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EMERGING TRENDS IN COMPUTER ENGINEERING AND INFORMATION TECHNOLOGY

Course Code : 316313

Programme Name/s	**: Cloud Computing and Big Data/ Computer Technology/ Computer Engineering/ Computer Science & Engineering/ Computer Hardware & Maintenance/ Information Technology/ Computer Science & Information Technology/ Computer Science/**
Programme Code	**: BD/ CM/ CO/ CW/ HA/ IF/ IH/ SE**
Semester	**: Sixth**
Course Title	**: EMERGING TRENDS IN COMPUTER ENGINEERING AND INFORMATION TECHNOLOGY**
Course Code	**: 316313**

I. RATIONALE

Emerging trends in Computer Engineering and Information Technology are driven by the need for efficiency, security and automation. Technologies like AI, cloud computing, IoT, and blockchain enhance productivity and connectivity. Digital forensics is essential for investigating cybercrimes, while green computing promotes sustainability. This course creates awareness in students regarding emerging trends in the area of Computer Engineering and Information Technology.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the students to attain following Industry Identified Outcome through various Teaching Learning experiences : Create awareness of latest trends in Computer Engineering and Information Technology.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Elaborate the role of Artificial Intelligence ,Machine Learning and Deep Learning in various domains.
- CO2 - Compare the architecture of IoT in Local environment vs Cloud Environment.
- CO3 - Explain the functioning of Blockchain Technology in various applications considering different challenges.
- CO4 - Explain characteristics of different Immersive Technologies.
- CO5 - Identify the appropriate Model of Digital Forensic Investigation for given situation.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme											
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
316313	EMERGING TRENDS IN COMPUTER ENGINEERING AND INFORMATION TECHNOLOGY	ETI	DSC	3	-	-	1	4	2	1.5	30	70*#	100	40	-	-	-	-	25	10	125

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Total IKS Hrs for Sem. : 0 Hrs

Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @$ Internal Online Examination

Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Describe the concept of Al. TLO 1.2 List applications of Al. TLO 1.3 Define Machine Learning. TLO 1.4 Describe characteristics of different types of Machine learning. TLO 1.5 Describe the concept of Deep learning. TLO 1.6 Describe importance of Neural Network. TLO 1.7 Differentiate the concepts of AI, ML ad DL. TLO 1.8 Explain the function of different key components of Generative AI. TLO 1.9 Describe the role of AI & ML to improve the effectiveness of security mechanisms.	**Unit - I Introduction of AI and ML** 1.1 Introduction of AI :Concept ,Scope of Al, Types of AI, Applications of AI 1.2 Machine Learning: Concept, Types: Supervised, Unsupervised, Reinforcement, Applications of Machine Learning, Concept of Deep Learning, Applications of Deep Learning ,Concept of Neural Network, Difference between AI, ML and DL 1.3 Generative AI: Concept ,Transformers: Key components of Transformers: Self-attention mechanism, Multi-head attention, Positional encoding, Feed forward Neural Network, Layer Normalization, Encoder Decoder Structure, Types of Generative AI: Text Generation, Image Generation, Music and Audio Generation, Video Generation ,Applications of Generative AI 1.4 AI & ML in Digital security :Types of attacks : AI Powered cyber attack, Adversarial AI attacks, Evasion AI Attack, AI poisoning attack, AI powered attacks protection measures: Turn on Multi-Factor Authentication, Use Super Strong Password, Update Everything, Secure your Network, Use your mobile Device Securely	Presentations Case Study Lecture Using Chalk-Board Video Demonstrations

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Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
2	TLO 2.1 Describe the concept of IoT. TLO 2.2 Write features and applications of IoT. TLO 2.3 List the advantages and Limitations of IoT. TLO 2.4 Explain the architecture of IoT in local environment. TLO 2.5 Describe the function of Sensors and actuators used in IoT. TLO 2.6 Explain NGN Architecture. TLO 2.7 Explain the architecture of cloud based IoT.	**Unit - II Internet of Things** 2.1 Introduction of Internet of Things (loT): Definition, Characteristics of loT, Features and Application of loT, Advantages and limitations of IoT 2.2 Design of loT: Physical design of IoT, Logical design of loT, Architecture of Internet of Things (IoT) 2.3 Sensors and actuators used in IoT 2.4 5G Network in IOT communication: 5-G characteristics and application areas, Next Generation Network: Architecture, Features, Functional block diagram, Network components: Media Gateway, Media Gateway Controller and Application Server 2.5 IoT and Cloud Computing: Architecture of Cloud based IoT	Presentations Lecture Using Chalk-Board Flipped Classroom
3	TLO 3.1 Explain the key features of Blockchain Technology. TLO 3.2 Describe Blockchain Architecture. TLO 3.3 Differentiate different types of Blockchain. TLO 3.4 List the Blockchain Applications. TLO 3.5 State the role of Smart Contracts & Cryptocurrencies. TLO 3.6 State the different challenges in Blockchain Technology.	**Unit - III Blockchain Technology** 3.1 Basics of Blockchain Technology-Definition, Key Features of Blockchain (Decentralization, Transparency, Immutability),Traditional vs Blockchain System 3.2 Blockchain Architecture 3.3 Types of Blockchain- Public Blockchain, Private Blockchain, Consortium Blockchain and Hybrid Blockchain 3.4 Blockchain Applications- Finance, Healthcare, Supply chain and Gaming 3.5 Role of Blockchain in Smart Contracts & Cryptocurrencies - Definition, Key Features of Smart Contracts, Popular Cryptocurrencies 3.6 Challenges in Blockchain Technology	Collaborative learning Presentations Case Study Flipped Classroom Video Demonstrations
4	TLO 4.1 Describe Key features of different immersive technologies. TLO 4.2 List applications of Immersive Technology. TLO 4.3 State the importance of Green Computing. TLO 4.4 Describe the concept of Quantum Computing.	**Unit - IV Immersive Technology and Sustainable Computing** 4.1 Introduction to Immersive Technology and types of immersive technologies- Augmented Reality (AR), Virtual Reality (VR), Mixed Reality (MR), Extended Reality (XR), Haptic Technology 4.2 Applications of Immersive Technology 4.3 Green Computing- Definition and its importance, Energy efficient hardware and data centers. E-waste management and recycling 4.4 Quantum Computing- Introduction, Applications	Video Demonstrations Presentations Flipped Classroom Hands-on

