PROPOSEDSCHEMEOFINSTRUCTIONANDEXAMINATION
B.E(AIML)

SEMESTER-VII

S. No	Code	Course Title	Scheme of Instruction			Contact Hrs/Wk	Scheme of Examination			Credits
			L	T	P		Hrs	CIE	SEE	
			Theory							
1	PC701AI	Generative AI	3	0			3	40	60	3
2	PC702AI	Computer Vision	3	0			3	40	60	3
3	PC703AI	Natural Language Processing	3	0	-		3	40	60	3
4	PC514AI	Reinforcement Learning	3	0			3	40	60	3
5	***Professional Elective- IV***									
	PE711AI	AR & VR	3	0	-		3	40	60	3
	PE712AI	Cyber Security								
	PE713AI	Block Chain Technologies								
	PE714AI	Scalable Architecture For Large Applications								
	PE715AI	Explainable AI								
6	***Open Elective – II***									
	OE 701BM	Basic Medical Equipment	3	0	-		3	40	60	3
	OE 702BM	Artificial Intelligence In Health Care								
	OE 701CE	Green Building Technology								
	OE702CE	Plumbing Technology								
	OE 701CS	Cloud Computing								
	OE 702CS	Data Base Management Systems								
	OE 701EC	Fundamentals Of Embedded Systems								
	OE 702EC	Introduction To Iot								
	OE 701EE	Optimization Techniques								
	OE 702 EE	Non-Conventional Energy Sources								
	OE 701 ME	Nano Technology								
	OE 702ME	Start Up Entrepreneurship								
Practicals										
7	PC751AI	Natural Language Processing Lab			2		3	25	50	1
8	PW761AI	Project Work—I		-	6		-	50	-	3
9	PW961AI	Summer Internship	-	-	-		-	50	-	2
		Total	18	0	08			**365**	410	24

PROPOSEDSCHEMEOFINSTRUCTIONANDEXAMINATION
B.E(CSE/ECE/EEE/AIML)
SEMESTER- VIII

SNo	Code	CourseTitle	Schemeof Instruction			Contact Hrs/Wk	Scheme of Examination			Credits
			L	T	P		Hrs	CIE	SEE	
			Theory							
i		*MandatoryCourse-1*	3	0			3	40	60	0
2		*MandatoryCourse—II*	3	0			3	40	60	0
3		*Mandatory Course-III*	3	0			3	40	60	0
Practicals										
4	PW861AI	*ProjectWork—II*			12			50	100	6
		Total	9	0	12		S	170	280	6

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	18	20	22	24	25	21	24	06	160

PC702CS	GENERATIVE AI					
CORE						
Pre-requisites	Deep Learning		L	T	P	C
			3	-	-	3
Evaluation	SEE	60 Marks	CIE		40 Marks	

Course Objectives :	
1	Understand and implement modern generative models for text, images, and other modalities
2	Adapt foundation models using prompting and fine-tuning techniques
3	Analyze scaling laws, attention mechanisms, and diffusion processes
4	Develop applied generative AI solutions with real-world impacts
5	Explore ethical considerations, risks, and interpretability challenges of generative AI

Course Outcomes :	
On completion of this course, the student will be able to:	
CO-1	Build and evaluate generative models like RNNs, Transformers, GANs, and VAEs
CO-2	Apply in-context learning, parameter-efficient tuning, and reinforcement learning from human feedback (RLHF)
CO-3	Analyze the architecture and optimization of large foundation models for diverse modalities
CO-4	Explore cutting-edge applications such as text-to-image generation, code generation, and autonomous agents
CO-5	Evaluate ethical, safety, and interpretability issues in generative AI systems

UNIT– I

Text Generation & Language Models :

- Introduction to RNN, LSTM, and Transformer-based language models, - Decoding strategies (sampling, beam search), Pre-training & fine-tuning, Foundation models (e.g., GPT, T5, BERT), Applications: Chatbots, text completion, summarization, LLM Agents & Tools:LangChain, AutoGen, ReAct framework — for building agents using LLM, Evaluation Techniques : BLEU, ROUGE, BERTScore, and newer factuality/hallucination metrics, Industry Use Cases:Customer support, document automation, voice assistants (integrate APIs like OpenAI, Cohere, Mistral)

UNIT – II

Generative Models for Images & Diffusion :

- CNNs and Vision Transformers, Generative Adversarial Networks (GANs), Diffusion models: Denoising Score Matching, DDPM , VariationalAutoencoders (VAEs), Applications: Text-to-image (DALL·E), image inpainting, **Stable Diffusion XL (2023)** and **SD Turbo (2024)**: more efficient, widely used in industry, **Video Generation Models**:Sora by OpenAI, Runway Gen-3, Pika — include short case studies or lab demos, **Comparative Evaluation**:FID, CLIPScore, human preference.

UNIT – III

Adaptation & Control of Generative Models : In-context learning, Prompt engineering and Prompt-to-Prompt, Fine-tuning: LoRA, Adapter tuning, Reinforcement Learning from Human Feedback (RLHF), Applications: Instruction tuning, controlled generation, Direct Preference Optimization

(DPO) and ORPO — for safety-aligned model fine-tuning, Function Calling / Tool Use, How models use APIs, tools, and planners (e.g., function-calling in OpenAI GPT-4o)

UNIT– IV

Scaling Laws & Efficient Training : Scaling laws in deep learning, Mixture-of-Experts (MoE), Efficient attention: Flash Attention, Long former, Parallel and distributed training, Applications: Efficient deployment of large models, A**gentic RAG**: planning, reflection, and tool use in retrieval-augmented systems, **Speculative Decoding**, **Token Merging**, **Quantization** — for faster, cheaper inference, **Mamba, RWKV** – efficient attention-free architectures

UNIT –V

Multimodal, Ethical & Emerging Applications

- Multimodal models: CLIP, Flamingo, Video Generation, Generative models for code (Codex), agents (AutoGPT), Interpretability and hallucinations , AI alignment, safety, and bias mitigation, Multimodal Agent Systems (e.g., GPT-4o, Gemini, Claude 3) — integration of vision + language + tools, Synthetic Data Generation for model training, Legal & Policy Updates : AI Bill of Rights (US), EU AI Act, India's Digital India guidelines on AI, Open-source Trends: Mistral, LLaMA 3, Phi-3, TinyML for generative AI.

Suggested Reading:

1	Vaswani et al. (2017), Radford et al. (2019) for Unit-I topics
2	Goodfellow et al. (2014), Ho et al. (2020), Kingma& Welling (2014) for Unit-II topics
3	Ouyang et al. (InstructGPT), DPO (2023) for Unit-III topics
4	Kaplan et al. (2020), Shazeer et al. (MoE), DAO modelsfor Unit-IV topics
5	OpenAI Codex, DeepMind’s Flamingo, Survey on Hallucination in LLMsfor Unit-V topics
6	Transformers for Natural Language Processing by Denis Rothman
7	Toolkits- LangChain, AutoGen, LlamaIndex, Diffusers (by Hugging Face)

PC703CS	COMPUTER VISION					
CORE						
Pre-requisites			L	T	P	C
			3	-	-	3
Evaluation	SEE	60 Marks	CIE		40 Marks	

Course Objectives :	
1	**Understand the mathematical and algorithmic foundations** of image formation, feature extraction, and vision-based perception
2	**Explore deep learning architectures** such as CNNs, Vision Transformers, and segmentation models for solving computer vision tasks.
3	**Analyze and implement advanced techniques** for object detection, video analysis, and 3D scene understanding.
4	**Develop practical applications and systems** using real-time image/video data, model optimization, and edge deployment.
5	**Critically evaluate ethical, social, and technical implications** of deploying vision systems in real-world settings.

Course Outcomes :	
On completion of this course, the student will be able to:	
CO-1	Describe and apply fundamental concepts in image processing, camera models, and visual perception.
CO-2	Extract and compare classical and deep features, and implement basic CNNs for image understanding.
CO-3	Apply deep learning techniques for object detection, image segmentation, and classification tasks.
CO-4	Utilize advanced architectures (e.g., Vision Transformers, 3D CNNs) and deploy models to edge/real-time systems.
CO-5	Assess ethical concerns such as bias, fairness, and explainability in computer vision applications.

UNIT– I

Foundations of Image Processing and CNN Basics : Image formation, camera models (pinhole, perspective projection), Color spaces (RGB, HSV, Lab), image normalization, Basic filtering operations: convolution, blurring, edge detection, **Introduction to CNNs**: Convolution, pooling, ReLU, **Training deep nets**: loss functions, overfitting, regularization, Visualization of learned filters

UNIT – II
Deep Feature Extraction and Representation: Classical features (SIFT, ORB) vs. learned features, Deep feature maps, transfer learning with VGG/ResNet, Fine-tuning vs. feature extraction, Feature visualization (Grad-CAM, attention maps), **Contrastive learning**: SimCLR, BYOL (Intro)

UNIT – III
Object Detection and Segmentation: Object detection models: Classical (HOG + SVM, sliding windows), Modern (YOLOv5/v8, SSD, Faster R-CNN), Semantic segmentation: **U-Net**, DeepLab, FCN, Instance segmentation. **Mask R-CNN,** Real-time considerations: NMS, anchor boxes.

UNIT– IV
Vision Transformers & Advanced DL Architectures: Limitations of CNNs for long-range dependencies, Vision Transformers (ViT, DeiT, DINOv2) **– architecture, patch embeddings,** Hybrid CNN-Transformer systems, Video modeling**: TimeSformer, SlowFast, I3D,** 3D deep vision**: PointNet, 3D CNNs, NeRF basics**

UNIT –V
Deployment, Edge AI, and Emerging Trends: Lightweight models: MobileNet, EfficientNet, YOLO-Nano, Model compression: pruning, quantization, Edge deployment: Jetson Nano, TensorRT, ONNX, **Multimodal models**: CLIP, Flamingo, OpenFlamingo, **Diffusion models for vision** (e.g., Stable Diffusion, SVD), **Ethics**: fairness, surveillance, adversarial attacks

Suggested Reading:

1	Computer Vision: Algorithms and Applications, 2nd ed. © 2022 Richard Szeliski, The University of Washington
2	"Computer Vision: A Modern Approach" – David Forsyth & Jean Ponce
3	"Hands-On Computer Vision with PyTorch" – V Kishore Ayyadevara
4	Deep Learning by Ian Goodfellow, Bengio and Courville
5	Hartley and Zisserman, " Multiple View Geometry in Computer Vision", Cambridge University Press 2004

PC703AI	NATURAL LANGUAGE PROCESSING					
CORE						
Pre-requisites			L	T	P	C
			3	-	-	3
Evaluation	SEE	60 Marks	CIE		40 Marks	

Course Objectives :	
1	Understand linguistic foundations and statistical techniques for language modeling.
2	Explore core NLP tasks such as parsing, tagging, sentiment analysis, and translation.
3	Apply deep learning models including RNNs, Transformers, and attention mechanisms to textual data.
4	Analyze recent advances in large language models (LLMs), prompting, and NLP agents.
5	Investigate ethical concerns like hallucinations, bias, and safety in language technologies.

Course Outcomes :	
On completion of this course, the student will be able to:	
CO-1	Explain the fundamentals of syntax, semantics, and linguistic structures used in NLP.
CO-2	Build models for POS tagging, NER, text classification, and sequence labeling.
CO-3	Apply deep learning models such as RNNs, LSTMs, Transformers, and BERT to NLP problems
CO-4	Develop practical applications using large language models and prompt engineering techniques.
CO-5	Evaluate NLP systems for performance, bias, and ethical compliance.

