally conscious.
- Integration of Outcome Based Education and cognitive teaching and learning strategies to enhance learning effectiveness.
- Developing necessary infrastructure to cater to the changing needs of Business and Society.
- Optimum utilization of the infrastructure and resources to achieve excellence in all areas of relevance.
- Adopting learning beyond curriculum through outbound activities and creative assignments.
- Imparting contemporary and emerging techno-managerial skills to keep pace with the changing global trends.
- Facilitating greater Industry-Institute Interaction for skill development and employability enhancement.
- Establishing systems and processes to facilitate research, innovation and entrepreneurship for holistic development of students.
- Implementation of Quality Assurance System in all Institutional processes.

VISION OF THE INSTITUTE

To strive at creating the institution a center of highest caliber of learning, so as to create an overall intellectual atmosphere with each deriving strength from the other to be the best of engineers, scientists with management & design skills.

MISSION OF THE INSTITUTE

- To serve its region, state, the nation and globally by preparing students to make meaningful contributions in an increasing complex global society challenge.
- To encourage, reflection on and evaluation of emerging needs and priorities with state-of-the-art infrastructure at institution.
- To support research and services establishing enhancements in technical, economic, human and cultural development.
- To establish interdisciplinary center of excellence, supporting/ promoting student's implementation.
- To increase the number of Doctorate holders to promote research culture on campus.
- To establish IIPC, IPR, EDC, innovation cells with functional MOU's supporting student's quality growth.

QUALITY POLICY

Dayananda Sagar Academy of Technology and Management aims at achieving academic excellence through continuous improvement in all spheres of Technical and Management education. In pursuit of excellence cutting – edge and contemporary skills are imparted to the utmost satisfaction of the students and the concerned stakeholders.

ABOUT THE DEPARTMENT

Year of Establishment: 2022 Intake of the Department = 60

Brief Details about Department of CSE in IoT & Cyber security including Blockchain

In today's world everything is connected to the Internet for ease of access, to monitor and control the devices across the globe. This provides an opportunity to automate different task and move all the communicating devices to be communicated through Internet. IoT is the most important technology for 21st century and it connects the device from home to industry, device to device or human to device.

The various industry which uses IoT are Manufacturing, Automotive, Transportation and Logistics, Retail, Public Sector, Health Care, Agriculture. The general safety across all industry is the requirement of securing these devices and its network. To secure the data generated due to communication between the devices, device to humans, and personal information are in demand.

Cyber Security courses aim to equip the students with the knowledge and skills required to defend your data, devices, and personal information from the attacker. This course provides a wide variety of opportunity in IT sector and in other manufacturing and production industries. As all devices are connected to Internet, the data generated is very huge. The data need to be accessed from the storage securely and should be available for access to the authorized users, the Blockchain provides this flexibility. Blockchain is a distributed ledger, in this system it records the information in such a way that it is impossible to change, hack or cheat the system.

VISION OF THE DEPARTMENT

To be frontier to provide the centre of Excellence in the field of IoT, Cybersecurity and Blockchain

MISSION OF THE DEPARTMENT

M1: a cutting-edge technology to the students to develop and innovate in IoT & Cybersecurity including Blockchain which proves to be an essential part for any organization.

M2: impart value based technical education of global standards.

M3: inculcate the entrepreneurship, technical knowledge and lifelong learning in theory and practice of Computer Science and Engineering in IoT & Cyber security including Blockchain.

M4: To strengthen the alumni and industrial association for development of students leading to technical and socio-economic growth.

PROGRAM EDUCATION OBJECTIVES (PEO'S):

PEO1: Employability: Having a successful professional career in Industry, Government, Academia, and Defense as an innovative engineer in a team.

PEO2: Higher Education: capable to pursue higher studies/research in the field of Engineering and other allied industries.

PEO3: Entrepreneurship: prepared for a successful career by meeting ever increasing demands required by Computer Science and Engineering profession and enable them to become an entrepreneur.

PEO4: Ethical: cultivated professional and ethical attitudes with effective communication skills, teamwork and multidisciplinary approach related to engineering issues.

PROGRAM OUTCOMES (PO's)

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

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

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

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

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

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

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

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

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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

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

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

PROGRAM SPECIFIC OUTCOMES (PSO's)

PSO1: Practices of Computing: Connect learning from Core and Disciplinary/Interdisciplinary courses of CSE (IoT & Cybersecurity including Blockchain Technology) to assimilate Technological advancements in the field for analyzing and designing subsystem processes to arrive at the solution to real world problems.

PSO2: Knowledge in the domain specific: Acquire software skills pertinent to Research and industry practices in the field of CSE (IoT & Cybersecurity including Blockchain Technology); along with the soft skills like persistence, proper judgment through projects and industrial interactions.

PROPOSED UG CREDIT STRUCTURE IN ALIGNMENT WITH VTU

Sl. No.	Semester	No. of Credits
1	1st Semester	20
2	2nd Semester	20
3	3rd Semester	21
4	4th Semester	21
5	5th Semester	22
6	6th Semester	22
7	7th Semester	20
8	8th Semester	14
	Total	160

PROPOSED UG SCHEME

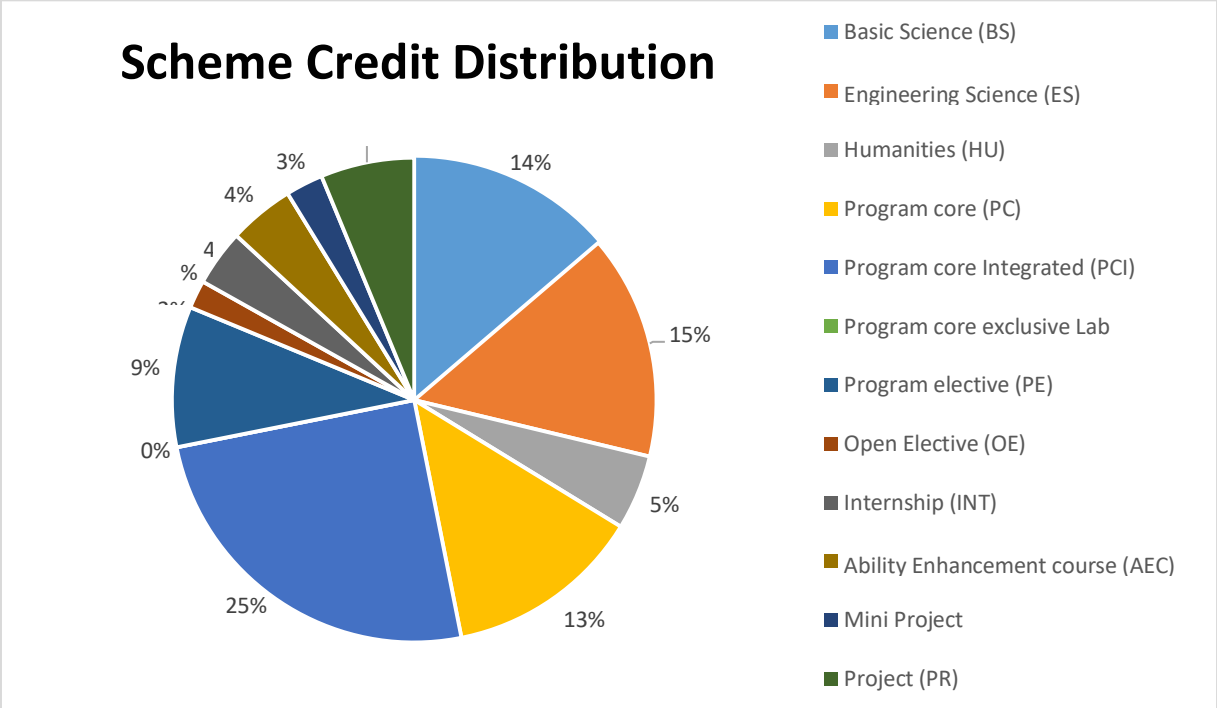
Sl. No	Course Category	BOS	TD	Teaching Hours/Week					Credits
				Lecture	Tutorial	Practical	Project	Total (Hrs/week)	
				L	T	P	S		
1	IPCC-1	CSE	CSET	3	0	2	0	5	5
2	IPCC-2	CSE	CSE	3	0	2	0	5	5
3	PCC-1	CSE	CSE	3	0	0	0	3	3
4	PEC-1	CSE	CSE	3	0	0	0	3	3
5	MPR	CSE	CSE	0	0	0	2	2	3
6	PBL	CSE	CSE	0	0	0	2	4	2
7	AEC	CSE	CSE	0	0	2	0	2	1
8	HSMS	CSE	CSE	1	0	0	0	1	0
9	NCMC	NSS / YOGA / PED							
10	AICTE Activity Points								
								Total	22

Percentage of Mapping– Theory & Practical - Scheme & Syllabus- 5th & 6th Sem

Sl. No	Course Category	Component			
		Theory	Practical	Outreach	YOGA/SPORTS
1	IPCC-1	60%	40%	--	--
2	IPCC-2	60%	40%	--	--
3	PCC-1	100%	--	--	--
4	PEC-1	100%	--	--	--
5	PR	--	100%	--	--
6	PBL	--	100%	--	--
7	AEC	--	100%	--	--
8	HSMS	--	--	100%	--
9	NCMC	--	--	--	100%
Total Percentage		36%	42%	11%	11%

Scheme Distribution Department of CSE in IoT & Cybersecurity including Blockchain

Course Component	Credits	% of Credits
Basic Science (BS)	22	14
Engineering Science (ES)	24	15
Humanities (HU)	8	5
Program core (PC)	21	13
Program core Integrated (PCI)	40	25
Program core exclusive Lab	0	0
Program elective (PE)	15	9
Open Elective (OE)	3	2
Internship (INT)	6	4
Ability Enhancement course (AEC)	7	4
Mini Project (MPR)	4	3
Project (PR)	10	6
Total	160	100



SEMESTER WISE CREDIT BREAKDOWN FOR B.E. DEGREE CURRICULUM BATCH 2023-2027

Course Category	Semester								Total Credits
	1st	2nd	3rd	4th	5th	6th	7th	8th	
Basic Sciences (BSC)			3	3	---	---			6
Engineering Sciences (ESC)			---	---	---	---			---
Humanities, Social Sciences and Management (HSMC)			---	---	2	---			---
Ability Enhancement Course (AEC)			1	1	1	1			5
Universal Human Values (UHV)			---	1	---	---			1
Professional Core Courses (PCC)			6	6	3	3			18
Professional Core Courses Lab (PCCL)			---	---	2	---			
Integrated Professional core Course (IPCC)			8	8	8	8			31
Professional Elective Course (PEC)			---	---	3	3			6
Institutional Open Elective Courses (IOE)			---	---	---	3			3
Internship (INT)			---	---	---	---			4
Mini Project / Project Work (PW)			2	2	3	4			13
Social Connect & Responsibility (SCR)			1	---	---	---			1
Non-credit Mandatory Courses (NCMC)			---	---	---	---			---
Total Credits			**21**	**21**	**22**	**22**			**86**

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Affiliated to VTU Approved by AICTE
Accredited by NAAC with A+ Grade
6 Programs Accredited by NBA
(CSE, ISE, ECE, EEE, MECH, CIVIL)

Scheme of Teaching and Examinations 2023
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from 2025-26)

5th SEMESTER: Computer Science Engineering in IoT & Cyber Security including Blockchain

Sl. No	Course Code	Course Title	Course Category	BOS	TD	Teaching Hours/Week					Credits	Examination			
						Lecture	Tutorial	Practical	Project	Total		SEE Duration (Hrs)	CIE Marks	SEE Marks	Total Marks
						L	T	P	S						
1	BIC501	Cryptography	PCC	CSE-ICB	CSE-ICB	3	-		-	3	**3**	03	50	50	100
2	BIC502	Sensors and Devices	IPCC	CSE-ICB	CSE-ICB	3	-	2	-	5	**4**	03	50	50	100
3	BIC503	Machine Intelligence	IPCC	CSE-ICB	CSE-ICB	3	-	2	-	5	**4**	03	50	50	100
4	BIC504X	Professional Elective	PEC-1	CSE-ICB	CSE-ICB	3	-	-	-	3	**3**	03	50	50	100
5	BIC505	Block Chain Technology	PBL	CSE-ICB	CSE-ICB	-	-	-	3	3	**3**	03	50	50	100
6	BIC506L	Raspberry Pi Lab	PCCL	CSE-ICB	CSE-ICB	-	-	-	3	3	**2**	02	50	50	100
7	BIC517 BIS527	- Ethical hacking - Research Methodology and IPR	AEC	CSE-ICB	CSE-ICB	-	-	2	-	2	**1**	02	50	50	100
8	BCV508	Environmental Studies and E-waste management	HSMS			1	-	-	-	1	**2**	02	50	50	100
9	BNSK509 BPEK509 BYOK509	National Service Scheme Physical Education Yoga	NCMC			-	-	2	-	-	**0**	---	100	---	100
AICTE Activity Points Mandatory					**Total**						**22**		**500**	**400**	**900**