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Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
5	TLO 5.1 Write the goal of digital forensics and investigation. TLO 5.2 Describe the characteristics of different Digital Forensic Investigation models. TLO 5.3 Explain the features of different types of hacking. TLO 5.4 Describe various types of IT Acts and policies.	**Unit - V Digital Forensics and Ethical Hacking** 5.1 Introduction to digital forensics 5.2 Rules of digital forensics, The Process of Digital forensics investigation and Evidence Handling 5.3 Models of Digital Forensic Investigation: DFRWS Investigative Model, Abstract Digital Forensics Model (ADFM) ,Integrated Digital Investigation Process (IDIP), End to End digital investigation process (EEDIP) , An extended model for cybercrime investigation, UML modeling of digital forensic process model (UMDFPM) 5.4 Ethical Hacking: Definition, Types of hackers 5.5 Types of Hacking- Network Hacking: AI powered phishing scams, Ransomware 2.0, IoT exploits , Deep fake Technology, Operating System Hacking- OS downgrade attack, Firmware level exploits, Application Hacking- Advanced Web Application Firewall(WAF) Bypass Technique, Zero day exploits 5.6 National Cyber Security Policy (NCSP), 2013 ,IT Act 2000, IT Act 2008(Amendment) and IT Act 2023(DPDP),Cyber Crime Prevention against Women and Children (CCPWC) Scheme (2018)	Case Study Presentations Video Demonstrations Collaborative learning Flipped Classroom

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES : NOT APPLICABLE.

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

Assignment

- Write assignment covering all COs given by Course Teacher

Micro project

- Prepare a report on given case for Healthcare Blockchain System.The healthcare industry faces numerous challenges, including data fragmentation, lack of interoperability, and security vulnerabilities. Blockchain technology has emerged as a potential solution to address these issues by providing a decentralized, secure, and transparent way to manage healthcare data. This case study explores the implementation of a blockchain-based healthcare system and its impact on data management, security, and patient outcomes.
- Prepare a report on given case for IoT Integration in Precision Agriculture.The goal is to enhance farm productivity, reduce input costs, and promote sustainable agricultural practices through the seamless integration of IoT technologies into precision agriculture systems.
- Prepare a report on given case for Use of Immersive Technologies in Training .Walmart's Virtual Reality (VR) Training Program-Walmart implemented virtual reality (VR) technology to train employees across its stores in the United States. The goal was to improve employee preparedness for real-world scenarios, from managing Black Friday crowds to handling customer service issues.
- Prepare a report on given case for IoT Integration Strategy for Telecom in Competitive Landscape.The goal is to position telecom providers as strategic enablers in the IoT value chain, driving innovation, improving customer experiences, and enhancing operational efficiencies in a highly competitive market.
- Prepare a report on given case for an Application of Artificial Intelligence in Education field.The goal is to leverage AI technologies to enhance teaching effectiveness, improve student outcomes, streamline administrative processes, and foster a more inclusive and engaging learning environment.

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- Prepare a report on given case for Digital Forensics Investigation on a Mobile Device- Case: Insider Data Theft via Mobile Phone -A financial services company suspected an employee of leaking sensitive client data. Digital forensic experts performed a mobile device analysis on the employee's company-issued smartphone, recovering deleted messages, call logs, and file transfers, which revealed the employee had shared confidential documents through encrypted messaging apps. The forensic report provided clear evidence of data exfiltration, which was used in court to support the company's case and led to disciplinary action and legal proceedings.
- Prepare a report on given case for Copyright Challenges for Generative Artificial Intelligence Systems.This case study seeks to explore the evolving landscape of copyright challenges in generative AI, highlighting key legal disputes, emerging regulatory responses, and potential strategies for ensuring ethical and legally compliant deployment of these transformative technologies.