UNIT– I

Foundations of NLP : Text preprocessing: tokenization, stemming, lemmatization, Word embeddings: one-hot, TF-IDF, Word2Vec, GloVe, N-gram language models, perplexity, Part-of-speech (POS) tagging, Named Entity Recognition (NER), Text classification: Naive Bayes, SVM, Logistic Regression

UNIT – II

Deep Learning for NLP :Recurrent Neural Networks (RNN), GRU, LSTM, Sequence-to-sequence models (Encoder-Decoder), Attention mechanism and its intuition, Applications: text generation, summarization, machine translation, Evaluation metrics: BLEU, ROUGE

UNIT – III

Transformers and Pretrained Models :Transformer architecture (Vaswani et al., 2017), Self-attention, multi-head attention, position encoding, BERT, RoBERTa, GPT architectures, Fine-tuning vs. feature extraction, Applications: QA, text entailment, sentence embeddings

UNIT – IV
Prompting, LLMs and NLP Agents :Prompt engineering: zero-shot, few-shot, chain-of-thought , In-context learning and function calling, OpenAI GPT-4, Claude, Gemini – capabilities and limitations, Retrieval-Augmented Generation , RAG), Agents using LLMs (LangChain, ReAct, AutoGen)

UNIT – V
Ethics, Evaluation, and Multimodal NLP : Hallucinations and factual consistency in LLMs, Bias and fairness in NLP systems, Explainability and interpretability of models, Multimodal models: CLIP, Flamingo, GPT-4o, Future directions: reasoning, alignment, multilingual models

Suggested Reading

1	Speech and Language Processing - Daniel Jurafsky& James H. Martin (3rd Ed. Draft)
2	Natural Language Processing with Transformers- Lewis Tunstall, Leandro von Werra, Thomas Wolf
3	Neural Network Methods for NLP - Yoav Goldberg

	REINFORCEMENT LEARNING					
CORE-IV						
Pre-requisites	Deep Learning		**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives :	
1	Fundamental RL terminology and mathematical formalism; a brief history of RL and its connection to neuroscience and biological systems
2	RL methods for discrete action spaces, e.g. deep Q-learning and large-scale Monte Carlo Tree Search
3	Methods for exploration, modelling uncertainty, and partial observability for RL
4	Modern policy gradient and actor-critic methods
5	Concepts needed to construct model-based RL and Model Predictive Control methods
6	Approaches to make RL data-efficient and ways to enable simulation-to-reality transfer
7	Examples of fine-tuning foundation models and large language models (LLMs) with human feedback; safe RL concepts; examples of using RL for safety validation
8	Examples of using RL for scientific discovery

Course Outcomes :	
On completion of this course, the student will be able to:	
CO-1	Gain experience with analysing RL methods to uncover their strengths and shortcomings, as well as proposing extensions to improve performance.
CO-2	Also gain skills needed to develop the ability to produce a critical analysis of current RL limitations.
CO-3	Prompt students to propose novel solutions that address shortcomings of existing methods.

UNIT– I
Introduction and Fundamentals **Overview of RL**: foundational ideas, history, and books; connection to neuroscience and biological systems, recent industrial applications and research demonstrations **Mathematical fundamentals**: Markov decision processes, Bellman equations, policy and value iteration, temporal difference learning.

UNIT – II
RL in Discrete Action Spaces: Q-learning, function approximation and deep Q-learning; nonstationarity in RL and its implications for deep learning; example applications (video games; initial example: Atari),Monte Carlo Tree Search; example applications (AlphaGo) **Exploration, Uncertainty, Partial Observability:** Multi-armed bandits, Bayesian optimisation, regret analysis**,** Partially observable Markov decision process; belief, memory, and sequence modelling (probabilistic methods, recurrent networks, transformers)**.**

UNIT – III
Policy Gradient and Actor-critic Methods for Continuous Action Spaces: Importance sampling, policy gradient theorem, actor-critic methods (SPG, DDPG)**,** Proximal policy optimisation; example applications **Model-based RL and Model Predictive Control:** Learning dynamics models (graph networks, stochastic processes, diffusion models, physics-based models, ensembles); planning with learned models**,** Model predictive control; example applications (real-time control)

UNIT– IV
Data-efficient RL and Simulation-to-reality Transfer: Data-efficient learning with probabilistic methods from real data (e.g. policy search in robotics), real-to-sim inference and differentiable simulation, data-efficient simulation-to-reality transfer**,** RL for physical systems (successful examples in locomotion, open problems in contact-rich manipulation, applications to logistics, energy, and transport systems); examples of RL for healthcare.

UNIT –V
RL with Human Feedback ; Safe RL and RL for Validation: Fine-tuning large language models (LLMs) and other foundation models with human feedback (TRLX,RL4LMs, a light-weight overview of RLHF), A review of SafeRL, example: optimising commercial HVAC systems using policy improvement with constraints; improving safety using RL for validation: examples in autonomous driving and autonomous flying and aircraft collision avoidance **RL for Scientific Discovery; Student Presentations**: Examples of RL for molecular design and drug discovery, active learning for synthesising new materials, RL for nuclear fusion experiments, Student presentations (based on essays and mini-projects) for other topics in RL, e.g. multi-agent RL, hierarchical RL, RL for hyperparameteroptimisation and NN architecture search, RL for multi-task transfer, lifelong RL, RL in biological systems, etc.

Suggested Reading:

1	Reinforcement Learning: An Introduction (second print edition). Richard S. Sutton, Andrew G. Barto.
2	Algorithms for Reinforcement Learning. CsabaSzepesvari.
3	Algorithms for Decision Making. Mykel J. Kochenderfer Tim A. WheelerKyle H. Wray. [Available from the book's website as a free PDF updated in 2023]
4	Reinforcement Learning and Optimal Control. Dimitri Bertsekas.

	AUGMENTED REALITY AND VIRTUAL REALITY					
CORE						
Pre-requisites			**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives :	
1	Introduce the fundamental concepts, characteristics, and applications of AR and VR technologies.
2	Equip students with skills in storytelling, design thinking, 3D modeling, and immersive content creation.
3	Teach principles of stereoscopic vision, haptics, and animation techniques for AR/VR experiences.
4	Train students in using game engines like Unity, C# scripting, and deploying VR applications
5	Enable students to apply design principles and iterative prototyping for developing immersive AR/VR experiences.

Course Outcomes :	
On completion of this course, the student will be able to:	
CO-1	Explain core principles, applications, and trends in AR and VR.
CO-2	Develop engaging AR/VR narratives using design thinking and storytelling methods
CO-3	Use stereoscopic rendering and haptic feedback in immersive systems.
CO-4	Build and deploy basic AR/VR applications using Unity and C# scripting.
CO-5	Apply UI/UX design and prototyping techniques for functional AR/VR product development

UNIT– I

Introduction to AR-VR: Characteristics of VR, Characteristics of AR, Applications of VR and AR,Future Trends and Considerations

Fundamentals Of AR/VR Content Creation:

Immersive Storytelling ,Design Thinking Process ,3D Modelling ,Interface Design Principles of AR and VR Content Creation ,Collaboration and Iteration

UNIT – II

Stereoscopic Vision & Haptic Rendering :

Fundamentals of the human visual system, Depth cues, Stereopsis, Retinal disparity, Haptic sense, Haptic devices, Algorithms for haptic rendering and parallax, Synthesis of stereo pairs, Pipeline for stereo images.

Fundamentals of Storytelling:

Foundational Principles of Storytelling, Storytelling in Immersive Mediums, Interactive and Emerging Narrative, Opportunity and Challenges

UNIT – III

Development Of Document For AR/VR Immersive Experience:

Fundamentals of Project Planning, Three Level Process, Project Planning Technical and Phase-wise Communication, Planning for Experiences

3d Graphics and Animation:

Introduction to Setting Up the Lighting and Rendering ,Introduction to Animation ,Visual Effects

Basics of Unity or Unreal :

Introduction to Game Engine ,Game Objects, Asset Development, Idea and Script Development Layout Planning , Audio Design

UNIT– IV

AR-VR Development : Overview of AR/VR Development Tools and scripts-

C# programming and scripting for AR and VR

C# programming introduction – data types and classes – programming logic – using C# to write scripts for Unity 3D – Using C# to animate and add advanced interactions to AR and VR models.

Creating Basic AR/VR Experiences- Virtual Reality Application essentials -

Virtual Reality fundamentals – VR design considerations – Using Unity 3D and C# programming to create VR applications – Oculus Quest VR headset fundamentals – User interface considerations - Creating a VR application and publishing to the Oculus VR headsets.

Optimisation Techniques

UNIT –V

Design Principles:

Fundamental Design Principles, Spatial Design Considerations

User Interface Design Inclusion , Visual Storytelling Techniques

Immersive Experience and Game Development With AR-VR:

Introduction to Immersive Technology , Industry Applications, Future Trends, and Innovations

Prototyping:

Understanding Prototyping ,Prototyping Tools and Techniques, Iterative Design Process, Importance of AR/VR Product Development

Suggested Reading:

1	Augmented Reality, Virtual Reality, and Computer Graphics by byLucioTommaso De Paolis& Patrick Bourdot, 2019
2	Creating Augmented and Virtual Realities: Theory and Practice for Next-Generation Spatial Computing, By Erin Pangilinan, Steve Lukas, Vasanth Mohan, 2019

OE602CS	**CYBER SECURITY**					
Prerequisites			L	T	P	C
			3	0	0	3
Evaluation	CIE	40 Marks	SEE		60 Marks	

Course Objectives :	
1.	To learn the various threats in networks and security concepts.
2.	To apply authentication applications in different networks.
3.	To understand security services for email.
4.	To awareness of firewall and IT laws and policies.
5.	To understand different IT Policies.

Course Outcomes : At the end of the course the student will be able to:	
1.	Understand the various network threats.
2.	Analyze the forensic tools for evidence collection.
3.	Apply the firewalls for threat analysis.
4.	Understand OS artifact.
5.	Evaluate Different IT Acts.

UNIT – I

Ethical hacking, Attack Vectors, Cyberspace and Criminal Behaviour, Clarification of Terms, Traditional Problems associated with Computer Crimes, Realms of Cyber world, brief history of the internet, contaminants and destruction of data, unauthorized access, computer intrusions, whitecollar crimes, viruses and malicious code, virus attacks, pornography, software piracy, mail bombs, exploitation, stalking and obscenity in internet, Cyber psychology, Social Engineering.

UNIT – II

Introduction to Digital forensics, Forensic software and handling, forensic hardware and handling, analysis and advanced tools, forensic technology and practices, Biometrics: face, iris and fingerprint recognition, Audio-video evidence collection, Preservation and Forensic Analysis

UNIT – III

Investigation Tools, e-discovery, EDRM Models, digital evidence collection and preservation, email investigation, email tracking, IP tracking, email recovery, search and seizure of computer systems, password cracking.

UNIT – IV
Forensic Analysis of OS artifact, Internet Artifacts, File System Artifacts, Registry Artifacts, Application Artifacts, Report Writing, Mobile Forensic- identification, collection and preservation of mobile evidences, social media analysis, data retrieval, Email analysis from mobile phones.

UNIT – V
Ethics, Policies and IT Act. Basics of Law and Technology, Introduction to Indian Laws, Scope and Jurisprudence, Digital Signatures, E Commerce-an Introduction, possible crime scenarios, law coverage, data interchange, mobile communication development, smart card and expert systems Indian Laws, Information Technology Act 2000, Indian Evidence Act, India Technology Amendment Act 2008, Indian Penal Code, Computer Security Act 1987, National Information Infrastructure Protection Act 1996, Fraud Act 1997, Children Online Protection Act 1998, Computer Fraud and Abuse Act 2001, Intellectual Property, IP Theft, Copyright, Trademark, Privacy and Censorship, ,Introduction to Cyber Ethics, rights over intellectual property, Corporate IT Policy Formulations, Compliance Auditing.

Suggested Readings:	
1.	William Stallings, “Cryptography and Network Security”, Prentice Hall, New Delhi, 2006.

References:	
1.	Charles P. Fleeger, "Security in Computing", Prentice Hall, New Delhi, 2009.
2.	BehrouzA.Forouzan, “Cryptography & Network Security”, Tata McGraw Hill, India, New Delhi, 2009.

CS 525	BLOCKCHAIN TECHNOLOGIES					
	PROGRAM ELECTIVE - II					
Pre-requisites			L	T	P	C
			3	-	-	3
Evaluation	SEE	60 Marks	CIE		40 Marks	

Course Objectives :	
1	To Introduce the Theoretical Foundations of blockchain through bitcoin.
2	To Introduce Hash functions and Transactions.
3	To Study Algorithms for Mining and Consensus implementation.
4	To Study Ethereum and Smart contracts concepts.
5	To Learn the concepts of Oracles and Decentralized Applications (DApps).

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Understand the principles of blockchain technologies and bitcoin
CO-2	Be familiar with hash functions with wallets
CO-3	Understand mining and consensus strategies
CO-4	Understand Ethereum and tockens
CO-5	Understand smart contracts of ethereum
CO-6	Understand Oracles and Decentralized Applications.