Professional Elective

BIC504A	Fundamentals of Blockchain Technology	BIC504B	Wireless and Mobile Device Security

6th SEMESTER: Computer Science Engineering in IoT & Cyber Security including Blockchain

Sl. No	Course Code	Course Title	Course Category	BOS	TD	Teaching Hours/Week					Credits	Examination			
						Lecture	Tutorial	Practical	Project	Total		SEE Duration (Hrs)	CIE Marks	SEE Marks	Total Marks
						L	T	P	S						
1	BIC601	IoT System Architecture	IPCC	CSE-ICB	CSE-ICB	3	-	2	-	5	**4**	03	50	50	100
2	BIC602	Applied AI for IoT and Cybersecurity	IPCC	CSE-ICB	CSE-ICB	3	-	2	-	5	**4**	03	50	50	100
3	BIC603	Data Analytics for IoT	PCC	CSE-ICB	CSE-ICB	3	-	-	-	3	**3**	03	50	50	100
4	BIC604X	Professional Elective	PEC-2	CSE-ICB	CSE-ICB	3	-	-	-	3	**3**	03	50	50	100
5	BIC6XX	Open Elective	OEC-1	CSE-ICB	CSE-ICB	3	-	-	-	3	**3**	03	50	50	100
6	BIC606	Project Phase -1	PR	CSE-ICB	CSE-ICB	-	-	-	3	2	**2**	02	50	50	100
7	BIC607	Threat Analysis	PBL	CSE-ICB	CSE-ICB	-	-	-	3	2	**2**	02	50	50	100
8	BIC608A BIC608**B**	-VAPT Lab -Gen AI Lab	AEC	CSE-ICB	CSE-ICB	-	-	2	-	2	**1**	02	50	50	100
9	BNSK609 BPEK609 BYOK609	National Service Scheme Physical Education Yoga	NCMC			-	-	2	-	2	---	-	100	-	100
AICTE Activity Points Mandatory Total											**22**		**500**	**400**	**900**

Professional Elective

BIC604A	Cyber security and Applications	BIC604B	Cloud Computing & Security

IPCC: Integrated Professional Core Course,

PCC: Professional Core Course

PBL: Project Based Learning

AEC: Ability Enhancement

Course, NCMC: Non-Credit

Mandatory Course L: Lecture,

T: Tutorial, P:Practical

S= SDA: Skill Development Activity,

CIE: Continuous Internal Evaluation,

SEE: Semester End Evaluation.

I**ntegrated Professional Core Course (IPCC):** Refers to Integrated Professional Core Course Theory Integrated with practicals of the same course. Credit for IPCC can be 04 and its Teaching Learning hours (L: T: P) can be considered as (3: 0: 2) or (2: 2: 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper.

Non-Credit Mandatory Course (NCMC) - National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE) (Sports and Athletics), and Yoga (YOG) with the concerned coordinator of the course during the first week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. 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.

Newly introduced subjects in the syllabus

		5th Semester	6th Semester
1.	**List of Existing Elective Courses**	Fundamentals of Block Chain Technology Wireless and Mobile Device Security	Cyber security and Applications Cloud Computing & Security
2.	**List of New Existing Elective Courses**	--	--
3.	**List of New Industry Aligned Course**	Block Chain Technology	Threat Analysis

Percentage of Change in the Syllabus

5th Semester						
Sl. No	**Course Code**	**Course Name**	**Topics Added**	**Topics removed**	**Revised in %**	**Justification**
1	BIC501	Cryptography	Lab is introduced	--		Aligned with Industry requirement
2	BIC502	Sensors and Devices	New Subject	--		Towards IoT domain
3	BIC503	Machine Intelligence	New Subject	--		Industry Aligned project based
4	BIC505	Block Chain Technology	New Subject	--		Industry Aligned project based

6th Semester						
Sl. No	**Course Code**	**Course Name**	**Topics Added**	**Topics removed**	**Revised in %**	**Justification**
1	BIC601	IoT System Architecture	Lab is introduced	--	--	towards IoT domain
2	BIC602	Micro controller and Embedded systems	Lab is introduced	--	--	To learn Embedded C
3	BIC603	Data Analytics for IoT	-	--	--	towards IoT domain

5th SEMESTER

PROFESSIONAL CORE COURSE (PCC)

Dayananda Sagar Academy of Technology & Management

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Semester	:	**5th Semester**				
Course Title	:	**Cryptography**				
Course Code	:	**BIC501**				
Course Type (Theory/Practical/Project/Integrated)	:	**THEORY**				
Category	:	**PCC**				
Stream	:	**CSE-ICB**		**CIE**	:	**50**
Teaching hours/ week (L: T:P:S)	:	**3-0-0-0**		**SEE**	:	**50**
Total Hours	:	**40 hours Theory + 20 hours Practical**		**SEE Duration**	:	**3 hours**
Credits	:	**3**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand the basics of Cryptography concepts, Security and its principle
2	Analyze different Cryptographic Algorithms
3	Illustrate public and private key cryptography
4	Understand the key distribution scenario and certification
5	Understand approaches and techniques to build protection mechanism in order to secure computer networks

Teaching-Learning Process Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

1. Adopt different teaching methods to attain the course outcomes.
2. Include videos to demonstrate various concepts.
3. Encourage collaborative (Group) Learning to encourage team building.
4. Ask at least three HOTS (Higher-order Thinking Skills) module-wise questions to promote critical thinking.
5. Adopt Problem-Based Learning (PBL), which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
6. Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
7. Discuss various case studies to map with real-world scenarios and improve the understanding.
8. Devise innovative pedagogy to improve Teaching-Learning Process (TLP).

DSATM

Scheme of Teaching and Examinations for BE Programme 2023
Outcome Based Education and Choice Based Credit System (CBCS)
(Effective from the Academic Year 2025-26)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**A model for Network Security, Classical encryption techniques:** Symmetric cipher model, Substitution ciphers-Caesar Cipher, Monoalphabetic Cipher, Playfair Cipher, Hill Cipher, Polyalphabetic Ciphers, One time pad, Steganography. Block Ciphers and Data Encryption Standards: Traditional Block Cipher structures, data Encryption Standard (DES), A DES Example, The strength of DES, Block cipher design principles. Chapter 1: 1.8 Chapter 3: 3.1, 3.2, 3.5 Chapter 4: 4.1, 4.2, 4.3, 4.4, 4.5	8
Pedagogy	**Demonstration**	
2	**Public key cryptography and RSA:** Principles of public key cryptosystems-Public key cryptosystems, Applications for public key cryptosystems, Requirements for public key cryptography, public key Cryptanalysis, The RSA algorithm: Description of the Algorithm, Computational aspects, The Security of RSA. Diffie-Hellman key exchange: The Algorithm, Key exchange Protocols, Man-in-the- middle Attack, Elliptic Curve Cryptography: Analog of Diffie-Hellman key Exchange, Elliptic Curve Encryption/Decryption, Security of Elliptic Curve Cryptography. Chapter 9: 9.1, 9.2 Chapter 10: 10.1, 10.4	8
Pedagogy	**Problem Solving**	
3	**Applications of Cryptographic Hash functions**: Two simple Hash functions, Key management and distribution: Symmetric key distribution using symmetric encryption, Symmetric key distribution using asymmetric encryption, Distribution of public keys, X.509 Certificates, Public Key Infrastructures. Chapter 11: 11.1, 11.2 Chapter 14: 14.1, 14.2, 14.3, 14.4, 14.5	8
Pedagogy	**Case study Assignment**	
4	User Authentication: Remote user authentication principles, Kerberos, Remote user authentication using asymmetric encryption. Web security consideration, Transport layer security. Email Threats and comprehensive email security, S/MIME, Pretty Good Privacy. Chapter 15: 15.1, 15.3, 15.4 Chapter 17: 17.1, 17.2 Chapter 19: 19.3, 19.4, 19.5	8

Pedagogy	**Poster Presentation**	
5	**IP Security:** IP Security overview, IP Security Policy, Encapsulating Security Payload, Combining security associations, Internet key exchange. Chapter 19: 19.9 Chapter 20: 20.1, 20.2, 20.3, 20.4, 20.5	8
Pedagogy	**Case studies**	
	Pedagogical Initiatives (Not limited to): ● Think Pair and Share (Blended Learning): provides an opportunity for students to learn from one another ● Problem Solving: encourages cognitive thinking and enables creative problem solving ● Poster Presentation: allows students to represent the concepts visually in order to understand the topics easily. ● Case studies: maps different domains in real time applications ● Demonstration: exhibits the implementation process	

Text Books	
Sl. No.	Title of the Book/Name of the author/Name of the publisher/Edition and Year
1	William Stallings, “Cryptography and Network Security”, Pearson Publication, Seventh Edition.
Reference Books	
1	Keith M Martin, “Everyday Cryptography”, Oxford University Press.
2	V.K Pachauri, “Cryptography and Network Security”, PHI, 2nd Edition.

Course Outcomes: At the end of the course, the student will be able to:

CO's	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Understand the basic concepts of Cryptography and Security aspects	Understand	L2
CO2	Apply different Cryptographic Algorithms for different applications	Apply	L3
CO3	Analyze different methods for authentication and access control.	Analyze	L4
CO4	Explain key management, key distribution and Certificates.	Understand	L2
CO5	Apply the basic electronic mail and IP Security.	Apply	L3

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2		3												
CO3			3											
CO4		3												
CO5				3								3		

INTEGRATED PROFESSIONAL CORE COURSE (IPCC)

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**5th Semester**				
Course Title	:	**IoT Sensors and Devices**				
Course Code	:	**BIC502**				
Course Type (Theory/Practical/Project/Integrated)	:	**Integrated**				
Category	:	**IPCC**				
Stream	:	**CS-IoT, Cyber Security including Blockchain**		**CIE**	:	**50 Marks**
Teaching hours/ week (L:T:P:S)	:	**3:0:2:0**		**SEE**	:	**50 Marks**
Total Hours	:	**40Hrs+20 hours of practical classes**		**SEE Duration**	:	**3 Hours**
Credits	:	**4**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To explain the fundamental working principles used in IoT
2	To describe the operating behavior used in physical parameter monitoring.
3	To analyze signal conditioning, data conversion, and transmission involved in smart sensor systems.
4	To evaluate the selection criteria for various sensor types and actuators
5	To explore actuator technologies in automated IoT environments.