Other

- Course on Artificial intelligence for beginners provided by Microsoft
- Crash Course on Machine Learning provided by Google
- Course on Blockchain and its applications on SWAYAM platform provided by NPTEL
- Courses provided by Infosys Springboard

Note :

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Not Applicable	All

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Introduction of AI and ML	CO1	9	6	6	2	14
2	II	Internet of Things	CO2	10	6	6	4	16
3	III	Blockchain Technology	CO3	8	4	6	2	12
4	IV	Immersive Technology and Sustainable Computing	CO4	8	6	4	2	12
5	V	Digital Forensics and Ethical Hacking	CO4	10	6	6	4	16
Grand Total				**45**	**28**	**28**	**14**	**70**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Two unit tests (MCQs) of 30 marks will be conducted and average of two unit tests will be considered.

Formative assessment of self learning of 25 marks should be assessed based on self learning activity such as Infosys Springboard Certification/Microprojects/Assignment(60% weightage to process and 40% to product)

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Summative Assessment (Assessment of Learning)

- End Semester Online (MCQ type)Exam

XI. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	2	2	1	-	-	1	1			
CO2	2	2	1	-	-	1	1			
CO3	2	2	1	-	-	1	1			
CO4	2	2	1	-	-	1	1			
CO5	2	2	1	-	-	1	1			

Legends :- High:03, Medium:02,Low:01, No Mapping: -
*PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	R.B. Mishra	Artificial Intelligence	PHI ISBN:978-8-1203-3849-9
2	S Sridhar, M Vijayalakshmi	Machine Learning	Oxford University Press ISBN:978-0-1901-2727-5
3	Bikramaditya Singhal Gautam Dhameja Priyanshu Sekhar Panda	Beginning Blockchain-A Beginner's Guide to Building Blockchain Solutions	Apress, ISBN-13 (pbk): 978-1-4842-3443-3 ISBN-13 (electronic): 978-1-4842-3444-0
4	Tiana Laurence	Blockchain For Dummies	Wiley India ISBN: 9788126527755
5	Arshadeep Bahga, Vijay Madisetti	Internet Of Things-A Hands-on Approach	University Press ISBN: 978-8-17371-954-7
6	John Sammons	The Basics of Digital Forensic	Elsevier ISBN: 978-1-59749-661-2
7	Dr. Nilakashi Jain, Dr. Dhananjat R. Kalbande	Digital Forensic (2017 Edition)	Wiley Publishing Inc. ISBN: 978-81-265-6574-0
8	Kevin Beaver CISSP	Hacking for Dummies (5th Edition)	Wiley Publishing Inc. ISBN: 978-81-265-6554-2
9	Sagaya Aurelia	Immersive Technologies	CRC Press ISBN: 978-10-327-5114-6
10	Githa S. Heggde,Santosh Kumar Patra,Rasananda Panda	Immersive Technology and Experiences	Palgrave Macmillan ISBN: 978-981-99-8833-4

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.versatek.com/wp-content/uploads/2016/06/IoT-eBook-version5.pdf	eBook on Internet of Things
2	https://www.youtube.com/watch?v=iqjcNRJf-Nc	Immersive technology
3	https://www.tutorialspoint.com/internet_of_things/internet_of_things_tutorial.pdf	eBook on Internet of Things

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Sr.No	Link / Portal	Description
4	https://microsoft.github.io/AI-For-Beginners/	Artificial intelligence for beginners course
5	https://developers.google.com/machine-learning/crash-course	Machine learning course
6	https://www.infosecinstitute.com/resources/digital-forensics/digital-forensics-models/#gref	Digital Forensics
7	https://www.researchgate.net/publication/300474145_Digital_Forensics/	Digital Forensics eBook
8	https://www.tutorialspoint.com/ethical_hacking/ethical_hacking_process.htm	Ethical Hacking
9	https://onlinecourses.nptel.ac.in/noc22_cs44/preview	Blockchain Technology course
10	https://www.youtube.com/watch?v=ScqopKqK6v0	Immersive technology
11	https://www.indiacode.nic.in/bitstream/123456789/13116/1/it_act_2000_updated.pdf	IT Act 2000
12	https://www.meity.gov.in/static/uploads/2024/06/2bf1f0e9f04e6fb4f8fef35e82c42aa5.pdf	IT Act 2023 (DPDP)
13	https://www.indiacode.nic.in/bitstream/123456789/15386/1/it_amendment_act2008.pdf	IT Act 2008 (Amendment)
14	https://www.infosys.com/about/springboard.html	Digital Learning and Reskilling
15	https://iterasec.com/blog/understanding-ai-attacks-and-their-types/	Types of AI attacks
16	https://www.cm-alliance.com/cybersecurity-blog/5-ways-to-avoid-ai-powered-hacking	AI powered attacks -protection measures

Note :

- Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students

MSBTE Approval Dt. 04/09/2025 **Semester - 6, K Scheme**