UNIT – I

Introductio: Bitcoin Uses, Users ,Getting Started ,Getting your first bitcoins ,Sending and receiving bitcoins, Transactions, Blocks, Mining, The Genesis Block,Merkle Trees,Block Header Hash and the Blockchain

Keys, Addresses, Wallets

Introduction of Crptography, Public key cryptography and crypto-currency ,Private and Public Keys ,Elliptic Curve Cryptography Explained Generating a public key ,Bitcoin Addresses, Base58 and Base58Check Encoding Key Formats, Implementing Keys and Addresses ,Wallets ,Non-Deterministic (Random) Wallets, Deterministic (Seeded) Wallets, Mnemonic Code Words ,Hierarchical Deterministic Wallets (BIP0032/BIP0044), Advanced Keys and Addresses ,Encrypted Private Keys (BIP0038) ,Pay To Script Hash (P2SH) and Multi-Sig Addresses ,Vanity Addresses ,Paper Wallets

UNIT – II

Transactions

Introduction of Transaction Lifecycle ,Creating Transactions ,Broadcasting Transactions to the Bitcoin Network ,Propagating Transactions on the Bitcoin Network ,Transaction Structure,Transaction Outputs and Inputs ,Transaction Outputs ,Transaction Inputs , Transactio fees ,Adding Fees to Transactions
Transaction Chaining and Orphan Transactions ,Transaction Scripts and Script Language

,Script Construction (Lock + Unlock) ,Scripting Language ,Turing Incompleteness ,Stateless Verification ,Standard Transactions ,Pay to Public Key Hash (P2PKH) ,Pay-to-Public-Key ,Multi-Signature ,Data Output (OP_RETURN) Pay to Script Hash (P2SH)

Mining and Consensus

De-centralized Consensus, Independent Verification of Transactions, Mining Nodes, Aggregating Transactions into Blocks, Transaction Age, Fees, and Priority, The Generation Transaction, Coinbase Reward and Fees ,Structure of the Generation Transaction, Coinbase Data, Constructing the Block Header ,Mining the Block ,Proof-of-Work Algorithm ,Difficulty Representation ,Difficulty Target and Re-Targeting ,Successfully Mining the Block ,Validating a New Block ,Assembling and Selecting Chains of Blocks, Blockchain Forks, Mining and the Hashing Race ,The Extra Nonce Solution ,Mining Pools ,Consensus Attacks

UNIT – III

What Is Ethereum

Compared to Bitcoin , Ether Currency Units ,Choosing an Ethereum Wallet Control and Responsibility ,Getting Started with MetaMask ,Creating a Wallet Switching Networks ,Getting Some Test Ether ,Sending Ether from MetaMask Exploring the Transaction History of an Address ,Introducing the World Computer Externally Owned Accounts (EOAs) and Contracts ,A Simple Contract: A Test Ether Faucet.

Cryptography

Ethereum‘s Cryptographic Hash Function: Keccak-256 , Ethereum Addresses , Ethereum Address Formats ,Inter Exchange Client Address Protocol, Hex Encoding with Checksum in Capitalization (EIP-55)

The Ethereum Virtual Machine

What Is the EVM? Comparison with Existing Technology ,The EVM Instruction Set (Bytecode Operations) , Ethereum State ,Compiling Solidity to EVM Bytecode ,Contract Deployment Code ,Disassembling the Bytecode

UNIT – IV

Transactions

Transmitting Value to EOAs and Contracts, Transmitting a Data Payload to an EOA or Contract,Special Transaction: Contract Creation ,Digital Signatures ,The Elliptic Curve Digital Signature Algorithm ,How Digital Signatures Work ,Verifying the Signature ,ECDSA Math ,Transaction Signing in Practice ,Raw Transaction Creation and Signing ,Raw Transaction Creation with EIP-155 ,The Signature Prefix Value (v) and Public Key Recovery ,Separating Signing and Transmission (Offline Signing) ,Transaction Propagation ,Recording on the Blockchain ,Multiple-Signature (Multisig) Transactions

Tokens

How Tokens Are Used, Tokens and Fungibility ,Counterparty Risk ,Tokens and Intrinsicality, Using Tokens: Utility or Equity ,ERC223: A Proposed Token Contract Interface Standard, ERC777: A Proposed Token Contract Interface Standard, ERC721: Non-fungible Token (Deed) Standard

UNIT –V

Oracles

Why Oracles Are Needed ,Oracle Use Cases and Examples ,Oracle Design,Patterns Data Authentication ,Computation Oracles ,Decentralized Oracles, Oracle Client Interfaces in Solidity

Decentralized Applications (DApps): Introduction,Backend (Smart Contract) ,Frontend (Web User Interface) ,Data Storage,Decentralized Message Communications Protocols ,A Basic DApp Example: Auction DApp ,Auction DApp: Backend Smart Contracts ,Auction DApp: Frontend User Interface ,Further Decentralizing the Auction DApp ,Storing the Auction DApp on Swarm ,Preparing Swarm ,Uploading Files to Swarm ,The Ethereum Name Service (ENS) ,History of Ethereum Name Services ,The ENS Specification ,Bottom Layer: Name Owners and Resolvers ,Middle Layer: The .eth Nodes ,Top Layer: The Deeds,Registering a Name,Managing Your ENS Name ,ENS Resolver,Resolving a Name to a Swarm Hash (Content) ,From App to DApp

Suggested Reading:

1	Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, **Bitcoin and Cryptocurrency Technologies,** Princeton University Press and Oxford, 2016
2	Andreas M. Antonopoulos**, Mastering Bitcoin: Programming the Open Blockchain,** O'Reilly, 2017.
3	Dr. Gavin Wood, Andreas M. Antonopoulos**, Mastering Ethereum: Building Smart Contracts and Dapps,** O'Reilly, 2018.

	SCALABLE ARCHITECTURES FOR LARGE APPLICATIONS					
CORE						
Pre-requisites	Distributed Systems		**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives :	
1	Tointroducetheideaofdifferencebetweenimplementing Machinelearningalgorithmsand large scale Machine Learning.
2	TounderstandandimplementthespecificlibrariesusefulforRunningMLapplicationsusing Spark.
3	To learn the importance of processing using streaming data

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Build architectures suitable for scaling across different kinds of applications
CO-2	2.Understand and suggest the mechanisms in building scalable systems

UNIT – I
Introduction to Scalable applications, Challenges with running applications using Machine Learning with scaling, Algorithms for Large scale Learning, Overview of Hadoop and Current Big Data Systems.

UNIT – II
How Programming for Data Flow Differs, Basic Spark, Working with Vectors and Matrices in Spark, Brief tour of Spark ML, Beyond parallelization ,Practical Big Data.

UNIT – III
Anatomy of Fast Data Applications, SMACK Stack–Functional Decomposition, Message Backbone-Understanding messaging requirements, Data ingestion, Fast data & low latency, Message Delivery Semantics, Distributing Messages.

UNIT – IV

Compute Engines-Micro Batch Processing, One-at-a time Processing, Choice of processing engine, Storage as the Fast Data Borders, The message backbone as Transition Point

UNIT – V
Sharing Stateful Streaming State, Data Driven Micro-services, State and Micro-services. Deployment environments for Fast Data Applications, Application containerization, resource scheduling, Apache Mesos, Kubernetes, Cloud Deployments.

Suggested Readings:

1	JanKunigk,IanBuss,PaulWilkinson&LarsGeorge,"*ArchitectingModernDataPlatforms*", O"reilly, 2019.
2	Gerard Maas, Stavros Kontopoulos, Sean Glover, "*Designing Fast Data Application Architectures*", O'Reilly Media, Inc. ,*June 2018.*
3	Bill Chambers, Matei Zaharia "*Spark-The definitive Guide*", O'Reilly Media, Inc., *June 2019.*

	Explainable AI (XAI)					
CORE-IV						
Pre-requisites			**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives :	
1	This course provides an Introduction to Explainable AI (XAI) through practical applications and real-world examples.
2	Students will gain a basic proficiency in interpreting and explaining the decisions of ML and AI systems, in a transparent and understandable manner to humans.
3	The course will cover various XAI techniques and algorithms, including rule-based models, feature importance analysis, model-agnostic approaches, and post-hoc explanations.

Course Outcomes :	
On completion of this course, the student will be able to:	
CO-1	Understand what Explainable AI is, its scope, and impact on various domains.
CO-2	Understand Global vs Local Explanations and their applications.
CO-3	Identify and evaluate the most used XAI techniques and algorithms.
CO-4	Use Python to apply Explainer algorithms/methods and interpret the results
CO-5	Critically evaluate and contextualize the performance and reliability of Explanations, and identify their limitations and biases.

UNIT– I : Introduction to Explainability: Course Overview and Introduction, Explaining Explainable AI, Overview of Python Data Stack, ML and AI Refresher

UNIT – II : Supervised Learning

Supervised Learning : Pre-model Explainability, Partial Dependence Plots, Permutation Feature Importance Lime
Intro to Shapley: More on Shapley: Tree Models and other applications
Rule Based Methods: Anchors, Counterfactual Explanations, Summary of Structured Data Explainers.

UNIT – III : Images

Region of Interest(ROI), Lime for Images; Gradcam, Summary of Image Explainers

UNIT– IV : Unsupervised Learning

Pre-model Explainability, Unsupervised Learning for Clustering, Summary of Unstructured Data Explainers

UNIT –V : Natural Language Programming(NLP)

Explaining Sentiment Analysis, Layer Integrated Gradients, Explaining Industry Classifier Model, Layer-Wise Relevance Propagation

Suggested Reading:

1	Textbook : Christoph Molnar, “Interpretable Machine Learning”. (2022)
2	**Arrieta, Alejandro Barredo, et al. "Explainable Artificial Intelligence (XAI): Concepts, taxonomies, opportunities and challenges toward responsible AI." Information fusion 58 (2020): 82-115.**
3	**Rudin, Cynthia, et al. "Interpretable machine learning: Fundamental principles and 10 grand challenges." Statistics Surveys 16 (2022): 1-85.**

Open Electives :

Students of CSE & AIML are supposed to NOT Take Cloud Computing and DBMS.

S.No	Code	Course Title	Scheme of Instruction			Contact Hrs/Wk	Scheme of Evaluation			Credits
			L	T	P		Hrs	CIE	SEE	
Theory										
6	**OpenElective–II**		3	-	-	3	3	40	60	3
	OE701BM	Basic Medical Equipment								
	OE702BM	Artificial Intelligence in Health Care								
	OE701 CE	Green Building Technology								
	OE702 CE	Plumbing Technology								
	OE701 CS	Cloud Computing								
	OE702CS	Data Base Management Systems								
	OE701EC	Fundamentals of EmbeddedSystems								
	OE702EC	Introduction to Internet of Things								
	OE701EE	Optimization Techniques								
	OE702EE	Non-Conventional EnergySources								
	OE701ME	NanoTechnology								
	OE 702ME	Startup Entrepreneurship								

Course Code	Course Title						Course Type
OE701BM	**BASIC MEDICAL EQUIPMENT**						Elective
Prerequisite	**Contact hours per week**			**Duration of SEE (Hours)**	**Scheme of Evaluation**		**Credits**
	L	**T**	**P**		**CIE**	**SEE**	
	3	**-**	**-**	**3**	**40**	**60**	**3**

Course Objectives:	
The course is taught with the objectives of enabling the student to:	
1	To make the students understand the need for several Biomedical equipment.
2	To make the students understand the operating principles of a wide range of Biomedical Equipment
3	To familiarize students with the design and functional aspects of medical imaging systems and therapeutic devices.
4	To develop the ability to assess the appropriate biomedical equipment needed for specific clinical and therapeutic applications.
5	To enable students to understand the operating principles and clinical use of therapeutic devices like pacemakers, dialysis machines, and lithotripters.

Course Outcomes:	
On completion of this course, the student will be able to :	
CO-1	Learn about various physiological parameters, monitoring and recording.
CO-2	Assess the need and operating principle of equipment used in physiotherapy
CO-3	Interpret the working principle and operating procedure and applications of Medical Imaging equipment.
CO-4	Perceive the governing principles and functions of critical care equipments.
CO-5	Learn about the various Therapeutic Equipment used for different applications

UNIT–I
Medical Monitoring and recording: Patient monitoring: System concepts, bedside monitoring systems, central monitors, heart rate and pulse rate measurement. Temperature measurement Blood pressure measurement: Direct and indirect methods. Respiration rate measurement: Impedance pneumograph, Apnoea detectors. Ambulatory monitoring: Arrhythmia monitor

UNIT–II
Physiotherapy and Electrotherapy Equipment: Diathermy machines: Short wave diathermy, Microwave diathermy and ultrasonic diathermy Electro diagnostic/Therapeutic apparatus: Nerve muscle stimulator, Functional electrical stimulator.