Teaching-Learning Process pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

1. Adopt different teaching methods to attain the course outcomes.
2. Include videos to demonstrate various concepts.
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4. Ask at least three HOTS (Higher-order Thinking Skills) module-wise questions to promote critical thinking.
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DSATM

Scheme of Teaching and Examinations for BE Programme 2023
Outcome Based Education and Choice Based Credit System (CBCS)
(Effective from the Academic Year 2025-26)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**IoT Fundamentals** IoT Conceptual Framework, IoT Architectural View, Technology Behind IoT, M2M Communication, Sensors, RFID, Wireless Sensor Networks, Networking Protocols for IoT Design Principles for Connected Devices, Prototyping the Embedded Devices for Iot and M2M, Introduction, Embedded Computing Basics, Embedded Platforms for Prototyping Things Always Connected to the Internet/Cloud	8
Pedagogy	Demonstration	
2	**Sensors, Actuators & Transducers** Sensors: Measurement devices, characteristics, signal transmission - hydraulic, pneumatic, primary measuring elements, resistive sensors, principle of resistive sensors, photo resistive sensor, Capacitor microphone, capacitive pressure sensor, proximity sensor Actuators: Types of Actuators, Pneumatic actuator, Hydraulic actuator, Electrical Actuating Systems, Piezoelectric Actuator Transducers: Inductive transducers, LVDT, Induction potentiometer, variable reluctance transducer, synchros, microsyn, Capacitive transducers	8
Pedagogy	**Flipped Classroom**	
3	**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.	8
Pedagogy	**Case Study Assignment**	
4	IoT Connectivity & Web Protocols Design Principles for Web Connectivity: Introduction, Web Communication Protocols for Connected Devices, Message Communication Protocols for Connected Devices, Web Connectivity for Connected Devices Network using Gateway, SOAP, REST, HTTP RESTful and Web Sockets Internet Connectivity Principles: Introduction, Internet Connectivity, Internet- Based Communication, IP Addressing in the IoT, Media Access Control, Application Layer Protocols, HTTP HTTPS, Telnet and Others	8
Pedagogy	**Poster Presentation**	

5	Case Studies Sensor Applications: On-board Automotive Sensors, Home Appliance Sensors, Medical Diagnostic Sensors, Manufacturing Sensors, Environmental Monitoring Sensors. Intelligent Systems: Home automation, Building infrastructures, IoT electronic equipments, Industry 4.0	8

Pedagogy	**Case studies**
	Pedagogical Initiatives (Not limited to): ● Think Pair and Share (Blended Learning): provides an opportunity for students to learn from one another ● Problem Solving: encourages cognitive thinking and enables creative problem solving ● Case studies: maps different domains in real time applications ● Demonstration: exhibits the implementation process

List of Experiments:

Sl. No.	**Experiments/Programs**	CO's
1	Develop a program to illustrate the working of LED and buzzer working in alternate	CO2
2	Develop a program to illustrate the working of traffic lights for pedestrians.	CO2
3	Develop a program to rotate servo motor both in clockwise and anticlockwise direction.	CO2
4	Develop a program control the intensity of LED using potentiometer.	CO2
5	Develop a program to display Button-Controlled LCD Messages with delay.	CO2
6	Develop an Arduino program to Toggle LED with Relay.	CO2
7	Develop an Arduino program to calculate and display the distance of an object using an ultrasonic sensor (HC-SR04).	CO3
8	Develop an Arduino program to upload real-time humidity data to cloud	CO3
	Open ended Programs	
1	Develop an Arduino program to trigger a buzzer alert when temperature crosses a set threshold using the DHT11 sensor.	CO3
2	Develop an Arduino program for monitoring soil moisture data using cloud.	CO3

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Patranabis.D, "Sensors and Transducers", Wheeler publisher, 1994.
2	Sergej Fatikow and Ulrich Rembold, "Microsystem Technology and Microbotics", First edition, Springer – Verlag NEwyork, Inc, 1997.
3	Jacob Fraden, "Hand Book of Modern Sensors: Physics, Designs and Application" Fourth edition, Springer, 2010.
Reference Books	
1	Thomas. G. Bekwith and Lewis Buck.N, Mechanical Measurements, Oxford and IBH publishing Co. Pvt. Ltd.,
2	Robert H Bishop, "The Mechatronics Hand Book", CRC Press, 2002.
3	Massood Tabib and Azar, "Microactuators Electrical, Magnetic, thermal, optical, mechanical, chemical and smart structures", First edition, Kluwer academic publishers, Springer, 1997.
4	Manfred Kohl, "Shape Memory Actuators", first edition, Springer.

Course Outcomes: At the end of the course, the student will be able to:

CO's	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Explain the operating principles and classifications of sensors used in IoT applications.	Understand	L2
CO2	Analyze the behavior of thermal, magnetic, and radiation sensors for physical parameter measurement.	Analyze	L4
CO3	Apply appropriate transduction methods to convert physical inputs into electrical signals.	Apply	L3
CO4	Evaluate and select suitable sensors and actuators for given real-time industrial or smart systems.	Evaluate	L5
CO5	Develop IoT-based applications using sensor-actuator integration and smart sensor interface protocols.	Create	L6

Mapping of Course Outcomes to Program Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2												1	1
CO2	3		2										2	2
CO3	3		2										2	2
CO4	3		2										2	2
CO5	3		3		2								3	3

Weblinks and Video Lectures (e-Resources)	
1	https://www.youtube.com/playlist?list=PLgMDNELGJ1CbufZjqWa8uoSlQWKqVwPN7
2	https://www.youtube.com/watch?v=r_Pqc9boyIU&list=PLgMDNELGJ1CbufZjqWa8uoSlQWKqVwPN7&index=2
3	https://onlinecourses.nptel.ac.in/noc21_ee32/preview

INTEGRATED PROFESSIONAL CORE COURSE (IPCC)

Dayananda Sagar Academy of Technology & Management
(Autonomous Institute under VTU)

Semester	:	**5th Semester**				
Course Title	:	**Machine Intelligence**				
Course Code	:	**BIC503**				
Course Type (Theory/Practical/Project/Integrated)	:	**INTEGRATED**				
Category	:	**IPCC**				
Stream	:	**CSE-ICB**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**3-0-2-0**		**SEE**	:	**50**
Total Hours	:	**40 Hours**		**SEE Duration**	:	**3 hours**
Credits	:	**4**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Learn the basic principles and theories underlying artificial intelligence
2	Apply AI techniques to solve real-world problems
3	Understand the ethical, legal, and societal implications of AI

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three HOTS (Higher-order Thinking Skills) module-wise questions to promote critical thinking.
- Adopt Problem-Based Learning (PBL), which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve Teaching-Learning Process (TLP)

DSATM

Scheme of Teaching and Examinations for BE Programme -2023
Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2025-26)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**Introduction to AI and Foundations**: What is AI? current trends (generative AI, Agentic/autonomous systems). Foundations: Intelligent agents, rationality, environments. Problem-solving: State-space search, uninformed search (BFS, DFS).	8
Pedagogy	**Quiz**	
2	**Machine Learning Fundamentals: Intro to ML:** Supervised, unsupervised, reinforcement learning. ML process: Data preprocessing, feature engineering, model evaluation (accuracy, precision, recall, F1). Understanding Data: Types, stats, visualization.	8
Pedagogy	**Quiz**	
3	**Supervised Learning**: Regression, Linear regression, Logistic Regression, Decision Trees, K-Nearest Neighbors (KNN) Unsupervised Learning: Clustering algorithms, K-means, PCA	8
Pedagogy	**Demonstration**	
4	**Deep Learning and Neural Networks:** Intro to Neural Networks: Perceptron. MLPs: Backpropagation, activation functions.	8
Pedagogy	**Demonstration**	
5	**Advanced Topics and Ethical AI: Generative AI:** GANs, VAEs, diffusion models, Genetic AI CASE STUDY: Artificial General Intelligence: Definitions, Impact on society, economy, jobs and individuals CASE STUDY: Artificial Super Intelligence: Definitions, Impact on society, economy, future of humanity.	8
Pedagogy	**Demonstration**	

LIST OF EXPERIMENTS

SL.NO	Experiments/Programs	CO's
1	Simulation of Intelligent Agent: Define environment, represent states & actions, implement rule-based agent, simulate behavior	CO1
2	Problem Formulation & State Space Representation: Define initial & goal states, represent state space, model actions	CO2
3	Uninformed Search (BFS & DFS): Represent graph, implement BFS & DFS, compare traversal and performance	CO2
4	Informed Search (A* Algorithm): Define heuristic, implement A*, compare with BFS/DFS, evaluate efficiency	CO2
5	Data Handling & Visualization: Load dataset, compute mean/median/variance, perform analysis, plot graphs	CO3
6	Machine Learning Workflow: Preprocess data, split dataset, train model, evaluate performance	CO3
7	k-Nearest Neighbour (k-NN): Implement k-NN, classify data, test with different k values, evaluate results	CO4
8	Weighted k-NN & Distance Metrics: Apply weighted k-NN, use Euclidean & Manhattan distance, compare accuracy	CO4
Open Ended		
1	Open Ended: Perceptron Model: Select dataset, train perceptron, visualize decision boundary, tune parameters	CO5
2	Open Ended: Multi-Layer Perceptron (MLP): Preprocess data, design model, train, evaluate and improve accuracy	CO5

Text Books

Sl. No.	Title of the Book/Name of the author/Name of the publisher/Edition and Year
1	Stuart Russell, Peter Norvig, Artificial Intelligence: A Modern Approach, 3rd Edition, Pearson Education, 2015.
2	Aurelien Geron, "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" 3rd Edition
3	Kevin Patrick Murphy "Probabilistic Machine Learning: An Introduction", MIT Press, March 2022.

Reference Books

1	Elaine Rich, Kevin Knight, Artificial Intelligence, 3rd Edition, Tata McGraw Hill, 2009.
2	"Superintelligence: Paths, Dangers, Strategies" by Nick Bostrom

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Understand the foundations and evolution of AI and ML, including modern applications.	Understand	L2
CO2	Apply problem-solving techniques using search algorithms and knowledge representation.	Apply	L3
CO3	Develop and evaluate machine learning models for classification, regression, and clustering.	Apply	L3
CO4	Build and optimize deep learning models for real-world tasks.	Apply	L3
CO5	Explore ethical considerations and deployment strategies for AI systems	Understand	L2

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2												
CO2	3	2	3	1	2									
CO3			3	2	2	1								
CO4	2	2	3											
CO5				1		3	1	3				3		

Weblinks and Video Lectures (e-Resources)	
1	https://www.coursera.org/learn/ai-for-everyone
2	Intro to ML: Supervised, Unsupervised, Reinforcement Learning - Machine Learning by Andrew Ng (Coursera) Intro to Machine Learning - YouTube
3	3Blue1Brown Neural Networks: https://www.youtube.com/playlist?list=PLZHQObOWTQDNU6R1_67000Dx_ZCJB-3pi
4	https://www.youtube.com/user/joshstarmer
5	edX – Artificial Intelligence (AI) by Columbia University: https://www.edx.org/course/artificial-intelligence-ai

PROFESSIONAL ELECTIVE COURSE (PEC-1)

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**5th Semester**				
Course Title	:	**Fundamentals of Blockchain Technology**				
Course Code	:	**BIC504A**				
Course Type (Theory/Practical/Project/Integrated)	:	**Theory**				
Category	:	**PEC1**				
Stream	:	**CSE-ICB**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**3:0:0:0**		**SEE**	:	**50**
Total Hours	:	**40 Hours**		**SEE Duration**	:	**3 Hours**
Credits	:	**3**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand the basic principles of block chain technology
2	Apply cryptographic functions along with their implementation strategies.
3	Analyze the various techniques of Block chain

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three HOTS (Higher-order Thinking Skills) module-wise questions to promote critical thinking.
- Adopt Problem-Based Learning (PBL), which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve Teaching-Learning Process (TLP).

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COURSE CURRICULUM

Module No.	Topics	Hours
1	Block chain Fundamentals: Tracing Block chain's Origin, Revolutionizing the Traditional Business Network, How Blockchain Works, What Makes a Blockchain Suitable for Business? Text book 1: Chapter 1 and 2	8
Pedagogy	Problem-based learning	
2	Introduction to Cryptography: Cryptographic Hash Functions, SHA256, Hash Pointers and Data Structures, Merkle tree. Text book 2: Chapter 1	8
Pedagogy	Chalk and talk	
3	How Bitcoin Achieves Decentralization: Centralization vs. Decentralization, Distributed Consensus, Consensus without identity using a block chain, Incentives and proof of work. Text book 2: Chapter 2	8
Pedagogy	Demonstration	
4	Mechanics of Bit coin: Bit coin transactions, Bit coin Scripts, Applications of Bit coin scripts, Bit coin blocks, The Bit coin network. Text book 2: Chapter 3	8
Pedagogy	Chalk and talk	
5	How to store and use Bitcoin: Simple Local Storage, Hot and Cold Storage, Splitting and Sharing Keys, Online Wallets and Exchanges, Payment Services, Transaction Fees, Currency Exchange Markets. Text book 2: Chapter 4	8
	Case Studies	

Pedagogical Initiatives (Not limited to):

Think Pair and Share (Blended Learning): provides an opportunity for students to learn from one another

Problem Solving: encourages cognitive thinking and enables creative problem solving

Poster Presentation: allows students to represent the concepts visually in order to understand the topics easily.

Case studies: maps different domains in real time applications

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	BlockChain for dummies, Manav Gupta, Second IBM Limited Edition, 2018, John Wiley & Sons.
2	Bitcoin and Cryptocurrency Technologies, Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, 2016.
Reference Books	
1.	Blockchain: Blueprint for a New Economy,Melanie Swan, First edition, 2015, O'Reilly Media.
2.	Bitcoin: Programming the Open Blockchain, Andreas M. Antonopoulos, Mastering, Second edition, 2017, O'Reilly Media.

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Describe the origin of blockchain technology	Understand	L2
CO2	Illustrate the fundamental components of cryptography relevant to blockchain	Apply	L3
CO3	Compare and contrast centralized and decentralized systems	Apply	L3
CO4	Demonstrate the internal mechanics of Bitcoin including transactions	Apply	L3
CO5	Analyze different methods of storing and using Bitcoin, including local storage	Analyze	L4

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3				3								2	2
CO2	3				3		2						2	1
CO3	3				3		2						2	1
CO4	3				3								2	2
CO5	3				3		2						2	1

Weblinks and Video Lectures (e-Resources)	
1	https://www.ted.com/talks/don_tapscott_how_the_blockchain_is_changing_money_and_business
2	https://github.com/bitcoinbook/bitcoinbook
3	https://bitcoin.org/en/secure-your-wallet

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**5th Semester**				
Course Title	:	**Wireless and Mobile Device Security**				
Course Code	:	**BIC504B**				
Course Type (Theory/Practical/Project/Integrated)	:	**Theory**				
Category	:	**PEC1**				
Stream	:	**CSE-ICB**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**3:0:0:0**		**SEE**	:	**50**
Total Hours	:	**40 Hours**		**SEE Duration**	:	**3 Hours**
Credits	:	**3**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand the evolution of wired and wireless networks and their societal and economic impacts.
2	Explore security measures for WLANs and mobile devices.
3	Learn about mobile communication technologies and associated security challenges.
4	Gain proficiency in risk assessment and security tools for wireless networks

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three HOTS (Higher-order Thinking Skills) module-wise questions to promote critical thinking.
- Adopt Problem-Based Learning (PBL), which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.

- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve Teaching-Learning Process (TLP).

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Outcome Based Education and Choice Based Credit System

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COURSE CURRICULUM

Module No.	Topics	Hours
1	**Evolution of Data and Wired Networking: The Evolution of Data Networks**: The Dawn of Data Communication; Early Data Networks; The Internet Revolution; Advances in Personal Computers and Mobile Phones; Computers Go Mobile; Convergence of Mobile and Data Networks; Business Challenges, Addressed by Wireless Networking; IP Mobility and BYOD Impact; Security	8
Pedagogy	**Quiz**	

2	**The Mobile Revolution and Security Threats: The Mobile Revolution: Cellular Communication and Coverage; Frequency Sharing and Handoff; Evolution of Mobile Networks (1G to 4G/LTE); BYOD and Economic Impact of Mobility; Business Use Cases for Mobile Networking.** **Security Threats Overview: Threat Categories: Confidentiality, Integrity, Availability; Wireless and Mobile Device Threats: Data Theft, System Access; Risk Mitigation and BYOD for SMBs;** **Security Standards and Regulatory Compliance** **(ISO, NIST, PCI DSS);**	**8**
Pedagogy	**Demonstration**	
3	**WLAN Fundamentals and Threat Analysis:** How Do WLAN's Work? WLAN Topologies, Service Sets, and Standards; Wireless Access Points (WAPs) and Antennas; Coverage Area Determination and Site Surveys; Spectrum and Protocol Analysis. WLAN and IP Networking Threat and Vulnerability Analysis: Types of Attackers: Insiders vs. Outsiders; Physical Security, Social Engineering, and Wardriving; Rogue Access Points and Bluetooth Vulnerabilities; Malicious Data Insertion, Denial of Service, and Peer to Peer Hacking;	**8**
4	**WLAN Security Measures Basic WLAN Security Measures:** Design and Implementation for Security; Authentication, MAC Filters, VPN, and VLANs; Wired Equivalent Privacy, WPA, WPA2; Ongoing Management Considerations (Firmware, Physical Security); Advanced WLAN Security Measures: Comprehensive Security Policies; Authentication and Access Control (EAP, RADIUS); Intrusion Detection/Prevention Systems and Protocol Filtering; Advanced Data Protection: WPA2 Modes, VPN, IPsec; User Segmentation, VLANs, DMZ Segmentation; Device and Network Management.	**8**
Pedagogy	**Problem Solving**	

Pedagogy	**Poster Presentation**	
5	**Advanced Mobile Security and Risk Management WLAN Auditing Tools**: Discovery Tools (NetStumbler, Kismet); Penetration Testing Tools (Metasploit, Aircrackng); Network Enumerators, Protocol Analyzers, and Attack Tools; WLAN and IP Network Risk Assessment: Risk Assessment Methodologies and Stages; Security Risk Analysis and Audits; Legal Requirements and IT Security Management; Mobile Communication Security Challenges: Mobile Phone Threats: Exploits, Tools, and Techniques; Security Architectures: Android, iOS, Windows Phone; BYOD and Enterprise Mobility Management;	**8**
Pedagogy	**Case Studies**	
	Pedagogical Initiatives (Not limited to): ● Think Pair and Share (Blended Learning): provides an opportunity for students to learn from one another ● Problem Solving: encourages cognitive thinking and enables creative problem solving ● Poster Presentation: allows students to represent the concepts visually in order to understand the topics easily. ● Case studies: maps different domains in real time applications ● Demonstration: exhibits the implementation process	

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	J. Doherty, Wireless and Mobile Device Security. Jones & Bartlett Learning, 2nd edition Dec. 2021.
Reference Books	
1	M. S. Obaidat, A. Anpalagan, I. Woungang, and S. Misra, Security and Privacy in Wireless and Mobile Networks. MDPI, 2021.
2	M. Zinkus, T. M. Jois, and M. Green, "Data Security on Mobile Devices: Current State of the Art, Open Problems, and Proposed Solutions," arXiv, 2021. [Online]. Available: https://arxiv.org/abs/2105.12613

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Explain the evolution and impact of wired and wireless networks.	L2	Understand
CO2	Identify and categorize security threats to wireless and mobile networks.	L3	Apply
CO3	Analyze and implement security measures for WLANs and mobile devices.	L4	Analyze
CO4	Apply security techniques for auditing and penetration testing.	L3	Apply
CO5	Analyze strategies to manage risks in mobile and wireless communication systems.	L4	Analyze

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2														
CO3														
CO4														
CO5														

Weblinks and Video Lectures (e-Resources)	
1	https://www.cisco.com/c/en/us/solutions/small-business/resource-center/security/mobile-device-security.html
2	https://www.irs.gov/irm/part10/irm_10-008-026r

PROJECT BASED LEARNING (PBL)

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**5th Semester**				
Course Title	:	**Block Chain Technology**				
Course Code	:	**BIC505**				
Course Type (Theory/Practical/Project/Integrated)	:	**Project**				
Category	:	**PBL**				
Stream	:	**CSE-ICB**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**0:0:0:3**		**SEE**	:	**50**
Total Hours	:	**30 hours – Theory + Project**		**SEE Duration**	:	**2 Hours Project Evaluation**
Credits	:	**2**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To Understand Blockchain terminologies with its applications. design
2	To learn working principles of Blockchain and methodologies used in Bitcoin
3	To gain knowledge on Ethereum Network, Wallets, Nodes, Smart contract & DApps
4	To learn blockchain Based Application Architecture using Hyperledger and the Smart

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three HOTS (Higher-order Thinking Skills) module-wise questions to promote critical thinking.
- Adopt Problem-Based Learning (PBL), which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve Teaching-Learning Process (TLP).

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Topics to implement project

- CAP theorem, Byzantine Generals problem, Consensus
- Methods of decentralization, Blockchain and full ecosystem decentralization,
- The genesis block, The bitcoin network, Wallets, Smart Contracts-History, Definition, Ricardian contracts,
- The Ethereum stack, Ethereum blockchain, Currency (ETH and ETC)
- Hyperledger, Hyperledger as a protocol, Fabric, Hyperledger Fabric, Sawtooth Lake, Corda.

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Imran Bashir. “Mastring BlockChain”, Third Edition, Packt – 2020.
Reference Books	
1	➢ Andreas M. , Mastering Bitcoin: Programming the Open Blockchain – O’rielly – 2017.

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Explain the Blockchain terminologies with its applications	Understand	Level 2
CO2	Illustrate the working principles of Blockchain and the Smart Contract Lifecycle	Apply	Level 3
CO3	Demonstrate the principles and methodologies used in Bitcoin	Apply	Level 3

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2														
CO3														

Weblinks and Video Lectures (e-Resources)	
1	https://nptel.ac.in/courses/106104220
2	https://www.tutorialspoint.com/blockchain/index.htm
3	https://www.alchemy.com/dapps/list-of/defi-dapps-on-ethereum
	https://www.quicknode.com/guides/ethereum-development/smart-contracts/how-to-create-and-deploy-an-erc20-token

ABILITY ENHANCEMENT COURSE (AEC)

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**5th Semester**				
Course Title	:	**RMIPR**				
Course Code	:	**BRM507**				
Course Type (Theory/Practical/Project/ Integrated)	:	**Experiential Learning**				
Category	:	**AEC**				
Stream	:	**CSE-ICB**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**0:0:1:0**		**SEE**	:	**50**
Total Hours	:	**15 Hours**		**SEE Duration**	:	**2 Hours**
Credits	:	**1**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To Understand the knowledge on basics of research and its types.
2	To Learn the concept of Literature Review, Technical Reading, Attributions and Citations.
3	To learn Ethics in Engineering Research
4	To Discuss the concepts of Intellectual Property Rights in engineering.

Teaching-Learning Process Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in R-Lang.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three HOTS (Higher-order Thinking Skills) module-wise questions to promote critical thinking.
- Adopt Problem-Based Learning (PBL), which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve Teaching-Learning Process (TLP).

DSATM

Scheme of Teaching and Examinations for BE Programme 2023

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(Effective from the Academic Year 2025-26)

COURSE CURRICULUM

Module No.	Topics	Hours
1	Introduction: Objectives of Engineering Research, and Motivation in Engineering Research, Types of Engineering Research, Finding and Solving a Worthwhile Problem. Ethics in Engineering Research, Ethics in Engineering Research Practice, Types of Research Misconduct, Ethical Issues Related to Authorship. Tools: Undermind, Litmaps, Bohrium, Perplexity.	3
	Textbook1: Chapter1	
Pedagogy	Think-Pair-Share	
2	Literature Review and Technical Reading, New and Existing Knowledge, Analysis and Synthesis of Prior Art Bibliographic Databases, Web of Science, Google and Google Scholar, Effective Search: The Way Forward Introduction to Technical Reading Conceptualizing Research, Critical and Creative Reading. Tools: Google Scholar, IEEE Xplore, ACM Digital Library, PubMed, Scopus, Web of Science, arXiv, bioRxiv, Semantic Scholar, Connected Papers / Research Rabbit	3
	Textbook 1: Chapter2	
Pedagogy	Literature Review Paper Writing and Demo of the same	
3	Paper Writing: Identification of research problem, Paper writing as per IEEE format, Introduction to LaTeX, Plagiarism Checking Attributions and Citations: Giving Credit Wherever Due, Citations: Functions and Attributes, Impact of Title and Keywords on Citations, Knowledge Flow through Citation, Citing Datasets, Styles for Citations. Tools: Grammarly, QuillBot,LaTeX , Jenni.AI, Turnitin , Mendeley , Zotero, Scite.ai, PubMed, ResearchRabbit, Scispace, Speechify.	3
	Text Book1: Chapter 3.	
Pedagogy	Case study, Patent Proposal Writing	
4	Introduction to Intellectual Property: IP as a Global Indicator of Innovation, Origin of IP History of IP in India. Major Amendments in IP Laws and Acts in India. Patents: Rights Associated with Patents, Enforcement of Patent Rights, Inventions Eligible for Patenting, Non-Patentable Matters, Patent Infringements, Avoid Public Disclosure of an Invention before Patenting. Process of Patenting, Prior Art Search. Choice of Application to be Filed. Patent Application Forms, Jurisdiction of Filing Patent Application, Publication, Pre-grant Opposition, Examination. Grant of a Patent, Validity of Patent Protection, Post-grant Opposition, Commercialization of a Patent, Need for a Patent Attorney/Agent. Tools: PatentPal, WIPO Lex/GPT-based querying, Google Patents, IPfolio/TurboPatent,WIPO, TrademarkNow Advisor, DesignSearch.ai, DesignShelf, Legal Robot	3
	Text Book1: Chapter 4,5,6	

5	Copyrights and Related Rights: Classes of Copyrights. Criteria for Copyright. Ownership of Copyright. Copyrights of the Author. Copyright Infringements. Copyright Infringement Trademarks: Designation of Trademark Symbols. Classification of Trademarks. Registration of a Trademark is Not Compulsory. Validity of Trademark. Types of Trademark Registered in India, Process for Trademarks Registration, Case Study: Coca-Cola Company vs. Bisleri International Pvt. Ltd. Tools: WIPO Lex, Google Scholar (Case Law), HeinOnline, LexisNexis / Westlaw, SCOPUS / Web of Science, Plagscan / Turnitin, WIPO Copyright Registration Tools, Scholarcy, Elicit	3
	Text Book1: Chapter 7,8	
	Pedagogical Initiatives (Not limited to): • Think Pair and Share (Blended Learning): provides an opportunity for students to learn from one another • Problem Solving: encourages cognitive thinking and enables creative problem solving • Poster Presentation: allows students to represent the concepts visually in order to understand the topics easily. • Case studies: maps different domains in real time applications • Demonstration: exhibits the implementation process	

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1.	Research Methodology and Intellectual Property Rights , Dr. Santosh M Nejakar, Dr. Harish Bendigeri, ISBN 978-93-5987-928-4, Edition: 2023-24.
Reference Books	
1.	Research Methods for Engineers, David V. Thiel , Cambridge University Press, 978-1-107-03488-4
2.	Intellectual Property Rights, N.K.Acharya Asia Law House 6th Edition. ISBN: 978-93-81849-30-9
3.	Research Methodology – Methods and Techniques., C. R Kothari, Gourav Garg, New Age International Publishers.