UNIT–III
Medical Imaging Equipment: X-Ray machines: Properties and production of X-Rays, X-ray machine, Image Intensifier. X-ray computed tomography: basic principle and construction of the components. Ultrasonic Imaging: Physics of ultrasonic waves, medical ultrasound, and basic pulse echo apparatus. Magnetic Resonance Imaging: Principle, Image reconstruction techniques, Basic NMR components, Biological effects, Merits.

UNIT-IV
Critical Care Equipment: Ventilators: Mechanics of respiration, artificial ventilators, Positive pressure ventilator, Types and classification of ventilators. Drug delivery system: Infusion pumps, basic components, implantable infusion system, closed-loop control in infusion pump. Cardiac Defibrillators: Need for defibrillators, DC defibrillator, Implantable defibrillators, Defibrillator analyzer.

UNIT – V
Therapeutic Equipment: Cardiac pacemakers: Need for cardiac pacemakers, External and implantable pacemakers, types. Dialysis Machine: Function of the kidney, artificial kidney, Dialyzers, Membranes, Hemodialysis machine. Lithotripters: The stone disease problem, Modern Lithotripter systems, extra corporeal shockwave therapy.

SUGGESTED READING:

1	R.S. Khandpur, Hand book of Biomedical Instrumentation, Tata McGraw-Hill, Second Edition, 2014.
2	John G.Webster, Medical Instrumentation Application and design, Wiley India Edition, 2009.
3	**Leslie Cromwell,***Biomedical Instrumentation and Measurements, 2nd Edition, Prentice Hall of India,*

Course Code	Course Title						Course Type
OE702BM	ARTIFICIAL INTELLIGENCE IN HEALTH CARE						Elective
Prerequisite	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation		Credits
	L	T	P		CIE	SEE	
	3	-	-	3	40	60	3

Course Objectives:	
The course is taught with the objectives of enabling the student to:	
1	To introduce students to the fundamentals of Artificial Intelligence (AI) with a focus on healthcare applications.
2	To explore AI techniques in clinical diagnostics and decision-making.
3	To understand the role of AI in medical imaging, disease prediction, patient monitoring, and personalized medicine.
4	To examine ethical, legal, and regulatory considerations in the deployment of AI in healthcare.
5	To enable students to design and evaluate AI-based healthcare solutions for improving patient outcomes and operational efficiency

Course Outcomes:	
On completion of this course, the student will be able to :	
CO-1	Understand and explain the fundamental AI concepts and techniques relevant to healthcare.
CO-2	Apply machine learning and deep learning methods to analyze medical data and assist in clinical decision-making.
CO-3	Analyze AI-based diagnostic tools used in medical imaging and disease prediction.
CO-4	Evaluate the implementation challenges and ethical implications of AI in healthcare systems.
CO-5	Design AI-driven healthcare applications and propose data-driven solutions to real-world health problems.

UNIT–I
Introduction to Artificial Intelligence: Definition. AI Applications, AI representation. Properties of internal Representation, General problem solving, production system, control strategies: forward and backward chaining. Uninformed and informed search techniques. A* and AO* Algorithm

UNIT–II

Machine Learning and Deep Learning for Healthcare: Supervised, unsupervised, and reinforcement learning. Classification and regression techniques in clinical datasets. Neural networks, CNNs, RNNs and their applications. Case studies: Diabetes prediction, cancer classification, readmission prediction. Model evaluation: accuracy, precision, recall, ROC curves

UNIT–III

AI in Medical Imaging and Diagnostics: Image processing fundamentals and feature extraction. AI in radiology: X-rays, CT, MRI, Ultrasound. Computer-aided diagnosis systems. Deep learning for medical image segmentation and classification. Real-world tools: Google Deep Mind, IBM Watson Health.

UNIT-IV

Natural Language Processing in Healthcare: Basics of NLP and its significance in healthcare**.** Clinical text mining and named entity recognition (NER).Chatbots and virtual health assistants. AI in Electronic Health Record (EHR) processing. Case study: Predictive analysis from clinical notes.

UNIT – V

Ethical, Legal, and Future Perspectives. Ethical concerns: bias, transparency, and ability. Data privacy and security in AI systems. Regulatory aspects: FDA, HIPAA, CDSCO. Human-AI collaboration in clinical settings. Future directions: AI in genomics, telemedicine, and wearable technologies.

SUGGESTED READING:

1	Eugene, Charniak, Drew Mcdermott: Introduction to artificial intelligence.
2	Elaine Rich and Kerin Knight, Nair B., "Artificial Intelligence (SIE)", Mc Graw Hill- 2008.
3	Mathias Goyen, *Artificial Intelligence in Healthcare: Past, Present and Future*, Elsevier, 2021.
4	Eric Topol, *Deep Medicine: How Artificial Intelligence Can Make Healthcare Human Again*, Basic Books, 2019
5	Parashar Shah, *AI in Healthcare: A Practical Guide*, BPB Publications, 2021.

Course Code	CourseTitle						Course Type
OE701CE	GREEN BUILDING TECHNOLOGY						Elective
Prerequisite	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation		Credits
	L	T	P		CIE	SEE	
	3	-	-	3	40	60	3

Course Objectives:	
The course is taught with the objectives of enabling the student to:	
1	Exposure to the green building technologies and their significance.
2	Understand the judicial use of energy and its management.
3	Educate about the Sun-earth relationship and its effect on climate.
4	Enhance awareness of end-use energy requirements in the society.
5	Develop suitable technologies for energy management.

Course Outcomes:	
On completion of this course, the student will be able to:	
CO-1	Understand concept of Energy in Buildings, factors on energy usage and Management.
CO-2	Environmental, Air conditioning and Auditory requirement indoors
CO-3	Climate, radiation, wind in connection with Energy
CO-4	End use energy requirements in buildings, concepts of heat gain and thermal performance
CO-5	Energy audit, energy management.

UNIT–I

Overview of the significance of energy use and energy processes in building: Indoor activities and environmental control - Internal and external factors on energy use and the attributes of the factors - Characteristics of energy use and its management - Macro aspect of energy use in dwellings and its implications.

UNIT–II

Indoor environmental requirement and management: Thermal comfort - Ventilation and air quality – Air-conditioning requirement - Visual perception - Illumination requirement – Auditory requirement.

UNIT–III

Climate, solar radiation and their influences: Sun-earth relationship and the energy balance on the earth's surface - Climate, wind, solar radiation, and temperature - Sun shading and solar radiation on surfaces - Energy impact on the shape and orientation of buildings.

UNIT–IV

End-use, energy utilization and requirements: Lighting and day lighting - End-use energy requirements - Status of energy use in buildings Estimation of energy use in a building - Heat gain and thermal performance of building envelope - Steady and non-steady heat transfer through the glazed window and the wall - Standards for thermal performance of building envelope-Evaluation of the overall thermal transfer

UNIT–V

Energy management options: Energy audit and energy targeting - Technological options for energy management.

Suggested Readings:

1	Michael Bauer, Peter Mösle and Michael Schwarz, *"Green Building–Guide book for Sustainable Architecture"*, Springer, Heidelberg, Germany, 2010.
2	Norbert Lechner, *"Heating, Cooling, Lighting-Sustainable Design Methods for Architects",* Wiley, New York, 2015.
3	Mike Montoya, *"Green Building Fundamentals* ‖,Pearson, USA, 2010.
4	Charles J.Kibert, *"Sustainable Construction-Green Building Design and Delivery*‖, John Wiley & Sons, New York, 2008.
5	Regina Leffers, *"Sustainable Construction and Design*‖, Pearson / Prentice Hall, USA 2009
6	James Kachadorian, *"The Passive Solar House: Using Solar Design to Heat and Cool Your Home",* Chelsea Green Publishing Co., USA, 1997.

CourseCode	CourseTitle						Course Type
OE702CE	PLUMBING TECHNOLOGY						Elective
Prerequisite	Contacthoursper week			DurationofSEE (Hours)	Schemeof Evaluation		Credits
	L	T	P		CIE	SEE	
	3	-	-	3	40	60	3

Course Objectives:	
The course is taught with the objectives of enabling the student to:	
1.	Understand plumbing components for various systems such as water supply, waste water, high rise buildings
2.	Study various plumbing fixtures materials, tools and equipment
3.	Study the codes and standards in the building industry for plumbing

Course Outcomes:	
On completion of this course, the student will be able to:	
CO-1	Understand and identify the various plumbing related systems, component and types,
CO-2	Ability to understand various plumbing terminology for water supply
CO-3	Ability to understand various plumbing fixtures materials, tools and equipment.
CO-4	Understand about different pumping systems available.
CO-5	Comprehend the importance of codes, the key responsibilities of a plumbing sector and plumber

UNIT–I

Building Plumbing - Introduction to Plumbing Systems, components of plumbing systems, and basic physics as related to plumbing. Various types of home plumbing systems for water supply and waste water disposal, high rise building plumbing, Pressure reducing valves, Break pressure tanks, Storage tanks, Building drainage for high rise buildings, various kinds of fixtures and fittings used.

UNIT–II

Plumbing Terminology: Definitions, use/purpose of Plumbing Fixtures - accessible, readily accessible, aerated fittings, AHJ, bathroom group, carrier, flood level rim, floor sink, flushometer valve, flush tanks, lavatories, macerating toilet, plumbing appliances, plumber.

Traps: indirect waste, vent, blow off, developed length, dirty arm, FOG, indirect waste, receptors, slip joints, trap, and vent.

Water supply: angle valve, anti-scald valve, backflow, bypass, check valve, cross connection, ferrule, gate valve, gray water, joints

UNIT–III
Plumbing Fixtures and Fittings: Definitions of plumbing fixtures, fittings, appliances and appurtenances; maximum flow rates, water closets, bidets, urinals, flushing devices, washbasins, bath/shower, toilets for differently abled, kitchen sinks, water coolers, drinking fountain,clotheswasher,dishwasher,mopsink,overflows,strainers,prohibitedfixtures,floor drains, floor slopes, location of valves, hot water temperature controls, installation standard dimensions in plan and elevation.

UNIT–IV
Pumping Systems : Terminology, pump heads, types of Pumps, applications, pump selection, pump characteristics, pumps and motors, pump efficiency, motor efficiency, Hydro Pneumatic Systems(HPS), Zoning, Storm Water and Drainage Pumps, introduction to starters and control panels.

UNIT–V
Codes and Standards: Scope, purpose; codes and standards in the building industry, UIPC-I, NBC and other codes, Local Municipal Laws, approvals, general regulations, standards, water supply, protection of pipes and structures, waterproofing.

Introduction to the Sector and the Job Role:

Overview of the Plumbing Sector- Importance and scope of plumbing in construction and maintenance, career opportunities in plumbing.
Understanding the Job Role of a Plumber – Duties and responsibilities of a plumber, Skills and attributes required for a plumber.
Safety Measures and Regulations –Importance of safety in plumbing, Basic safety regulations and practices.
Tools and Equipment – Introduction to basic plumbing tools and equipment, Proper use and handling of plumbing tools.

Reference books and codes:

- Uniform Illustrated Plumbing Code-India (UIPC- I) published by IPA and IAPMO (India)
- National Building Code (NBC) of India
- IS17650 Part1 and Part2 for Water Efficient Plumbing Products
- Water Efficient Products-India (WEP-I) published by IPA and IAPMO (India)
- Water Efficiency and Sanitation Standard (WE. Stand) published by IPA and IAPMO (India)
- Water Pollution, Berry, CBS Publishers.
- 'A Guide to Good Plumbing Practices', a book published by IPA.
- Elements of Water Pollution Control Engineering, O.P.Gupta, Khanna Book Publishing, New Delhi
    - Plumbing Engineering.Theory,DesignandPractice,S.M.Patil,1999
    - Water supply and sewerage system– G. Birdie

Learning Website:

1. www.nptel.co.in
2. https://ndrfandcd.gov.in/Cms/NATIONA0LBUILDINGCODE.aspx

PE701CS	CLOUDCOMPUTING					
Pre-requisites	Distributed Systems		**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60Marks	**CIE**		40Marks	

CourseObjectives:	
1	Tointroducebasicconceptscloudcomputingandenablingtechnologies
2	TolearnaboutAuto-Scaling,capacityplanningandloadbalancingincloud
3	Tointroducesecurity,privacyandcomplianceissuesinclouds
4	Tointroducecloudmanagement standardsandprogrammingmodels

CourseOutcomes:	
Oncompletionofthiscourse, thestudentwill beable to:	
CO-1	Understandthebasicapproachesand Coreideas ofCloud Computing.
CO-2	Understandthe Challenges and approaches in the management of the Cloud environments.
CO-3	Familiarizewith advancedparadigmsandsolutionsnecessaryforbuildingandmanaging modernCloudenvironments.
CO-4	EnvisionuseofCloudNative Microservices and Serverless Computing.