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Acquire the knowledge of research and conduct a literature review.	Understand	L2
CO2	Apply the knowledge of research design, Citations, and the concepts of research methodology to a problem.	Apply	L3
CO3	Write an effective research paper for a given problem statement and Analyze data collection methods.	Analyze	L4
CO4	Choose Indian patent applications, Patent laws, Gain the requirements about registration and infringements related to trademarks, & copyrights.	Evaluate	L5

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	2	-	-	3	-	3	-	3	2	-
CO2	-	-	-	2	2	-	-	3	-	3	-	3	-	-
CO3	-	-	-	2	3	-	-	3	-	2	-	3	-	-
CO4	-	-	-	-	2	-	-	3	-	3	-	3	-	2

Weblinks and Video Lectures (e-Resources)	
1	https://onlinecourses.nptel.ac.in/noc24_ge21/preview
2	https://archive.nptel.ac.in/content/syllabus_pdf/121106007.pdf
3	https://onlinecourses.nptel.ac.in/noc21_hs08/preview

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember	-	-	-	-
Understand	20	-	10	-
Apply	20	10	20	20
Analyse	10	20	10	20
Evaluate	-	20	5	5
Create	-		5	5

CIE Course Assessment Plan

CO	PO	PSO
CO1	-	-
CO2	PO1,PO2,PO5	PSO1
CO3	PO1,PO2,PO5	-
CO4	PO1,PO3	PSO2
CO5	PO1,PO2,PO3,PO5,PO12	PSO1

CO's	Marks Distribution						Total Marks	Weightage
	Test-1(50)			Test-2(50)				
	Module -1	Module -2	Module 2 to 2.5	Module -2.5 to 3	Module -4	Module -5		
CO1	10	10	-	-	-	-	20	50 Marks
CO2	5	5	10	-	-	0	20	
CO3	5	5	-	10	10		30	
CO4	-	-	-	-	10	5	15	
CO5	-	-	-	-	-	15	15	
Total	20	20	10	10	20	20	100	

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks
	(90% Theory+10% Practical Questions)
Remember	-
Understand	20
Understand	20
Understand	30
Understand	15
Understand	15

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module -1	Module -2	Modul e 2 to 2.5	Module -2.5 to 3	Module -4	Module -5		
CO1	5	5	5	0	0	0	15	50 Marks
CO2	5	5	5	0	5	0	20	
CO3	5	5	0	5	5	5	25	
CO4	5	5	0	5	5	5	25	
CO5	0	0	0	0	5	10	15	
Tota l	20	20	10	10	20	20	100	

COs Mapped with POs and PSOs:

CO	PO	PSO
CO1	-	-
CO2	PO1,PO2,PO5	PSO1
CO3	PO1,PO2,PO5	-
CO4	PO1,PO3	PSO2
CO5	PO1,PO2,PO3,PO5,PO12	PSO1

Dayananda Sagar Academy of Technology & Management
(Autonomous Institute under VTU)

Semester	:	**5th Semester**				
Course Title	:	**Ethical Hacking**				
Course Code	:	**BIC517**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Category	:	**AEC**				
Stream	:	**CSE-ICB**		**CIE**	:	**50 Marks**
Teaching hours/ week (L:T:P:S)	:	**0:0:2:0**		**SEE**	:	**50 Marks**
Total Hours	:	**15**		**SEE Duration**	:	**3 Hours**
Credits	:	**01**				

Teaching-Learning Process

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) needs not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding
9. Use any of these methods: Chalk and board, Active Learning, Case Studies

DSATM

Scheme of Teaching and Examinations for BE Programme 2023

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2025-26)

COURSE CURRICULUM		
Module No.	Introduction to Hacking – Overview of hacking, ethical vs. unethical hacking, roles of ethical hackers. Types of Hacking – Black hat, white hat, grey hat,	Hours
1	hacktivism, and nation-state attacks. Methodologies of Hacking – Reconnaissance, scanning, gaining access, maintaining access, covering tracks.	5
Pedagogy	Group Discussion: Black hat, white hat, grey hat	
2	Introduction to Cybersecurity – Basic principles, CIA triad, cyber laws, and ethical considerations. Introduction to OWASP & SANS Checklist – Industry standards and frameworks for web security. Introduction to Kali Linux & Installation Methods – VirtualBox, dual booting, live USB, customization.	5
Pedagogy	Debate: cyber laws, and ethical considerations	
3	Hacking Android Phones, Hacking Windows Systems. Privilege escalation, persistence, and exploitation, Use of tools like njRAT Quasar, and building batch file malware, Hacking WEP/WPA/WPA2 Networks, Wireless cracking tools like air-crack-ng, Reaver, Wifite.	5
Pedagogy	Hands-on a building batch file malware	

Text Books	
Sl. No.	Title of the Book/Name of the author/Name of the publisher/Edition and Year
1	Mastering Threat Modeling: A Comprehensive Guide to Identifying and Mitigating Risks: Empowering Secure Systems Through Proactive Risk Assessment and Strategic Mitigation
Weblinks	
1	https://threatmap.checkpoint.com/
2	https://blog.google/threat-analysis-group/

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	To understand methodologies, and cyber threat landscape.	Understand	L2
CO2	To Build a solid foundation in hacking principles	Apply	L3

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2														

Humanities, Social Sciences and Management (HSMS)

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**5th Semester**				
Course Title	:	**Environmental Studies and E-Waste Management**				
Course Code	:	**BESK508**				
Course Type (Theory/Practical/Project/Integrated)	:	**THEORY**				
Category	:	**HSMS**				
Stream	:					
Teaching hours/ week (L:T:P:S)	:	**2:0:0:0**	**2:0:0:0**	**2:0:0:0**	**2:0:0:0**	**2:0:0:0**
Total Hours	:	**15**	**15**	**15**	**15**	**15**
Credits	:	**2**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To introduce students to the fundamental concepts of the environment, ecosystems, and biodiversity, emphasizing their interdependence and significance in sustaining life.
2	To identify the causes, effects, control measures major challenges of pollution of environmental problems and e-waste management.
3	To provide guidance on developing skills, and demonstrate socio-economic skills for Environmental protection e-waste management.

Teaching-Learning Process

General Instructions - Pedagogy:

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the activities will develop students' theoretical and applied social and cultural skills.

State the need for activities and its present relevance in the society and Provide real-life examples.

Support and guide the students for self-planned activities.

You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress in real activities in the field.

Encourage the students for group work to improve their creative and analytical skills

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Scheme of Teaching and Examinations for BE Programme -2023
Outcome Based Education and Choice Based Credit System (CBCS)
(Effective from the Academic Year 2025-26)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**Environment and Sustainability:** Environment & Ecosystem: Components of the environment, Ecosystems: Structure and Function, Types: Forest, Wetlands, River, Oceanic and Lake ecosystem. Sustainability: 17SDG targets and possible actions. Self-Study Component (SSC): Biodiversity: Types, Values, and Conservation of biodiversity.	3 Hours
Pedagogy		
2	**Natural resources and Energy:** Natural Resources: Water resources – Availability & Quality aspects, Water borne diseases & Fluoride problem in drinking water. Energy: Different types of energy, Wind Energy, Hydrogen as an alternative energy. Self-Study Component (SSC): Conventional sources & non-conventional sources of Energy, Solar energy	3 Hours
Pedagogy		
3	**Environmental Pollution and Global Environmental Issues** Environmental Pollution: Water Pollution, Noise pollution, Air pollution (Sources, Impacts, Preventive measures, Case studies, Relevant Environmental Acts) Global Environmental Issues: Acid Rain, Ozone Depletion, Global warming and Ground water depletion. Self-Study Component (SSC): Case studies of air pollution episodes.	3 Hours
Pedagogy		
4	**Waste management & Environmental Legislation:** Waste management: Solid Waste Management, types and sources, Biomedical Waste Management - Sources, Characteristics, Environmental Legislation: Water Act 1974, Air Act 1981, Environmental Protection Act 1984 Solid Waste Management Rules,2016, Biomedical Waste Management Rules, 2016. Self-Study Component (SSC): Case studies on waste management options	3 Hours
Pedagogy		
5	**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. Component of E waste management. E-waste (Management and Handling) Rules, 2011; and E-Waste (Management) Rules, 2022 - Salient Features and its implications. Self-Study Component (SSC): E-Waste (Management) Amendment Rules, 2023, 2024	3 Hours

	Pedagogical Initiatives (Not limited to): **Think Pair and Share (Blended Learning): provides an opportunity for students to learn from one another** **Problem Solving: encourages cognitive thinking and enables creative problem solving** **Poster Presentation: allows students to represent the concepts visually in order to understand the topics easily.** **Case studies: maps different domains in real time applications** **Demonstration: exhibits the implementation process**

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	**S M Prakash – Environmental Studies,3rd Edition Elite Publishers, Mangalore, 2018.**
2	**Hester R.E., and Harrison R.M, Electronic Waste Management. Science, 2009.**
3	**Benny Joseph- Environmental studies, Tata Mcgraw-Hill 2nd edition 2012.**
Reference Books	
1	**R Geetha Balakrishna & K G Lakasminarayana Bhatta- Environmental Studies, S M Publications, 2006-2007.**
2	**M.Ayi Reddy Textbook of environmental science and Technology, BS publications 2007**
3	**Johri R., E-waste: implications, regulations, and management in India and current global best practices, TERI Press, New Delhi.**
4	**Dr. B.S Chauhan- Environmental studies, university of science press 1st edition**
5	**M.Ayi Reddy Textbook of environmental science and Technology, BS publications 2007**

Course Outcomes: At the end of the course, the student will be able to:

CO	**Course Outcomes**	**RBT Level**	**RBT Level Indicator**
CO1	**To understand the principles of ecology and environmental issues that apply to air, land and water issues along with e-waste management on a global scale.**	**Understand/ Remember**	**L1**
CO2	**To evaluate the societal complex issues related to environment and e-waste management.**	**Design**	**L4**
CO3	**To develop sustainable solution for environmental issues and e-waste management issues**	**Create**	**L5**

Course Outcomes to Program Outcomes:															
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO
CO1													2		
CO2									2	2				2	1
CO3								3		3					

Weblinks and Video Lectures (e-Resources)	
1	https://youtu.be/l_bnGkviWOUhttps://youtu.be/Ar04qG1P8Es
2	https://sdgs.un.org/goals
3	https://kspcb.karnataka.gov.in/waste-management/biomedical-waste
4	https://archive.nptel.ac.in/courses/109/105/109105190/
5	https://youtu.be/l_bnGkviWOUhttps://youtu.be/Ar04qG1P8Es

Course - Skills Mapping Table

5th Semester					
Sl. No	**Name of the Course**	**Course Code**	**Course Type**	**Course Category**	**Skills attained by the students**
1	Cryptography	BIC501	Integrated	IPCC	Designing and analyzing cryptographic algorithms
2	Block Chain Technology	BIC505	Project Based Learning	PBL	Implementing smart contracts on platforms like Ethereum
3	Ethical Hacking	BIC517	Ability Enhancement Course	AEC	Identifying and exploiting system vulnerabilities

6th SEMESTER

INTEGRATED PROFESSIONAL CORE COURSE (IPCC)

Semester	:	**6 th**				
Course Title	:	**IoT System Architecture**				
Course Code	:	**BIC601**				
Course Type (Theory/ Practical/ Integrated)	:	**Integrated**				
Category	:	**IPCC**				
Stream	:	**CS-IoT, Cyber Security including Blockchain**		**CIE**	:	**50 Marks**
Teaching hours/ week (L:T:P:S)	:	**3:0:2:0**		**SEE**	:	**50 Marks**
Total Hours	:	**40 Hrs+20 hours of practical classes**		**SEE Duration**	:	**3 Hours**
Credits	:	**4**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Knowledge on concepts of IoT applications and IoT architectures
2	Event driven analysis and security testing IoT systems
3	Illustrate the layered IoT architecture including perception, network, and application layers.
4	Simulate basic IoT-based applications using appropriate platforms

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in Electronic Devices and Circuits.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three HOTS (Higher-order Thinking Skills) module-wise questions to promote critical thinking.
- Adopt Problem-Based Learning (PBL), which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analysing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve Teaching-Learning Process (TLP).

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Scheme of Teaching and Examinations for BE Programme -2024-25

Outcome Based Education and Choice Based Credit System (CBCS)

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COURSE CURRICULUM

Module No.	Topics	Hours
1	**M2M to IoT -** An Architectural Overview: Building an Architecture, Main Design Principles and Needed Capabilities, An IoT Architecture Outline, Standards Considerations. **M2M and IoT Technology Fundamentals:** Devices and Gateways, Local and Wide Area Networking, Data Management. **Textbook 1: Ch. 4.1 - 4.4, Ch. 5.1 - 5.3**	8
Pedagogy	**Experiential Learning**	
2	**IoT Architecture -** State of the Art: Introduction, State of the Art: ETSI M2M High-level Architecture, ETSI M2M Service Capabilities, ETSI M2M Interfaces, ETSI M2M Resource Management. **Architecture Reference Model:** Introduction, Reference Model and Architecture, IoT Reference Model: IoT Domain Model, Information Model, Functional Model, Communication Model, Safety, Privacy, Trust, Security Model. **Textbook 1: Ch. 6.1 - 6.2 (6.2.1.1 – 6.2.1.4), Ch. 7.1 - 7.3**	8
Pedagogy	**Think Pair Share**	
3	**IoT Reference Architecture:** Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant Architectural Views. **Real-world Design Constraints:** Introduction, Technical Design Constraints, Data Representation and Visualization, Interaction and Remote Control. **Textbook 1: Ch. 8.1 – 8.5, Ch. 9.1 - 9.4**	8
Pedagogy	**Mobile Studio**	
4	**IoT System Architectures:** Introduction, Protocols Concepts, IoT-Oriented Protocols, Databases, Time Bases, Security. Event-Driven **System Analysis:** Introduction, IoT Network Model: Events, Networks, Devices and Hubs, Single-Hub Networks, Multi-Hub Networks, Network Model and Physical Networks, IoT Event Analysis: Event Populations, Stochastic Event Populations, Environmental Interaction Modeling, Event Transport and Migration. **Textbook 2: Ch. 2.1 – 2.6, Ch. 4.1, 4.4, 4.5**	8
Pedagogy	**Demonstration**	
5	**Industrial Internet of Things**: Introduction, Industry 4.0, Industrial Internet of Things (IIoT), IIoT Architecture, Basic Technologies, Applications and Challenges. **Security and Safety**: Introduction, Systems Security, Network Security, Generic Application Security, Application Process Security and Safety, Reliable-and-Secure-by Design IoT Applications, Run-Time Monitoring, The ARMET Approach, Privacy and Dependability. **Textbook 2: Ch. 5.1 – 5.6, Ch. 6.1 – 6.9**	8 **Hours**

Pedagogy	Demonstration	
	Case Studies ● **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another ● **Problem Solving**: encourages cognitive thinking and enables creative problem solving ● **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. ● **Case studies:** maps different domains in real time applications ● **Demonstration:** exhibits the implementation process	

List of Experiments:

Sl. No.	Experiments/Programs	Cos
	Hardware	
1	To study various IOT protocol- 6 LowPAN, IPv4/IPv6, Wifi, Bluetooth, MQTT.	CO2
2	Interfacing of temperature sensor LM35 with Arduino	CO2
3	Interfacing of the Relay with Arduino..	CO2
4	To develop an application to send and receive data with Arduino using HTTP request	CO2
5	To develop an application that measures the room temperature and posts the temperature value on the cloud platform.	CO2
6	To develop an application that measures the moisture of soil and post the sensed data over Google firebase cloud platform.	CO2
7	Building Intrusion Detection System with Arduino and Ultrasonic Sensor **(Can be Demo experiments for CIE)**	CO3
8	Directional Control of the DC motor using Arduino **(Can be Demo experiments for CIE)**	CO3
	Open ended Programs	
1	To develop an application for measuring the distance using ultrasonic sensor and post distance value on Google cloud IoT platform (**Can be Demo experiments for CIE)**.	CO3
2	To develop a Simple application based on sensors.(**Can be Demo experiments for CIE)**	CO3

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stamatis Karnouskos, Stefan Avesand, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2015.
2	Dimitrios Serpanos, Marilyn Wolf, "Internet-of-Things (IoT) Systems - Architectures, Algorithms, Methodologies", ISBN 978-3-319-69714-7.
Reference Books	

1	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton, Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things" 1st Edition, Pearson Education (Cisco Press Indian Reprint) (ISBN: 978- 9386873743).
2	Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5, e-ISBN 978-3-642-19157-2, Springer, 2016.
3	Danial Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Wiley Publications.

Course Outcomes: At t

the end of the course, the student will be able to:

CO's	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Understand IoT value chain structure (device, data cloud), application areas and technologies involved.	Understand	L2
CO2	Understand IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, and sensing modules	Apply	L3
CO3	Market forecast for IoT devices with a focus on sensors	Apply	L3
CO4	Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi	Analyze	L4
CO5	Develop Sensor-Based smart applications for the given real world	Analyze	L4

Mapping of Course Outcomes to Program Outcomes:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	3	2	–	–	2	–	–	–	–	–	–	2	3	2	–
CO 2	3	3	–	2	2	–	–	–	–	–	–	2	3	2	–
CO 3	3	3	2	2	2	–	–	–	–	–	–	2	3	3	–
CO 4	3	3	2	3	3	–	–	–	2	2	–	2	3	3	2
CO 5	3	3	3	3	3	2	–	–	2	2	2	3	3	3	3

Weblinks and Video Lectures (e-Resources)	
1	http://www.springer.com/engineering/electronics/book/978-0-387-25746-4 ,Analog Circuit Design: A Tutorial Guide to Applications and solutions.
2	https://www.tutorialspoint.com/Electronic devices applications/index.htm
3	https://www.scribd.com/book/282535091/ElectronicDevices
4	https://nptel.ac.in/courses/108/106/108106084/
6	https://nptel.ac.in/courses/117/103/117103063/

Dayananda Sagar Academy of Technology & Management

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Semester	:	**6th**				
Course Title	:	**Applied AI for IoT and Cybersecurity**				
Course Code	:	**BIC602**				
Course Type (Theory/ Practical/ Integrated)	:	**Integrated**				
Category	:	**IPCC**				
Stream	:	**CSE**		**CIE**	:	**50 Marks**
Teaching hours/ week (L:T:P:S)	:	**3:0:2:0**		**SEE**	:	**50 Marks**
Total Hours	:	**40 hours Theory + 20 Hours of Practical Classes**		**SEE Duration**	:	**3 hrs**
Credits	:	**4**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand data characteristics in **IoT and cybersecurity systems**
2	Perform **feature engineering on real-world datasets**
3	Apply **machine learning and deep learning techniques** for anomaly detection
4	Design **AI pipelines for edge and cloud environments**
5	Develop **AI-based solutions for IoT and cybersecurity applications**

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in AI on real-world IoT and cybersecurity applications.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

DSATM

Scheme of Teaching and Examinations for BE Programme -2024-25
Outcome Based Education and Choice Based Credit System (CBCS)
(Effective from the Academic Year 2025-26)

COURSE CURRICULUM		
Module No.	**Topics**	**Hours**
1	**Data in IoT and Cyber Security Systems** **Types of data:** IoT sensor data, Network traffic data, System and security logs **Characteristics of IoT data:** Noise, drift, missing values, Time-series nature **Data collection and pre-processing:** Cleaning and normalization, Handling missing and noisy data, Introduction to time-series data and visualization TB1 – Chapters 2, 3; TB2 – Chapters 1, 2	**8**
Pedagogy	**Presentation**	
2	**Feature Engineering for Data Systems** **Feature extraction:** Sensor data (statistical and temporal features), Network traffic and event-based logs Time-series feature engineering, Feature selection techniques, Dimensionality reduction, Data representation for machine learning models TB1 – Chapters 2, 4; TB2 – Chapter 3	**8**
Pedagogy	**Think Pair and Share**	
3	**Machine Learning and Deep Learning for Behaviour Analysis** **Machine Learning Techniques:** Classification, Clustering, Anomaly detection **Deep Learning in CPS Applications:** Neural network basics (intuitive understanding), Convolutional Neural Networks (CNN): Pattern recognition use cases, Recurrent Neural Networks (RNN / LSTM): Sequential data analysis (logs, network traffic) **Model Evaluation:** Accuracy, precision, recall, Basic performance comparison TB1 – Chapters 3, 10, 14, 15; TB2 – Chapters 4, 5	
Pedagogy	**Jigsaw Classroom**	
4	**AI for Edge, Cloud and Real-Time Systems** **End-to-end AI pipeline:** Data → Feature → Model → Output, Real-time and batch processing	**8**

	Edge AI vs Cloud AI: Latency and bandwidth considerations, Resource constraints: CPU, memory, power, Introduction to deployment concepts, APIs for AI models TB1 – Chapters 2, 19; TB2 – Chapter 6	
Pedagogy	**Flipped Classroom**	
	AI Applications in IoT and Cybersecurity Systems	
5	**AI for IoT Systems:** Sensor anomaly detection, Smart monitoring systems **AI for Cybersecurity:** Intrusion detection systems, Log anomaly detection, Behaviour-based detection TB2 – Chapters 5, 7; TB3 – Chapters 1, 2	**8**
Pedagogy	**Think Pair and Share**	
	Pedagogical Initiatives (Not limited to): ● **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another ● **Problem Solving**: encourages cognitive thinking and enables creative problem solving ● **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. ● **Case studies:** maps different domains in real time applications ● **Demonstration:** exhibits the implementation process	

List of Programs:

Sl. No.	Experiments/Programs	CO
1	**IoT and Security Data Exploration** Load IoT sensor dataset / network log dataset, Identify data types and attributes, Perform basic statistics (mean, variance), Visualize data (plots) Tools: Python (Pandas, Matplotlib)	CO2
2	**Time-Series Analysis of Sensor Data** Plot time-series data, Identify trends, seasonal patterns and simple anomalies visually Tools: Python	CO2
3	**Data Preprocessing for IoT and Security Data** Handle missing values, Normalize data, Remove noise/outliers, Prepare cleaned dataset Tools: Python	CO2
4	**Feature Engineering for Sensor Data**	CO3

	Extract statistical features (mean, std, min, max), Apply sliding window technique, Create feature vectors Tools: Python (NumPy, Pandas)	
5	**Feature Engineering for Network and Log Data** Extract features (frequency, counts, patterns), Encode categorical variables, Create ML-ready dataset Tools: Python	**CO5**
6	**Classification for Intrusion/Attack Detection** Train classifier (Decision Tree / Logistic Regression), Predict outcomes, Evaluate accuracy Tools: Scikit-learn	**CO4**
7	**Anomaly Detection in IoT/Security Data** Apply anomaly detection (Isolation Forest / K-Means), Identify anomalies, Visualize abnormal patterns Tools: Scikit-learn	**CO3**
8	**Deep Learning for Sequential Data** Use pre-built RNN/LSTM model, Apply on time-series/log dataset, Observe prediction behavior Tools: TensorFlow / PyTorch	**CO4**
9	**AI Pipeline for IoT/Cyber System** Data → preprocessing → feature extraction, Train model → predict output, Evaluate results Tools: Python	**CO4**
	Open-Ended Experiments	
10	**Mini Project 1: IoT System Intelligence** a. Sensor anomaly detection, Smart monitoring system b. Select dataset, Build ML model, Display results	**CO5**
11	**Mini Project 2: Cybersecurity Intelligence** a. Intrusion detection, Log anomaly detection and Behaviour profiling b. Analyze dataset, Detect anomalies or attacks, Provide insights	**CO5**

Text Books:	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Aurélien Géron , Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow, 3rd Edition, 2022.