UNIT–I
Introduction,Benefitsandchallenges,Cloudcomputingservices,ResourceVirtualization,Resourcepoolingsharingand provisioning.

UNIT– II
Scalingin theCloud, CapacityPlanning, LoadBalancing, FileSystemandStorage,

UNIT– III
Multi-tenantSoftware,DatainCloud,DatabaseTechnology,ContentDeliveryNetwork,SecurityReferenceModel,SecurityIssues,PrivacyandComplianceIssues

UNIT– IV
PortabilityandInteroperabilityIssues,CloudManagementandaProgrammingModelCaseStudy,PopularCloudServices

UNIT–V
Cloud Native Microservices: How and Why, KubernetesArchitecture Overview, Stateless and Statefulmicroservices. GitOps: Cloud Native Continuous Delivery, Creating CI/CD Pipelines for Microservices, CI/CD tools: Jenkins, Spinnaker, Argo CD,GitHub Actions,GitLab CI/CD What is Serverless Computing?, Getting Started with AWS Lambda, Getting Started with Azure Functions, Getting Started with Google Cloud Functions

SuggestedReading:

1	CloudComputing-Sandeep Bhowmik,Cambridge UniversityPress,2017.

2	“Cloud Native MicroserviceswithKubernetes: A Comprehensive Guide to Building, Scaling, Deploying,Observing, and Managing Highly-Available Microservices inKubernetes”, Aymen El Amri, Lean Publishing, 2023
3	“Hands-On Serverless Computing: Build, run and orchestrate serverless applications using AWS Lambda, Microsoft Azure Functions, and Google Cloud Functions”, KuldeepChowhan, Pack Publishing, 2018

Course Code	Course Title						Course Type
OE702CS	DATA BASE MANAGEMENT SYSTEMS						Elective
Prerequisite	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation		Credits
	L	T	P		CIE	SEE	
	3	-	-	3	40	60	3

Course Objectives:	
1	To introduce three schema architecture and DBMS functional components.
2	To understand the principles of ER modeling and design.
3	To learn query languages of RDBMS.
4	Tofamiliarizetheoryofserializablityandimplementationofconcurrencycontrol,and recovery.
5	To study different file organization and indexing techniques

Course Outcomes:	
On completion of this course, the student will be able to:	
CO-1	Understand the mathematical foundations on which RDBMS are built.
CO-2	Model a set of requirements using the Entity Relationship Model (ER), transform into a relational model, and refine the relational model using theory of Normalization.
CO-3	Develop Database application using SQL and Advanced SQL.
CO-4	Understand the working of concurrency control and recovery mechanisms in RDBMS
CO-5	Use the knowledge of indexing and hashing to improve database application performance.

Unit 1: Introduction to DBMS:

- **Introduction:** Database System Applications, Purpose of Database Systems, View of Data, Database Languages, Database Design, Database Engine, Database and Application Architecture, Data Base Users and Administrators.
- **Introduction to the Relational Model:** Structure of Relational Databases, Database Schema, Keys, Schema Diagram, Relational Query Languages, The Relational Algebra

Unit 2: Data Models and Database Design:

- **Entity-Relationship (ER) Model**: The Entity-Relational Model, Complex Attributes, Mapping Cardinalities, Primary key, Removing Redundant Attribute in Entity Set,

Reducing E-R diagrams to Relational Schemas, Extended E-R features, Entity-Relationship Design Issues, Alternative Notations for Modelling Data.

- **Relational Model**: Features of Good Relational Designs, Decomposition Using Functional Dependencies, Normal Forms, Functional-Dependency Theory, algorithms for Decomposition using Functional Dependencies, Decomposition Using multivalued Dependencies, Atomic Domains and First Normal Form, Database-Design process, Modelling Temporal Data

Unit 3: SQL and Querying:

- **SQL Basics**: Data definition, data manipulation, and data control languages. functions in sql (single row and multirow& conversion functions), Creating Tables, keys, integrity constraints (column level and table level)
- **Advanced SQL**: Joins, subqueries, aggregate functions, and views. Synonyms
- **Stored Procedures and Triggers**: Concepts and usage.

Unit 4: Transaction Management and Concurrency Control:

- **Transaction Concepts**: Transaction Concept, transaction states, A simple transaction Model, Implementation of Atomicity and Durability, Implementation of Isolation, Serializability (view Serializability, conflict serializability)
- **Concurrency Control**: Locking mechanisms, Lock-based protocol, Timestamp-Based Protocol, Validation Based Protocol, Multiple Granularity, deadlock handling.
- **Recovery Techniques**: Failure Classification, Storage Structure, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with Loss of Non-Volatile Storage, High Availability Using Remote Backup Systems, ARIES, Early Lock Release and Logical Undo Operations, Recovery in Main-memory Databases.

Unit 5: Indexing and Hashing:

Database-System Architectures: Centralized Database Systems, Server System Architectures, Parallel Systems, Distributed Systems, Transaction Processing in Parallel and Distributed Systems, Cloud-Based Services.

Introduction to Big Data: Big Data Storage Systems, The MapReduce Paradigm, Beyond MapReduce, Algebraic Operations, Streaming Data, Graph Databases

Reference Books:

1) Database System Concepts Seventh Edition Abraham Sliberschantz, Henry f. Korth,S. Sudarshan, 7th Edition, 2024.
2) Rama krishnan, Gehrke, "*Database Management Systems"*, McGraw-Hill International Edition, 3rd Edition, 2003.
3) Elma sri, Nava the, Somayajulu, "*Fundamentals of Database Systems"*PearsonEducation, 4th Edition, 2004.

OE 701 EC	FUNDAMENTALS OF EMBEDDED SYSTEMS					
Pre-requisites	Computer Organization, Micro Processors		**L**	**T**	**P**	**C**
			3	**-**	**-**	**3**
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives:	
1	Learn basics of Computer architecture, its working and types.
2	Learn basics of Embedded Systems and their applications.
3	Learn interfacing various components with Embedded Systems

Course Outcomes:	
On completion of this course, the student will be able to :	
1	Learn about the general principles of computer architecture
2	Understand the working of a simple embedded system and embedded system applications
3	Understand the hardware aspects of embedded systems
4	Understand the sensors, ADCs and actuators used in embedded systems
5	Understand the real world examples of embedded systems

UNIT–I
Basics of computer architecture and the binary number system: Basics of computer architecture, computer languages, RISC and CISC architectures, number systems, number format conversions, computer arithmetic, units of memory capacity.

UNIT–II
Introduction to embedded systems: Application domain of embedded systems, desirable features and general characteristics of embedded systems, model of an embedded system, microprocessor Vs microcontroller, example of a simple

embedded system, figure of merit for an embedded system, classification of MCUs: 4/8/16/32 bits, history of embedded systems, current trends.

UNIT–III
Embedded systems-The hardware point of view: Microcontroller unit(MCU), a popular 8-bit MCU, memory for embedded systems, low power design, pull up and pull down resistors

UNIT-IV
Sensors, ADCs and Actuators: **Sensors: Temperature Sensor, Light Sensor, Proximity/range Sensor; Analog to digital converters: ADC Interfacing; Actuators Displays, Motors, Opto couplers/Opto isolators, relays.**

UNIT – V
Examples of embedded systems: Mobile phone, automotive electronics, radio frequency identification (RFID), wireless sensor networks (WISENET), robotics, biomedical applications, brain machine interface.

Suggested Reading:

1	Lyla B Das, Embedded systems: An Integrated Approach, 1st Ed., Pearson, 2013
2	Raj Kamal, Embedded Systems – Architecture, Programming and Design, 2nd Edition, TMH, 2008
3	Shibu, K.V., Introduction to Embedded Systems, 1st Ed., TMH, 2009
4	Kanta Rao B, Embedded Systems, 1st Ed., PHI
5	Frank Vahid& Tony Givargis, Embedded System Design, 2nd Edition, John Wiley.

Course Code	Course Title						Course Type
OE702EC	INTRODUCTION TO INTERNET OF THINGS						Elective
Prerequisite	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation		Credits
	L	T	P		CIE	SEE	
	3	-	-	3	40	60	3

Course Objectives :	
The course is taught with the objectives of enabling the student to:	
1	To understand the concepts of the Internet of Things and be able to build IoT applications
2	To learn the programming and use of Arduino and Raspberry Pi boards Design And detail the deep beams.
3	To study about various IoT case studies and industrial applications.

Course Outcomes:	
On completion of this course, the student will be able to:	
CO-1	Known basic protocols in sensor networks.
CO-2	To Know the Architecture and Protocols of IoT.
CO-3	Python programming and interfacing for Raspberry Pi.
CO-4	Interfacing sensors and actuators with different IoT architectures.
CO-5	Compare IOT Applications in Industrial &real world

UNIT–I
Introduction to the Internet of Things, Characteristics of IoT, Physical design of IoT, Functional blocks of IoT, Sensing, Actuation, Basics of Networking, Communication Protocols.

UNIT–II
IoT Architecture: Physical and Logical design of IoT, IoT frameworks, IoT Protocols – MQTT, COAP, 6LOWPAN

UNIT–III
Introduction to Python programming, Introduction to Raspberry Pi, Interfacing Raspberry Pi with basic peripherals, Implementation of IoT with RaspberryPi..

UNIT–IV
IoT applications in home, Infrastructures, Buildings, Security, Industries, Home appliances, other IoT electronic equipments.

UNIT–V
Prototyping and Programming for IoT: Sensors, Actuators, Micro Controllers, SoC, Choosing a platform, prototyping hardware platforms- Arduino, Raspberry Pi, Prototype in Physical design- Laser Cutting, 3D-Printing, CNC milling, techniques for writing Embedded code

Suggested Reading:

1	Raj Kamal, "Internet of Things – Architecture and Design Principles", McGraw Hill Education Pvt. Ltd., 2017
2	"Makesensors":Terokarvinen,kemo,karvinenandvilleyvaltokari,1stedition, maker media, 2014.
3	IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Cisco Press, 2017
4	Internet of Things – A hands-on approach, ArshdeepBahga, Vijay Madisetti, Universities Press, 2015
5	Rao, M. (2018). Internet of Things with Raspbery Pi 3: Leverage the power of Raspberry Pi 3 and JavaScript to build exciting IoT projects. Packt Publishing Ltd
6	Internet of Things and Data Analytics, HwaiyuGeng, P.E, Wiley Publications, 2017

CourseCode	CourseTitle						CourseType
OE701EE	OPTIMIZATIONTECHNIQUES						Elective
Prerequisite	Contacthoursper week			DurationofSEE (Hours)	Schemeof Evaluation		Credits
	L	T	P		CIE	SEE	
	3	-	-	3	40	60	3

Course Objectives:	
The course is taught with the objectives of enabling the student to:	
1	Tounderstandtheneedandbasicconceptsofoperationsresearchandclassifythe optimization problems.
2	To study about the linear programming and non-linear programming concepts and their applications.
3	To understand various constrained and un-constrained optimization techniques and their applications.
4	To understand the concepts and implementation of Genetic Algorithms to get the optimum solutions.
5	To study the concepts of Metaheuristics Optimization techniques.

Course Outcomes:	
On completion of this course, the student will be able to:	
CO-1	Analyze any problem of optimization in an engineering system and able to formulate a mathematical model to the problem and solving it by the techniques that are presented.
CO-2	Solve problems of L.P. by graphical and Simplex methods.
CO-3	Apply various constrained and un-constrained optimization techniques for the specific problems.
CO-4	Implement the Genetic Algorithms to solve the for optimum solution.
CO-5	Understand the concepts to use the Metaheuristics Optimization techniques.

UNIT–I
Introduction: Definitions, Characteristics, Objective function, Classification of optimization problems, Engineering applications and limitations. Single-Variable Optimization, Multivariable Optimization with No Constraints, Multivariable Optimization with Equality Constraints and Multivariable Optimization with Inequality Constraints: Kuhn–Tucker Condition.

UNIT–II
LinearProgramming: DefinitionsandFormulationoftheLPP,ConstructionofL.P.Models, Slack and surplus variables, Standard form, Canonical form and matrix form of LP Problems. Artificial Variables, solution by the Big-M method, Duality principle, Dual problems and numerical problems.