2.	Clarence Chio, David Freeman, Machine Learning and Security, 1st Edition, 2018.
3.	Stuart Russell, Peter Norvig, Artificial Intelligence: A Modern Approach, Pearson India, 4th Edition, 2023.
Reference Books:	
1	Kevin P. Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.
2	Alice Zheng, Amanda Casari, Feature Engineering for Machine Learning, O'Reilly, 2018.
3	Goodfellow, Bengio, Courville, Deep Learning, MIT Press, 2016.

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Describe preprocessing IoT and cybersecurity datasets	**L2**	**Understand**
CO2	Apply feature engineering for system-level data	**L3**	**Apply**
CO3	Analyze machine learning and deep learning techniques for anomaly detection	**L4**	**Apply**
CO4	Evaluate AI pipelines for edge and cloud-based systems	**L5**	**Analyze**
CO5	Create AI-based solutions for IoT and cybersecurity applications	**L6**	**Evaluate**

Mapping of Course Outcomes to Program Outcomes:

CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	3	–	2	2	–	–	–	–	–	–	2	3	2	–
CO2	3	3	–	3	2	–	–	–	–	–	–	2	3	3	–
CO3	3	3	2	3	3	–	–	–	–	–	–	2	3	3	2
CO4	3	3	3	3	3	–	–	–	2	2	–	2	3	3	2
CO5	3	3	3	3	3	2	–	–	2	2	2	3	3	3	3

Weblinks and Video Lectures (e-Resources)	
1	**Introduction to Machine Learning:** https://onlinecourses.nptel.ac.in/noc19_cs53/preview
2	**Deep Learning:** https://nptel.ac.in/courses/106105215

PROFESSIONAL CORE COURSE (PCC)

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**6th**				
Course Title	:	**DATA ANALYTICS FOR IOT**				
Course Code	:	**BIC603**				
Course Type (Theory/Practical/Project/Integrated)	:	**Theory**				
Category	:	**PCC**				
Stream	:	**CSE-ICB**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**3:0:0:0**		**SEE**	:	**50**
Total Hours	:	**40 Hours of Theory**		**SEE Duration**	:	**3 Hours**
Credits	:	**3**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To understand IoT Analytics and Challenges
2	To Analyze the IoT data to infer the protocol and device characteristics
3	To Explore and visualize data, and techniques to understand data quality

Teaching-Learning Process
Pedagogical Initiatives:
Some sample strategies to accelerate the attainment of various course outcomes are listed below:

1. Adopt different teaching methods to attain the course outcomes.
2. Include videos to demonstrate various concepts.
3. Encourage collaborative (Group) Learning to encourage team building.
4. Ask at least three HOTS (Higher-order Thinking Skills) module-wise questions to promote critical thinking.
5. Adopt Problem-Based Learning (PBL), which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
6. Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
7. Discuss various case studies to map with real-world scenarios and improve the understanding.
8. Devise innovative pedagogy to improve Teaching-Learning Process (TLP).

DSATM

Scheme of Teaching and Examinations for BE Programme - 2025-26 Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2025-26)

COURSE CURRICULUM

Module No.	Topics	Hours
1	Defining IoT Analytics and Challenges Introduction to IoT, applications, IoT architectures, introduction to analytics, IoT analytics challenges.	8
Pedagogy	Demonstration	
2	IoT Devices and Networking Protocols IoT devices, Networking basics, IoT networking connectivity protocols, IoT networking data messaging protocols, Analyzing data to infer protocol and device characteristics.	8
Pedagogy	Problem Solving	
3	IoT Analytics for the Cloud Introduction to elastic analytics, Decouple key components, Cloud security and analytics, designing data processing for analytics, Applying big data technology to storage.	8
Pedagogy	Case study Assignment	
4	Exploring IoT Data Exploring and visualizing data, Techniques to understand data quality, Basic time series analysis, Statistical analysis.	8
Pedagogy	Poster Presentation	
5	Data Science for IoT Analytics Introduction to Machine Learning, Feature engineering with IoT data, Validation methods, Understanding the bias–variance tradeoff, Use cases for deep learning with IoT data.	8
	Pedagogical Initiatives (Not limited to): ● Think Pair and Share (Blended Learning): provides an opportunity for students to learn from one another ● Problem Solving: encourages cognitive thinking and enables creative problem solving ● Poster Presentation: allows students to represent the concepts visually in order to understand the topics easily. ● Case studies: maps different domains in real time applications ● Demonstration: exhibits the implementation process	

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	**Minteer, Andrew, Analytics for the Internet of Things (IoT), Packt Publishing Ltd. July 2017, ISBN 9781787120730**
Reference Books	
1	Kai Hwang, Min Chen, Big-Data Analytics for Cloud, IoT and Cognitive Computing, Wiley
2	Hwaiyu Geng, Internet of Things and Data Analytics Handbook, Wiley
3	John Soldatos, Building Blocks for IoT Analytics Internet-of-Things Analytics, River Publishers Gerardus Blokdyk,
4	IoT Analytics a Complete Guide, 5starcooks.

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	**Understand the fundamentals of IoT Analytics and Challenges**	**U**	**Level 2**
CO2	**Analyze IoT Devices and Networking Protocols**	**An**	**Level 4**
CO3	**Apply IoT Analytics for the Cloud**	**Ap**	**Level 3**
CO4	**Analyze the concept of exploring and visualizing data**	**An**	**Level 4**
CO5	**Apply the validation methods**	**Ap**	**Level 3**

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3														
CO2		3													
CO3			3												
CO4		3													
CO5	2		2		3				3			3			

Weblinks and Video Lectures (e-Resources)	
1	https://www.analytixlabs.co.in/blog/analytics-in-iot/
2	https://aws.amazon.com/iot-analytics/
3	https://www.ibm.com/think/insights/real-time-analytics-on-iot-data

PROFESSIONAL ELECTIVE COURSE (PEC)

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**6th**				
Course Title	:	**Cyber Security and Applications**				
Course Code	:	**BIC604A**				
Course Type (Theory/Practical/Project/Integrated)	:	**Theory**				
Category	:	**PEC**				
Stream	:	**CSE-ICB**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**3:0:0:0**		**SEE**	:	**50**
Total Hours	:	**40 Hours**		**SEE Duration**	:	**3 Hours**
Credits	:	**3**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To learn the fundamental concepts and techniques of natural language processing (NLP) including Language Models, Word Embedding, Part pf speech Tagging, Parsing
2	To learn computational properties of natural languages and the commonly used algorithms for processing linguistic information
3	To introduce basic mathematical models and methods used in NLP applications to formulate computational solutions
4	To introduce students research and development work in Natural language Processing

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three HOTS (Higher-order Thinking Skills) module-wise questions to promote critical thinking.
- Adopt Problem-Based Learning (PBL), which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.

- Devise innovative pedagogy to improve Teaching-Learning Process (TLP).

DSATM	Scheme of Teaching and Examinations for BE Programme - 2024-25 Outcome Based Education and Choice Based Credit System (CBCS) (Effective from the Academic Year 2025-26)	
COURSE CURRICULUM		
Module No.	**Topics**	**Hours**
1	**Introduction to Cybercrimes: Definition and classification of cybercrimes in Indian law, Legal frameworks: Information Technology Act, 2000 (amended in 2008), and relevant sections of the Indian Penal Code, Challenges in investigating and prosecuting cybercrimes in India.**	**8 Hours**
Pedagogy	**Short examples for preprocessing. Quiz on definitions and basic techniques.**	
2	**Cyber security Principles: Principles of cyber security: confidentiality, integrity, availability (CIA triad), Threat landscape in India: types of cyber threats and vulnerabilities, Risk management strategies: prevention, detection, and response to cyber incidents.**	**8 Hours**
Pedagogy	**Problem solving (N-gram probability calculation)**	

3	Legal and Regulatory Frameworks: Overview of cyber security laws in India: Data Protection laws, GDPR compliance, Role of regulatory authorities: CERT-In (Indian Computer Emergency Response Team), RBI (Reserve Bank of India) guidelines, international cooperation and treaties for combating cybercrimes	8 Hours
Pedagogy	Demonstration/Visualization of vector space	
4	Digital Forensics: Digital evidence: collection, preservation, and admissibility in Indian courts, Forensic tools and techniques: chain of custody, data recovery, and analysis, Role of cyber forensics in cybercrime investigations in India.	8 Hours
Pedagogy	Demonstration	
5	Emerging Trends and Challenges: Emerging technologies and their implications for cyber security in India, Ethical and privacy issues in cyber security practices: data sovereignty, surveillance concerns, Future directions: cyber security workforce development, national cyber security strategies	8 Hours
	Case Studies	
	Pedagogical Initiatives (Not limited to):	

Think Pair and Share (Blended Learning): provides an opportunity for students to learn from one another

Problem Solving: encourages cognitive thinking and enables creative problem solving

Poster Presentation: allows students to represent the concepts visually in order to understand the topics easily.

Case studies: maps different domains in real time applications

Demonstration: exhibits the implementation process

Text Books	
Sl. No.	Title of the Book/Name of the author/Name of the publisher/Edition and Year
1	"Cyber security Essentials" by Charles J.
2	"Cybercrime: Investigating High-Technology Computer Crime" by Robert Moore
3	"Cyber security: The Beginner's Guide" by Dr. Erdal Ozkaya
4	"Cyber security and Cyberwar: What Everyone Needs to Know" by P.W. Singer and Allan Friedman
5	"Cyber security for Beginners" by Raef Meeuwisse
6	Cyber Security: Law and Practice" by Vivek Sood
7	Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives"by Pavan
8	Cyber Laws and IT Protection" by Karnika Seth 9. Cyber Law: Indian Perspective" by Rohas Nagpal

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Understand types of cybercrimes and their impacts on individuals and organizations.	U	Level 2
CO2	Apply the essential knowledge of cyber security principles.	Ap	Level 3
CO3	Demonstrate awareness of the legal and ethical considerations surrounding cyber activities.	U	Level 2

CO4	Apply skills in assessing cyber security risks and implementing effective risk management strategies.	Ap	Level 3
CO5	Analyze emerging cyber threats and case studies.	An	Level 4

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3														
CO2		3													
CO3			3												
CO4				3											
CO5			3												

Weblinks and Video Lectures (e-Resources)	
1	https://www.netacad.com/courses/cybersecurity-essentials
2	https://www.ncsc.gov.uk/cyberessentials/overview
3	https://www.eccouncil.org/train-certify/essentials/

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**6th**				
Course Title	:	**Cloud Computing & Security**				
Course Code	:	**BIC604B**				
Course Type (Theory/Practical/Project/Integrated)	:	**Theory**				
Category	:	**PEC**				
Stream	:	**CSE-ICB**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**3:0:0:0**		**SEE**	:	**50**
Total Hours	:	**40 Hours**		**SEE Duration**	:	**3 Hours**
Credits	:	**3**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Introduce the rationale behind the cloud computing revolution and the business drivers
2	Understand various models, types and challenges of cloud computing
3	Understand the design of cloud native applications, the necessary tools and the design tradeoffs
4	Realize the importance of Cloud Virtualization, Abstraction`s, Enabling Technologies and cloud security

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three HOTS (Higher-order Thinking Skills) module-wise questions to promote critical thinking.
- Adopt Problem-Based Learning (PBL), which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve Teaching-Learning Process (TLP).

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Scheme of Teaching and Examinations for BE Programme -2024-25

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2025-26)

COURSE CURRICULUM

Module No.	Topics	Hours
1	Distributed System Models and Enabling Technologies: Scalable Computing Over the Internet, Technologies for Network Based Systems, System Models for Distributed and Cloud Computing, Software Environments for Distributed Systems and Clouds, Performance, Security and Energy Efficiency. Textbook 1: Chapter 1: 1.1 to 1.5	8
Pedagogy	Quiz	
2	Virtual Machines and Virtualization of Clusters and Data Centers: Implementation Levels of Virtualization, Virtualization Structure/Tools and Mechanisms, Virtualization of CPU/Memory and I/O devices, Virtual Clusters and Resource Management, Virtualization for Data Center Automation. Textbook 1: Chapter 3: 3.1 to 3.5	8
Pedagogy	Quiz	
3	Cloud Platform Architecture over Virtualized Datacenters: Cloud Computing and Service Models, Data Center Design and Interconnection Networks, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms: GAE, AWS and Azure, Inter-Cloud Resource Management. Textbook 1: Chapter 4: 4.1 to 4.5	8
Pedagogy	Demonstration	
4	Cloud Security: Top concern for cloud users, Risks, Privacy Impact Assessment, Cloud Data Encryption, Security of Database Services, OS security, VM Security, Security Risks Posed by Shared Images and Management OS, XOAR, A Trusted Hypervisor, Mobile Devices and Cloud Security. Cloud Security and Trust Management: Cloud Security Defense Strategies, Distributed Intrusion/Anomaly Detection, Data and Software Protection Techniques, Reputation-Guided Protection of Data Centers. Textbook 2: Chapter 11: 11.1 to 11.3, 11.5 to 11.8, 11.10 to 11.14 Textbook 1: Chapter 4: 4.6	8
Pedagogy	Demonstration	
5	Cloud Programming and Software Environments: Features of Cloud and Grid Platforms, Parallel and Distributed Computing Paradigms, Programming Support for Google App Engine, Programming on Amazon AWS and Microsoft, Emerging Cloud Software Environments. Textbook 1: Chapter 6: 6.1 to 6.5	8

	Pedagogical Initiatives (Not limited to): **Think Pair and Share (Blended Learning): provides an opportunity for students to learn from one another** **Problem Solving: encourages cognitive thinking and enables creative problem solving** **Poster Presentation: allows students to represent the concepts visually in order to understand the topics easily.** **Case studies: maps different domains in real time applications** **Demonstration: exhibits the implementation process**

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	**Kai Hwang, Geoffrey C Fox, and Jack J Dongarra, Distributed and Cloud Computing, Morgan Kaufmann, Elsevier 2012**
2	**Dan C. Marinescu, Cloud Computing Theory and Practice, Morgan Kaufmann, 2nd Edition, Elsevier 2018**
Reference Books	
1	**Rajkumar Buyya, Christian Vecchiola, and Thamrai Selvi, Mastering Cloud Computing McGrawHill Education, 1st Edition, 2017**
2	**Toby Velte, Anthony Velte, Cloud Computing: A Practical Approach, McGraw-Hill Education, 2017**
3	**George Reese, Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, O'Reilly Publication, 1st Edition, 2009**
4	**John Rhoton, Cloud Computing Explained: Implementation Handbook for Enterprises, Recursive Press, 2nd Edition, 2009.**

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Describe various cloud computing platforms and service providers.	L2	Apply
CO2	Illustrate the significance of various types of virtualization.	L3	Apply
CO3	Identify the architecture, delivery models and industrial platforms for cloud computing based applications.	L4	Demonstrate
CO4	Analyze the role of security aspects in cloud computing.	L4	Demonstrate
CO5	Demonstrate cloud applications in various fields using suitable cloud platforms.	L4	Demonstrate

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3														
CO2		3			3										
CO3			3		3				2			3			
CO4			3		3				2			3			
CO5		3			3				2			3			

Weblinks and Video Lectures (e-Resources)	
1	https://freevideolectures.com/course/4639/nptel-cloud-computing/1.
2	https://www.youtube.com/watch?v=EN4fEbcFZ_E

PROJECT BASED LEARNING (PBL)

Subject Identified for Project Based Learning

Semester	**6**
Subject Identified for PBL	**Threat Analysis**
Prerequisite	**Basic knowledge of Cybersecurity**
Justification for the selected subject	**Machine Learning concepts is a required subject for data science course in perusing further courses of data science.**
List of possible projects	**Planning to engage this course by industry experts, projects will be assigned by them.**

Signature of the Guide **Signature of HOD**

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**6th**				
Course Title	:	**THREAT ANALYSIS**				
Course Code	:	**BIC607**				
Course Type (Theory/Practical/Project/Integrated)	:	**Project**				
Category	:	**PBL**				
Stream	:	**CSE-ICB**		**CIE**	:	**50**
Teaching hours/ week (L: T:P:S)	:	**0:0:0:2**		**SEE**	:	**50**
Total Hours	:	**30 Hours Project**		**SEE Duration**	:	**2 Hours**
Credits	:	**2**				

Sl. No	Course Objectives
1	Gain insight into the mindset, goals, and tactics of threat actors and the technical underpinnings of modern attack infrastructures
2	Learn to proactively identify hidden threats using log data and structured hunting methodologies.
3	Develop effective detection and mitigation strategies using behavior analytics and XDR platforms

Scheme of Teaching and Examinations for BE Programme -2024-25

Outcome Based Education and Choice Based Credit System

(CBCS)

(Effective from the Academic Year 2025-26)

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Topics to implement project
• Understanding Command & Control (C2) servers: Function, setup, and obfuscation techniques • Dissecting multi-stage attacks: Initial compromise to data exfiltration • Threat actor motives and targeting strategies • Case studies of APTs and nation-state actors
• Fundamentals of threat hunting: Hypothesis-driven and IOC-based approaches • Parsing and correlating logs from SIEMs, endpoints, and firewalls • Detecting lateral movement, privilege escalation, and C2 beaconing via logs • Tooling: Sysmon, ELK stack, Sigma rules
• Introduction to the Antimalware Scan Interface (AMSI): Architecture, role in malware detection • How malware tries to bypass AMSI (obfuscation, reflection) • Ransomware lifecycle from the dark web's ecosystem: RaaS, initial access brokers, extortion models • Threat actor collaboration via underground forums
• Behavioral analysis vs. signature detection • Creating detection logic using MITRE ATT&CK mapping • Leveraging Extended Detection and Response (XDR) for visibility and automation Building rule-based mitigation strategies (YARA, custom rules)
Simulating credential dumping using Mimikatz: Purpose and implications • UAC bypass techniques: Fileless execution, DLL sideloading • Mitigation strategies: Application whitelisting, event monitoring, UAC hardening • Detection via event logs, Sysmon, and EDR telemetry

Text Books	
Sl. No.	Title of the Book/Name of the author/Name of the publisher/Edition and Year
1	Mastering Threat Modeling: A Comprehensive Guide to Identifying and Mitigating Risks: Empowering Secure Systems Through Proactive Risk Assessment and Strategic Mitigation
Reference Books	
1	Adam Shook and Donald Mine, "MapReduce Design Patterns: Building Effective Algorithms and Analytics

	for Hadoop and Other Systems" - O'Reilly 2012

2	Tom White, “Hadoop: The Definitive Guide” 4th Edition, O’reilly Media, 2015.
3	Thomas Erl, Wajid Khattak, and Paul Buhler, Big Data Fundamentals: Concepts, Drivers & Techniques, Pearson India Education Service Pvt. Ltd., 1st Edition, 2016
4	John D. Kelleher, Brian Mac Namee, Aoife D'Arcy -Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms, Worked Examples, MIT Press 2020, 2nd Edition

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Explain the fundamental concepts of threat analysis, risk management, and attack vectors in cybersecurity.	Understand	Level 2
CO2	Identify and classify different types of cyber threats and threat actors using real-world case studies.	Apply	Level 3

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3				3				3						
CO2		3			3				3						

Weblinks and Video Lectures (e-Resources)	
1	https://threatmap.checkpoint.com/
2	https://blog.google/threat-analysis-group/

ABILITY ENHANCEMENT COURSE (AEC)

DSATM

Scheme of Teaching and Examinations for BE Programme -2024-25 Outcome Based Education and Choice Based Credit System (CBCS) (Effective from the Academic Year 2025-26)

Semester	:	**6th**				
Course Title	:	**Vulnerability Assessment Penetration Testing Laboratory**				
Course Code	:	**BIC608A**				
Course Type (Theory/ Practical/ Integrated/ Project)	:	**Practical - Experiential Learning**				
Category	:	**AEC**				
Stream	:	**CSE-ICB**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**0-0-1-0**		**SEE**	:	**50**
Total Hours	:	**15 Hours**		**SEE Duration**	:	**2 hours**
Credit	:	**1**				

Course Learning Objectives: Students will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Implement Network Reconnaissance, Vulnerability Scanning and assessment.	Apply	L3
CO2	Demonstrate the working of Password Cracking, Reporting and Remediation strategy.	Apply	L3
CO3	Implement Full web applications penetration Testing. Experiment with Cross Site Scripting Attacks and SQL Injection attacks.	Apply	L3

Teaching-Learning Process Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

1. Adopt different teaching methods to attain the course outcomes.
2. Include videos to demonstrate various concepts in C.
3. Encourage collaborative (Group) Learning to encourage team building.
4. Ask at least three HOTS (Higher-order Thinking Skills) module-wise questions to promote critical thinking.
5. Adopt Problem-Based Learning (PBL), which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply **recalling it.**

DSATM

Scheme of Teaching and Examinations for BE Programme -2024-25

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2025-26)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**Experiment 1: Network Reconnaissance & Footprinting** **Scenario:** **An organization, "TechSecure Corp," suspects that its internal LAN might contain devices with unpatched services. As an external consultant with limited initial knowledge, your first step is to gain intelligence about the network. You have been given a subnet range and must map out devices and open ports.** **Tasks:** **-Use Nmap for host discovery, port scanning, and service enumeration.** **-Employ Recon-ng or Amass for passive reconnaissance to discover hostnames, subdomains, or metadata.** **-Document identified hosts, operating systems, and running services. Deliverable:** **A network inventory report listing IP addresses, OS guesses, and active services.**	**3 Hours**
2	**Experiment 2: Vulnerability Scanning & Assessment** **Scenario:** **After mapping the network, you've discovered a web server and a file-sharing server. Management wants a vulnerability assessment of these targets to identify known weaknesses before attackers can exploit them.** **Tasks:** **- Use OpenVAS to perform a comprehensive vulnerability scan on a Linux-based server (Metasploitable 2).** **- Run Nikto against the web application (e.g., DVWA) to find outdated server software, dangerous file uploads, or default credentials.** **- Assess the severity and relevance of each discovered vulnerability. Deliverable:** **● A vulnerability assessment report with CVE references and risk ratings.**	**3 Hours**
3	**Experiment 3: Exploiting a Known Vulnerability** **Scenario:** **Your scan found a critical vulnerability on a target server (e.g., Metasploitable 2's vsftpd backdoor). The organization wants proof-of-concept exploitation to understand the potential damage if a malicious actor leverages this flaw.** **Tasks:** **-Use the Metasploit Framework to exploit the known vulnerability and obtain a shell.** **-Verify the level of access gained and the data potentially exposed. Deliverable:**	**3 Hours**

	A screenshot and log of a successful exploit session, and notes on potential impact. Deliverable: • A screenshot and log of a successful exploit session, and notes on potential impact.	
4	Experiment 4: SQL Injection Attacks on Web Applications Scenario: The DVWA application's login and search functionalities are suspected to lack proper input validation. The company needs confirmation that attackers can extract sensitive data using SQL injection. Tasks: - Use SQLMap against DVWA's vulnerable pages to enumerate databases, tables, and potentially user credentials. - Confirm that an attacker could retrieve confidential information from the backend database. Deliverable: • Proof (screenshots/logs) of extracted database entries and a brief report on the risk to the organization.	3 Hours
5	Experiment 5: Cross-Site Scripting (XSS) Attacks Scenario: The OWASP Juice Shop allows user-generated content. The security team suspects there is an XSS flaw that could lead to user session hijacking or credential theft. Tasks: - Inject a malicious JavaScript payload via a form or comment section using Burp Suite Community Edition or OWASP ZAP to intercept and modify requests. - Demonstrate that the payload executes in a victim's browser (e.g., by producing an alert or stealing cookies). Deliverable: • A screenshot of the XSS payload executing and a short explanation of the potential consequences.	3 Hours

Text Books

Sl. No.	Title of the Book/Name of the author/Name of the publisher/Edition and Year
1	M. Scheffler, Hacking and Security: The Comprehensive Guide to Penetration Testing and Cybersecurity. Addison-Wesley, 2022
2	M. Chapple and D. Seidl, CompTIA PenTest+ Study Guide: Exam PT0-002. Wiley, 2021.

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Implement Network Reconnaissance, Vulnerability Scanning and assessment.	Apply	L3
CO2	Demonstrate the working of Password Cracking, Reporting and Remediation strategy.	Apply	L3

CO3	Implement Full web applications penetration Testing. Experiment with Cross Site Scripting Attacks and SQL Injection attacks.	Apply	L3

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3								2						
CO2			3						2			2			
CO3			3						2			2			

Weblinks and Video Lectures (e-Resources)	
1	https://onlinecourses.nptel.ac.in/noc24_cs94/preview
2	https://archive.nptel.ac.in/courses/106/105/106105217/
3	https://onlinecourses.nptel.ac.in/noc25_ee54/preview