UNIT–III
Random Search Methods Concepts: Direct Search Methods - Univariate Method, Gradient of a Function, Indirect Search Methods - Gradient of a Function, Steepest Descent (Cauchy) Method, Newton's Method.

UNIT-IV
Binary Genetic Algorithm: Genetic Algorithms Natural Selection on a Computer, Components of a Binary Genetic Algorithm. Selecting the Variables and the Cost Function. Variable Encoding and Decoding, The Population, Natural Selection, Selection, Mating. Mutations, the Next Generation and Convergence, Components of a Continuous Genetic Algorithm.

UNIT – V
Metaheuristics Optimization: Concepts of Simulated Annealing, Theoretical approaches, Advantages and disadvantages, applications, Ant Colony Algorithms - Introduction, Collective behavior of social insects, Formalization and properties of ant colony optimization.

Suggested Reading:

1	Rao, S.S. (2009). "Engineering Optimization: Theory and Practice." John Wiley & Sons,Inc.
2	Taha,H.A.(2008)."OperationsResearch,PearsonEducation India."NewDelhi, India.
3	RandyL.HauptandSueEllenHaupt,"Practical geneticalgorithms"secondedition,aJohn Wiley & sons, inc., publication -2004.
4	SharmaJ.K.(2013)."OperationResearch:TheoryandApplications."FifthEdition, Macmillan Publishers, New Delhi, India.
5	J.DreoA.Petrowski,P.SiarryE.Taillard."MetaheuristicsforHardOptimization" Springer.

Course Code	Course Title						Course Type
OE702EE	NON-CONVENTIONALENERGY SOURCES						Elective
Prerequisite	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation		Credits
	L	T	P		CIE	SEE	
	3	-	-	3	40	60	3

Course Objectives:	
The course is taught with the objectives of enabling the student to:	
1	To understand the different types of energy sources.
2	To understand the need of non-conventional energy sources and their principles.
3	To understand the limitations of non-conventional energy sources.
4	To outline division aspects and utilization of renewable energy sources for diriment application.
5	To analyze the environmental aspects of renewable energy resources.

Course Outcomes:	
On completion of this course, the student will be able to :	
CO-1	Know the different energy resources and need of renewable energy resources.
CO-2	Understand the concepts of working of fuel cell systems along with their applications.
CO-3	Describe the use of solar energy and the various components and measuring devices used in the energy production and their applications.
CO-4	Appreciate the need of Wind Energy and their classification and various components used in energy generation and working of different electrical wind energy system.
CO-5	Understand the concept of OTEC technology, Biomass energy resources and different types of biogas Plants used in India.

UNIT–I
Review of Conventional and Non-Conventional energy sources, Need for non-conventional energy sources Types of Non-conventional energy sources, Fuel Cells, Principle of operation with special reference to H2O2 Cell, Classification and Block diagram of fuel cell systems, Ion exchange membrane cell, Molten carbonate cells, Solid oxide electrolyte cells, Regenerative system, Regenerative Fuel Cell, Advantages and disadvantages of Fuel Cells, Polarization, Conversion efficiency and Applications of Fuel Cells.

UNIT–II
Solar energy, Solar radiation and its measurements, Solar Energy collectors, Solar Energy storage systems, Solar Pond, Application of Solar Pond, Applications of solar energy.

UNIT–III
Wind energy, Principles of wind energy conversion systems, Nature of wind, Power in the Wind, Basic components of WECS, Classification of WECS, Site selection considerations, Advantages and disadvantages of WECS, Wind energy collectors, Wind electric generating and control systems, Applications of Wind energy, Environmental aspects.

UNIT–IV
Energy from the Oceans, Ocean Thermal Electric Conversion (OTEC) methods, Principles of tidal power generation, Advantages and limitations of tidal power generation, Ocean waves, Wave energy conversion devices, Advantages and disadvantages of wave energy, Geo- thermal Energy, Types of Geo-thermal Energy Systems, Applications of Geo-thermal Energy.

UNIT–V
Energy from Biomass, Biomass conversion technologies / processes, Photosynthesis, Photosynthetic efficiency, Biogas generation, Selection of site for Biogas plant, Classification of Biogas plants, Details of commonly used Biogas plants in India, Advantages and disadvantages of Biogas generation, Thermal gasification of biomass, Biomass gasifies.

Suggested Reading:

1	Rai G. D,Non-Conventional Sources of Energy,KhandalaPublishers,NewDelhi,1999.
2	M.M. El-Wakil, Power Plant Technology. McGrawHill,1984.

Course Code	Course Title						Course Type
OE701ME	NANO TECHNOLOGY						Elective
Prerequisite	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation		Credits
	L	T	P		CIE	SEE	
	3	-	-	3	40	60	3

Course Objectives:

- To familiarize Nano materials and technology.
- To understand Nano structures, fabrication and special Nano materials.

UNIT-I

Introduction: Nanoscale, Properties at Nanoscale, advantages and disadvantages, importance of Nano Technology, Bottom-up and Top-down approaches, challenges in NanoTechnology.

UNIT-II

Materials of Nano Technology: Introduction-Si-based materials, Ge-based materials, Smart materials, metals, Ferroelectric materials, Polymer materials, GaAs &InP (III-V) group materials, Nano tribology and Materials, Principles and analytical techniques of XRD, SEM, TEM and STM/AFM.

UNIT-III

Nano Structures: Zero dimensional Nano structure (Nano Particles)- Synthesis procedure, characterization techniques, properties and applications of Nano Particles One dimensional Nano structures (Nano Wires, Nano Tubes)- Various Synthesis procedure, characterization procedure and principles involved, properties and applications of Nano Wires, Types of Nano Tubes, Synthesis procedure, characterization properties and applications of Nano Tubes.

UNIT-IV

Nano Fabrication: Introduction, Basic fabrication techniques (Lithography, thin film deposition, and doping) MEMS fabrication techniques, Nano fabrication techniques (E-beam Nano-imprint fabrication, Epitaxy and strain engineering, Scanned probe techniques).

UNIT-V

Special Nano Materials: Nano Composites: Introduction, Synthesis procedures, various systems (metal-polymer, metal- ceramics and polymer-Ceramics), Characterization procedures, applications. Nano Biomaterials: Introduction, Biocompatibility, anti-bacterial activity, principles involved, applications.

Suggested Reading:

1. A.K.Bandyopadyay, Nano Materials, New Age Publications, 2007.
2. T. Pradeep, Nano: The Essentials: Understanding Nanoscience and Nanotechnolgy, Tata McGraw-Hill, 2008.

3. Carl. C. Koch, Nano Materials Synthesis, Properties and Applications, Jaico Publishing House,2008.
4. WilliaIllsey Atkinson, NanoTechnology, Jaico Publishing House, 2009.

Course Code	Course Title						Course Type
OE702ME	START UP ENTREPRENEURSHIP						Elective
Prerequisite	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation		Credits
	L	T	P		CIE	SEE	
	3	-	-	3	40	60	3

Course Objectives:

- To motivate students to take up entrepreneurship in future
- To learn nuances of starting an enterprise & project management
- To understand the behavioural aspects of entrepreneurs and time management

Course Outcomes: Student will

1. Understand the behavioural aspects of entrepreneurs and time management
2. Creative thinking and transform ideas into reality
3. Importance of innovation in new business opportunities
4. Create a complete business plan and workout the budget plan.
5. write a project proposal with budget statement

UNIT I

Creativity & Discovery: Definition of Creativity, self test creativity, discovery and delivery skills, The imagination threshold, Building creativity ladder, Collection of wild ideas, Bench marking the ideas, Innovative to borrow or adopt, choosing the best of many ideas, management of tradeoff between discovery
and delivery, Sharpening observation skills, reinventing self, Inspire and aspire through success stories

UNIT II

From Idea to Startup : Introduction to think ahead backward, Validation of ideas using cost and strategy, visualizing the business through value profile, activity mapping, Risks as opportunities, building your own road map

UNIT III

Innovation career lessons : Growing & Sharing Knowledge, The Role of Failure In Achieving Success, Creating vision, Strategy, Action & Resistance: Differentiated Market Transforming Strategy; Dare to Take Action; Fighting Resistance; All About the startup Ecosystem; Building a Team; Keeping it Simple and Working
Hard.

UNIT IV

Action driven business plan: Creating a completed non-business plan (a series of actions each of which moves your idea toward implementation), including a list of the activities to be undertaken, with degrees of importance (scale of 1 to 3, where 1 is 'most important'). A revision of the original product or service idea, in light of information gathered in the process, beginning to design the business or organization that will successfully implement your creative idea. Preparing an activity map.

UNIT V

Startup financing cycle: Preparing an initial cash flow statement, showing money flowing out (operations; capital) and flowing in. Estimate your capital needs realistically. Prepare a bootstrapping option (self financing). Prepare a risk map. Prepare a business plan comprising five sections: The Need; The Product; Unique Features; The Market; Future Developments. Include a Gantt chart (project plan –
detailed activities and starting and ending dates); and a project budget.

Suggested Readings:

1. Vasant Desai, "Dynamics of Entrepreneurial Development and Management", Himalaya PublishingHouse, 1997.
2. Prasanna Chandra, "Project – Planning , Analysis, Selection, Implementation and Review", TataMcGraw-Hill Publishing Company Ltd., 1995.
3. B. Badhai, "Entrepreneurship for Engineers", Dhanpath Rai & Co., Delhi, 2001.
4. Stephen R. Covey and A. Roger Merrill, "First Things First", Simon and Schuster, 2002.
5. Robert D. Hisrich and Michael P.Peters, " Entrepreneurship", Tata McGRaw Hill Edition, 2002.

	NATURAL LANGUAGE PROCESSING LAB					
Prerequisites			**L**	**T**	**P**	**C**
			0	**0**	**2**	**1**
Evaluation	**CIE**	**50 Marks**	**SEE**		**25 Marks**	

Natural Language Processing Lab – Problem Statements

This document outlines 14 NLP Lab problem statements aligned with the enhanced undergraduate syllabus. These labs provide hands-on exposure to classical NLP, deep learning, transformer models, prompting, and ethical AI evaluation.

Unit I – Classical NLP and Language Modeling

1. 1. Text Preprocessing and Analysis:
   Write a Python program that performs tokenization, stemming, lemmatization, and frequency analysis on a large text corpus. Visualize the most frequent tokens using a word cloud.
2. 2. POS Tagging and Named Entity Recognition:
   Implement rule-based and statistical POS tagging and NER using NLTK and spaCy. Compare the performance across multiple datasets (news, legal, tweets).
3. 3. N-gram Language Modeling:
   Build a unigram and bigram language model from a given text corpus. Evaluate the models using perplexity and generate random sentences.
4. 4. Text Classification using Traditional ML:
   Design a text classification pipeline using TF-IDF and Logistic Regression or Naive Bayes for spam detection or sentiment analysis.

Unit II – Deep Learning for NLP

5. 1. Sequence Modeling with RNN and LSTM:
   Train an LSTM model for next-word prediction using a Shakespeare or Wikipedia dataset. Visualize training loss and sample predictions.
6. 2. Neural Machine Translation:
   Implement a sequence-to-sequence model with attention to translate English to a low-resource language (e.g., Hindi or Telugu). Use BLEU score for evaluation.
7. 3. Text Summarization using Encoder-Decoder:
   Build a simple abstractive text summarizer using an attention-based encoder-decoder model. Compare with extractive summaries using ROUGE.

Transformers and Pretrained Models

8. 1. Fine-tuning BERT for Text Classification:
   Fine-tune a pretrained BERT model using Hugging Face Transformers for sentiment classification on IMDB or Amazon Reviews dataset.

9. 2. Question Answering with Transformer Models:
   Build a QA system using SQuAD dataset with a fine-tuned BERT or DistilBERT model. Evaluate accuracy and response time.
10. 3. Named Entity Recognition with Transformer Embeddings:
    Compare spaCy NER with BERT-based NER fine-tuned on the CoNLL-2003 dataset. Visualize token importance using attention heatmaps.

Unit IV – LLMs, Prompting, and NLP Agents

11. 1. Prompt Engineering for Few-shot Classification:
    Use OpenAI GPT or similar LLM to classify short texts (e.g., political speeches or tweets) using prompt templates (zero-shot, few-shot, CoT prompts). Analyze accuracy vs. prompt complexity.
12. 2. Retrieval-Augmented Question Answering (RAG):
    Implement a domain-specific question-answering system (e.g., Medical or Legal FAQs) using LangChain + OpenAI + vector database (FAISS). Test different retrieval strategies.

Ethics, Multimodal NLP, and Explainability

13. 1. Hallucination and Bias Analysis in LLMs:
    Evaluate generated text from LLMs (GPT-3.5 or Claude) on a set of prompts for hallucination, stereotypes, or toxicity. Document findings using PromptEval or similar tools.
14. 2. Image Captioning using CLIP or BLIP:
    Build a basic multimodal model that generates image captions or performs text-based image retrieval using CLIP embeddings. Extend it to detect mismatched captions.

	PROJECT WORK-I					
Prerequisites			**L**	**T**	**P**	**C**
			0	**0**	**6**	**3**
Evaluation	**CIE**	**50 Marks**	**SEE**		**-**	

Course Objectives:

- To enhance practical andprofessional skills.
- To familiarize tools and techniques ofsystematic Literaturesurvey and documentation
- To expose the students to industrypracticesand team work.
- To encouragestudents towork with innovative and entrepreneurialideas

CourseOutcomes: Student willbe able to:

1. Demonstratetheabilitytosynthesizeandapplytheknowledgeandskillsacquiredinthe academic program to real-worldproblems
2. Evaluatedifferent solutions based on economicand technical feasibility
3. Effectivelyplana project and confidentlyperformall aspects of project management
4. Demonstrate effective written and oral communication skills

Thedepartment caninitiate theproject allotmentprocedure at the end of VIsemesterand finalize it in the first two weeks of VIIsemester.

Thedepartmentwillappointaprojectcoordinatorwhowillcoordinatethefollowing:

- Collectionofprojecttopics/descriptionsfromfacultymembers(Problemscanalsobe invited from the industries)
- Groupingof students (max3 in a group)
- Allotment of projectguides

Theaimofprojectworkistodevelopsolutionstorealisticproblemsapplyingtheknowledgeand skillsobtainedindifferentcourses,newtechnologiesandcurrentindustrypractices.Thisrequires studentstounderstandcurrentproblemsintheirdomainandmethodologiestosolvetheseproblems. Togetawarenessoncurrentproblemsandsolutiontechniques,thefirst4weeksofVIIsemesterwill bespentonspeciallecturesbyfacultymembers,researchscholars,postgraduatestudentsofthe departmentandinvitedlecturesbyengineersfromindustriesandR&Dinstitutions.Aftercompletion oftheseseminarseachgrouphastoformalizetheprojectproposalbasedontheirownideasoras suggested bythe projectguide.

Seminar schedule willbeprepared bythecoordinator for all the students from the 5th week to thelast week of thesemester which should be strictly adhered to.

Eachgroupwillberequiredto:

1. Submit a onepagesynopsisbeforethe seminar for displayon noticeboard.
2. Give a30 minutes presentation followed by10 minutes discussion.
3. Submit a technical write-up on the talk.

	SUMMER INTERNSHIP					
Prerequisites			**L**	**T**	**P**	**C**
			0	**0**		**2**
Evaluation	**CIE**	**50 Marks**	**SEE**			

CourseObjectives:

- Totrainandprovidehands-onexperienceinanalysis,design,andprogrammingof information systems bymeans of case studies and projects.
- To expose the students to industrypracticesand team work.
- Toprovidetraininginsoftskillsandalsotraintheminpresentingseminarsandtechnical report writing.

CourseOutco
mes: Student
willbe able to :

1.GetPracticalexperienceofsoftwaredesignanddevelopment,andcodingpracticeswithin Industrial/R&D Environments.
2.Gain workingpracticeswithinIndustrial/R&D Environments. 3.Prepare reports and otherrelevant documentation.

SummerInternshipisintroducedaspartofthecurriculaofencouragingstudentstoworkon problemsofinteresttoindustries.Abatchofthreestudentswillbeattachedtoapersonfromthe ComputerIndustry/SoftwareCompanies/R&DOrganizationforaperiodof8weeks.Thiswillbe duringthesummervacationfollowingthecompletionoftheIIIyearCourse.Onefacultycoordinator willalsobeattachedtothegroupof3studentstomonitortheprogressandtointeractwiththe industryco-ordinate (person from industry).

Afterthecompletionoftheproject,studentwillsubmitabrieftechnicalreportontheproject executedandpresenttheworkthroughaseminartalktobeorganizedbytheDepartment.Awardof sessionalsaretobebasedontheperformanceofthestudents,tobejudgedby acommittee constituted bythedepartment.Onefacultymemberwillco-ordinatetheoverallactivityofIndustryAttachment Program. Atleast two teacher swill be associated with the Project Seminar to evaluate students for the award of sessional marks which will be on the basis of performance in all the 3 items stated above.

Theseminarpresentationshouldincludethefollowingcomponentsoftheproject:

*Problem definition and specification

*Literaturesurvey

*Broad knowledgeof available techniques to solve aparticular problem. *Planningof thework, preparation of bar (activity)charts

*Presentation- oralandwritten

PROPOSEDSCHEMEOFINSTRUCTIONANDEXAMINATION
B.E(CSE)

VIII—Semester

S No	Code	CourseTitle	Schemeof Instruction			Contact Hrs/we	Schemeof Examination			Credits
			L	T	P		Hrs	CIE	SEE	
			Theory							
1	MC80XXX	MandatoryCourse-1	3	0	-		3	40	60	0
2		MandatoryCourse—II	3	0			3	40	60	0
3		MandatoryCourse-III	3	0			3	40	60	0
Practicals										
4	PW861CS	ProjectWork—II			12			50	100	6
		Total	9	0	12		9	170	280	6

Credit Summary

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	18	20	22	23	23	24	24	06	160

Mandatory Courses

S.No.	Code	Course Title
1	MC801CE	Environmental Science
2	MC802HS	Intellectual Property Rights
3	MC803HS	English for Technical Paper Writing
4	MC804HS	Constitution of India
5	MC805HS	Essence of Indian Traditional Knowledge
6	MC806HS	Stress Management by Yoga
7	MC807HS	Sports

MC-I MC801CE	ENVIRONMENTAL SCIENCE					
Pre-requisites	Water Resources Engineering Subjects		**L**	**T**	**P**	**C**
			3	-	-	0
Evaluation	**SEE**	60Marks	**CIE**		40Marks	

Course Objectives:	
The course is taught with the objectives of enabling the student to:	
1.	Comprehend the need of environmental science, ethics and issues
2.	Realize the availability and utilization of various natural resources
3.	Illustrate the characteristics and functions of Ecosystem
4.	Study various environmental pollution effects, prevention and control acts
5.	Understand the concepts of Biodiversity and its conservation needs

Course Outcomes:	
On completion of this course, the student will be able to:	
CO-1	Application and awareness of various environmental issues for sustainable society
CO-2	Acquaintance with utilization of various natural resources
CO-3	Capacity to understand and practice for sustainability of ecosystem.
CO-4	Knowledge of social and environment related issues and their preventive measures
CO-5	Ability in conserving and protecting the biodiversity

UNIT-I

Multidisciplinary nature of Environmental studies:

Definition, scope and importance, Need for public awareness, Environmental ethics: issues and possible solutions, Global Warming and Climate change, Acid rain, Ozone layer depletion. Environment and human health, Population growth, Sustainable development and SDGs

UNIT-II

Natural Resources:

Types of Natural Resources, Role of individual in conservation of natural resources, Equitable use of resources for sustainable life styles, Natural resources and associated problems.

Land Resources: Land as a resource, land degradation, soil erosion and desertification.

Forest resources: Use and Overexploitation, Deforestation, Timber Extraction, Mining, Dams, and their Effects on Forests and Tribal People

Water resources: Water Resources: Use and Overutilization of Surface and Ground Water, Floods, Drought, Conflicts over Water, Dams – Benefits and problems

Mineral Resources: Use and Exploitation, Environmental Effects of Extracting and using Mineral Resources

Food Resources: World Food Problems, Changes Caused by Agriculture and Overgrazing, Effects of Modern Agriculture, Fertilizer-Pesticide Problems, Water Logging, Salinity, Energy Resources.

UNIT-III

Ecosystems:

Concept of an Ecosystem, Types, Structure and function of an ecosystem, Producers, consumers, decomposers. Energy flow in the ecosystems, Ecological succession, Food chains, food webs and ecological pyramids.

Introduction, types, characteristic features, structure and functions - Forest ecosystem, Grass land ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT-IV

Environmental Pollution:

Definition, Causes, effects and control measures - Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards,

Environmental Protection: Air (prevention and control of pollution) Act, Water (prevention and control of pollution) Act, Wildlife conservation and protection act, Forest conservation and protection act, Role of an individual's, communities and NGOs in prevention of pollution

Solid waste Management: Causes, effects and control measures of urban and industrial wastes

UNIT-V

Biodiversity and its Conservation:Definition: genetics, species and ecosystem diversity, Spatial Patterns of Species Richness, Shannon's, Simpson's Diversity Index. Bio-geographically classification of India. Value of biodiversity - consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, national and local level. India as a mega diversity nation. Hot-spots of biodiversity,

Threats to biodiversity: habitats loss, poaching of wild life, man wildlife conflicts. Endangered and endemic spaces of India. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity, Biological Diversity Act, 2002.

Suggested Reading:

1.	ErachBharucha., Textbook of Environmental Studies, UGC, New Delhi and BharathiVidyapeeth Institute of Environment Education and Research, Pune.
2.	**MahuaBasu and Xavier SavarimuthuSJ., Fundamentals of Environmental Studies,**Cambridge University Press, New Delhi, 2017.
3.	Mishra D D., Fundamental Concepts in Environmental Studies, S Chand & Co Ltd., New Delhi, 2010.
4.	Botkin and Keller., Environmental Science, Wiley India Pvt., Ltd., New Delhi, 2012.
5.	Gilbert, M. Masters., Introduction to Environmental Engineering and Science, Prentice- Hall of India Pvt., Ltd., New Delhi, 1995.
6.	Sasi Kumar, K. and SanoopGopi Krishna., Solid waste Management, Prentice-Hall of India Pvt., Ltd., New Delhi, 2009.
7.	Daniel D. Chiras, Environmental Science, Jones & Bartlett Learning Publishers Inc, Burlington, MA, 2014.

MC802HS	INTELLECTUAL PROPERTY RIGHTS					
Pre-requisites			**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives :	
The course is taught with the objectives of enabling the student to:	
1	Acquaint the students with basics of intellectual property rights with special reference to Indian Laws and its practices.
2	Compare and contrast the different forms of intellectual property protection in terms of their key differences and similarities.
3	Provide an overview of the statutory, procedural, and case law underlining these processes and their interplay with litigation.

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Understand the concept of intellectual property rights.
CO-2	Develop proficiency in trademarks and acquisition of trade mark rights.
CO-3	Understand the skill of acquiring the copy rights, ownership rights and transfer.
CO-4	Able to protect trade secrets, liability for misappropriations of trade secrets.
CO-5	Apply the patents and demonstration of case studies.

UNIT – I
Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT – II
Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.

UNIT – III
Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law. Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer**.**

UNIT – IV
Trade Secrets: Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation. Unfair competition: Misappropriation right of publicity, false advertising.

UNIT –V
New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Suggested Reading:

1	Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd, 2007.
2	“Mayall, “Industrial Design”, McGraw Hill,1992
3	“Niebel, “Product Design”, McGraw Hill,1974.
4	“Asimov, “Introduction to Design”, Prentice Hall,1962.
5	“Robert P. Merges, Peter S. Menell, Mark A. Lemley, “Intellectual Property in New Technological Age”,2016.
6	T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand,2008

MC 803 HS	ENGLISH FOR TECHNICAL PAPER WRITING					
Pre-requisites			**L**	**T**	**P**	**C**
			3	-	-	0
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives:	
1.	Understand that how to improve your writing skills and level of readability. Learn about what to write in each section.
2	Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission.

Course Outcomes:	
1.	Able to plan and prepare paragraphs, avoiding ambiguity and grammatical errors
2.	Writing of abstracts, paraphrasing and plagiarism
3.	Providing critical and thorough review of literature, discussions and conclusions
4.	Able to exhibit key skills for writing titles, introduction, abstract.
5.	Able to show key and necessary skills for paper writing, phrases, results.

UNIT-I

Root Words, Synonyms and Antonyms, One word substitutes, importance of Punctuation, Sentence Structure, Subject Verb Agreement, Noun Pronoun Agreement, Redundancy, Cliche

UNIT-II

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness ,

UNIT-III

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

UNIT-IV

Describing, Defining, Classifying, Providing examples or evidence, Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check,

UNIT-V

Key skills are needed when writing a Title, Abstract, Introduction, Review of the Literature, Methods, Results, Discussion, Conclusions -Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

Suggested Reading:

1. Norman Lewis, Word Power Made Easy, Anchor Books, New York, Reprint Edition, 2014.
2. C.R. Kothari and Gaurav Garg, Research Methodology: Methods and Techniques, 4th Edition, New Age International Publishers, New Delhi, 2019.
3. P.C. Wren and H. Martin, A Comprehensive Grammar of the English Language, Revised and Updated by N.D.V. Prasada Rao, S. Chand Publishing, New Delhi, Latest Edition.
4. Goldbort R, Writing for Science, Yale University Press (available on Google Books), 2006.
5. Day R, How to Write and Publish a Scientific Paper, Cambridge University Press, 2006.
6. Highman N Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book. 1998
7. Adrian Wallwork English for Writing Research Papers, Springer New York Dordrecht Heidelberg London. 2011.

MC804HS	CONSTITUTION OF INDIA					
Pre-requisites			**L**	**T**	**P**	**C**
			2	-	-	0
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives:

1.	Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective
2.	To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role
3.	Entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.

Course Outcomes: *At the end of this course, students will be able to:*

1.	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2.	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3.	Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru
4.	The eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
5.	Discuss the passage of the Hindu Code Bill of 1956.

UNIT – I
History of Making of the Indian Constitution: History, Drafting Committee, (Composition & Working) Philosophy of the Indian Constitution: Preamble, Salient Features.
UNIT – II
Contours of Constitutional Rights & Duties: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.
UNIT – III

Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications. Powers and Functions.
UNIT – IV
Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative CEO of Municipal Corporation, Panchayat raj: Introduction, PRI: Zilla Panchayat, Elected officials and their roles, CEO Zilla Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.
UNIT – V
Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

References:

1	*"The Constitution of India",* 1950 (Bare Act), Government Publication.
2	Dr. S. N. Busi, *"Dr. B. R. Ambedkar framing of Indian Constitution",* 1st Edition, 2015.
3	M. P. Jain, "*Indian Constitution Law",* 7th Edn., Lexis Nexis, 2014.
4	D.D. Basu, *"Introduction to the Constitution of India",* Lexis Nexis, 2015.

MC 805HS	ESSENCEOFINDIANTRADITIONALKNOWLEDGE					
Pre-requisites			L	T	P	C
			3	-	-	0
Evaluation	SEE	60 Marks	CIE		40 Marks	

CourseObjectives:

The course aims at enabling the students to

1. Comprehend the Basic fundamental aspects of Society, Culture and Heritage.
2. Understand the significant aspects of Traditional Hindu Social Organization and vedic literature both at individual level and societal level.
3. Inculcate a philosophical insight through shad darshanas and a spiritual outlook through Yoga Sutras.
4. Realize the significance and the utilitarian aspect of the traditional knowledge system through case studies.
5. Appreciate the significance and necessity for the preservation of traditional knowledge system.

CourseOutcomes: Studentwillbeableto

1. Know the fundamental concepts of Society with regard to values, norms, cultural and nature of Indian culture.
2. Understand the connect between the vedic literature and the traditional structural organization guiding at the various phases of life of an individual.
3. Recognize the importance of Darshanas and significance of Yoga sutra in building up a holistic life perspective.
4. To inculcate a pursuit of looking deeper into IKS for addressing the multi faceted contemporary issues both at local and global platform.
5. Analyze the significance and the measures for the preservation of Traditional Knowledge System.

UNIT - I

Fundamental Concepts : Society, Definition and its Characteristics; Values- Norms, Role-Status, Order and Stability, Habits, Custom; Understanding difference between Belief and Ritual, Tradition and Heritage; Culture : Definition and its Characteristics; Characteristics of Indian Culture; Concept of Unity in Diversity;.

UNIT - II

Indian Traditional System: Traditional Hindu Organization: Purusharthas, Varna Dharma and Ashrama Dharma. Indian Traditional Scriptures and their Classification; General Understanding of Vedas : Rig veda, Samaveda, Yajur Veda, and Atharvaveda, Upanishads; Smritis : Itihasa, Puranas, Agamas, Upvedas, and Vedangas.

UNIT - III

Traditional Philosophies / School of thoughts: Darshanas : philosophies of 6 Schools : Nyaya, Vaisheshika, Samkhya, Yoga, Mimamsa and Vedanta; Nastika School of Philosophy : Charvaka, Jainism and Bhuddhism; Yoga and Spirituality.

UNIT - IV

Traditional Knowledge System : Definition of Traditional knowledge, Indigenous Knowledge System; Case studies of Ancient traditional Knowledge System Astronomy,Vastu-Shatras, Wootz Steel lost technology of IKS, Water Management, and Agriculture.

UNIT - V

Protection of Traditional Knowledge - Significance and Need of Protection of Traditional Knowledge ; and measure for protection of TK, Role of the Government to harness TK. Documentation and Preservation of IKS , Approaches for conservation and Management of nature and bio-resources, Approaches and strategies to protection and conservation of IKS.

SuggestedBooks for Reference:

1. V.Sivaramnkrishna(Ed.).CulturalHeritageof Lndia - CourseMaterial,BharatiyaVidyaBhavan,Mumbai.5thEdition,2014
2. SwamiJirntmanand.ModernPhysicsandVedant,BharatiyaVidyaBhavan
3. FritzofCapra.TaoofPhysics
4. FritzofCapra,ThewaveofLife
5. VNJba(Eng.Trans.).TarkasangrahaofAnnam Bhana,lnernationalChinmayFoundation,Velliamad.Amaku.am
6. YogaSutraofPatanjali,RamakrishnaMission.Kolkatta
7. GNJha (Eng.Trans.)Ed.RNJha,Yoga-darshanamwithVyasaBhashya.VidyanidhiPrakasham,Delhi,2016
8. RNJha.ScienceofConsciousnessPsychotherapyandYogaPractices.Vidya nidhiPrakasham,Delhi.2016
9. PRSha.min(Englishtranslation).ShodashangHridayam

MC 806HS	STRESS MANAGEMENT BY YOGA					
Pre-requisites			**L**	**T**	**P**	**C**
			2	-		0
Evaluation	**SEE**	60Marks		**CIE**	40Marks	

CourseObjectives:	
Thecourseis taughtwiththe objectivesofenablingthestudentto:	
1	Creatingawarenessaboutdifferenttypesofstressandtheroleofyogainthemanagementof stress.
2	Promotionofpositivehealthandoverallwellbeing(Physical,mental,emotional,socialan d spiritual).
3	Preventionofstressrelatedhealthproblemsbyyogapractice.

CourseOutcomes:	
Oncompletionofthiscourse, thestudentwill beable to:	
CO-1	Tounderstandyogaanditsbenefits.
CO-2	EnhancePhysicalstrengthandflexibility.
CO-3	Learntorelax andfocus.
CO-4	RelievephysicalandmentaltensionthroughAsanas
CO-5	Improveworkperformanceand efficiency.

UNIT– I
MeaninganddefinitionofYoga-HistoricalperspectiveofYoga-PrinciplesofAstangaYoga byPatanjali.

UNIT– II
MeaninganddefinitionofStress-Typesofstress-EustressandDistress.AnticipatoryAnxiety andIntenseAnxietyanddepression.Meaningof Management-StressManagement.

UNIT– III
ConceptofStressaccordingtoYoga-Stressassessmentmethods-RoleofAsana,Pranayama andMeditationinthemanagementofstress.

UNIT– IV
Asanas-(5Asanasin each posture)-Warmup -StandingAsanas-Sitting Asanas-ProneAsanas-Supineasanas-Surya Namaskar.

UNIT– V
Pranayama-AnulomandVilomPranayama -Nadishudhi Pranayama–Kapalabhati-Pranayama-BhramariPranayama-NadanusandhanaPranayama.
Meditationtechniques: OmMeditation-Cyclicmeditation:InstantRelaxationtechnique (QRT),QuickRelaxationTechnique(QRT),DeepRelaxationTechnique(DRT).

SuggestedReading:

1	"YogicAsanasforGroupTraining -Part-I":JanardhanSwamiYogabhyasiMandal, Nagpur
2	"RajayogaorConqueringthe InternalNature"bySwamiVivekananda,Advaita Ashrama(PublicationDepartment),Kolkata
3	NagendraH.RnadNagaratnaR,"YogaPerspectiveinStressManagement", Bangalore,SwamiVivekanandaYogaPrakashan

Webresource:

1	https://onlinecourses.nptel.ac.in/noc16_ge04/preview
2	https://freevideolectures.com/course/3539/indian-philosophy/11

MC 807HS	SPORTS					
Pre-requisites			**L**	**T**	**P**	**C**
			3	-		0
Evaluation	**SEE**	-		**CIE**	50 Marks	

Course Objectives:

1. To develop an understanding of the importance of sport in the pursuit of a healthy and active lifestyle at the College and beyond.
2. To develop an appreciation of the concepts of fair play, honest competition and good sportsmanship.
3. To develop leadership skills and foster qualities of co-operation, tolerance, consideration, trust and responsibility when faced with group and team problem-solving tasks.
4. To develop the capacity to maintain interest in a sport or sports and to persevere in order to achieve success.
5. To prepare each student to be able to participate fully in the competitive, recreational and leisure opportunities offered outside the school environment.

Course Outcomes:

1) Students' sports activities are an essential aspect of university education, one of the most efficient means to develop one's character and personal qualities, promote the fair game principles, and form an active life position.
2) Over the past year, sports have become much more popular among our students. Let us remember the most memorable events related to sports and physical training.
3) Special attention was paid to team sports. Our male and female games and sports have achieved remarkable progress at a number of competitions.
4) Our teams in the main sports took part in regional and national competitions. Special thanks to our team in track and field athletics, which has been revitalized this year at ICT and which has won Javelin competition.
5) Staff of our faculties and students of Sports, Physical Development, & Healthy Lifestyle of Faculty congratulates everyone on the upcoming New Year and wishes you robust health and new victories in whatever you conceive.

I. Requirements:

i) Track Pants (students should bring)
ii) Shoes
iii) Volley Ball, Foot Ball and Badminton (Shuttle)
iv) Ground, Court, indoor stadium and swimming pool

II. Evaluation Process:

Total Marks 50

i) 20 marks for internal exam (continuous evaluation)
  a) 8 marks for viva
  b) 12 marks for sports & fitness

ii) 30 marks for end exam
  a) 10 marks for viva

b) 20 marks for sports & fitness

	PROJECT WORK -II					
Prerequisites			**L**	**T**	**P**	**C**
			0	**0**	**12**	**6**
Evaluation	**CIE**	**50**	**SEE**		**100 Marks**	

Course Objectives

- Toenhancepracticalandprofessionalskills
- To familiarize tools and techniques of systematic Literature survey and documentation.
- Toexposethestudents toindustrypracticesand teamwork.
- Toencouragestudentsto workwithinnovativeandentrepreneurialideas.

CourseOutcomes: After completion ofthis course,thestudents shallbeable to:

1.Demonstratetheabilitytosynthesizeandapplytheknowledgeandskillsacquiredin theacademicprogramtoreal-worldproblems.
2.Evaluatedifferentsolutionsbasedoneconomic andtechnicalfeasibility.
3.Effectivelyplanaproject and confidentlyperform all aspectsof projectmanagement.
4.Demonstrateeffectivewrittenandoralcommunicationskills.

The aim of project stage –II is to implement and evaluate the proposal made as part of project stage - II. Students can also be encouraged to do full time industrial internship as part of project stage -II based on the common guidelines for all the departments. The students placed in internships need to write the new proposal in consultation with industry coordinator and project guide within two weeks from the commencement of instruction.

Thedepartmentwillappointaproject coordinator whowillcoordinatethefollowing:

1. Re-groupingof students - deletion of internship candidates from groups made as part of project work-I
2. Re-Allotment of internship students to project guides Project monitoring at regular intervals

All re-grouping/re-allotment has to be completed by the 1nd week of VIII-Semester so that students get sufficient time for completion of the project.

All projects (internship and departmental) will be monitored at least twice in a semester through student presentation for the award of sessional marks. Sessional marks are awardedby a monitoring committee comprising of faculty members as well as by the supervisor. The first review of projects for 25 marks can be conducted after completion of five weeks. The second review for another 25 marks can be conducted after 12 weeks of instruction. Common norms will be established for the final documentation of the project report by the respective departments.Thestudentsarerequiredtosubmitdraftcopiesoftheirprojectreportwithinone week after completion of instruction.