PROPOSEDSCHEMEOFINSTRUCTIONANDEXAMINATION
B.E (CSE)
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	PC701CS	Cloud Computing	3	0	-		3	40	60	3
2	PC702CS	Generative AI	3	0			3	40	60	3
3	PC703CS	Computer Vision	3	0			3	40	60	3
4	PC704CS	Reinforcement Learning	3	0			3	40	60	3
5	**Professional Elective—IV**									
	PE711CS	AR & VR	3	0			3	40	60	3
	PE712CS	Secure Coding Principles								
	PE713CS	FPGA Based System Design								
	PE714CS	Scalable Architecture For Large Applications								
	PE 715 CS	Natural Language Processing								
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	PC751CS	Computer Vision Lab	-		2		3	25	50	1
8	PW761CS	Project Work—I	-		6			50		3
9	PW961CS	Summer Internship			4			50		2
		Total	**18**	0	12		21	**365**	**410**	**24**

PROPOSEDSCHEMEOFINSTRUCTIONANDEXAMINATION
B.E(CSE)

VIII—Semester

S No	Code	Course Title	Scheme of Instruction			Contact Hrs/ we	Scheme of Examination			Credits
			L	T	P	we	Hrs	CIE	SEE	
			Theory							
1		Mandatory Course-1	3	0	-		3	40	60	0
2		Mandatory Course—II	3	0			3	40	60	0
3		Mandatory Course-III	3	0			3	40	60	0
Practical's										
4	PW861CS	Project Work—II			12			50	100	6
		Total	9	0	12		9	170	280	6

CreditSummary

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

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

Course Objectives:	
1	To introduce basic concepts cloud computing and enabling technologies
2	To learn about Auto-Scaling, capacity planning and load balancing in cloud
3	To introduce security, privacy and compliance issues in clouds
4	To introduce cloud management standards and programming models

Course Outcomes:	
On completion of this course, the student will be able to:	
CO-1	Understand the basic approaches and Core ideas of Cloud Computing.
CO-2	Understand the Challenges and approaches in the management of the Cloud environments.
CO-3	Familiarize with advanced paradigms and solutions necessary for building and managing Modern Cloud environments.
CO-4	Envision use of Cloud Native Micro services and Serverless Computing.

UNIT–I

Introduction, Benefits and challenges, Cloud computing services, Resource Virtualization, Resource pooling sharing and provisioning.

UNIT– II

Scaling in the Cloud, Capacity Planning, Load Balancing, File System and Storage,

UNIT– III

Multi-tenant Software, Data in Cloud, Database Technology, Content Delivery Network, Security Reference Model, Security Issues, Privacy and Compliance Issues

UNIT– IV

PortabilityandInteroperabilityIssues,CloudManagementandaProgrammingModelCaseStudy,PopularCloudServices

UNIT–V

Cloud Native Micro services: How and Why, Kubernetes Architecture Overview, Stateless and Stateful micro services. 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	Cloud Computing-Sandeep Bhowmik,Cambridge UniversityPress,2017.

2	“Cloud Native Micro services with Kubernetes: 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

PC702CS	GENERATIVE AI					
CORE						
Pre-requisites			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: Lang Chain, Auto Gen, 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 , Variational Autoencoders (VAEs), Applications: Text-to-image (DALL·E), image in painting, **Stable Diffusion XL (2023)** and **SD Turbo (2024)**: more efficient, widely used in industry, **Video Generation Models**: Sora by Open AI, Runway Gen-3, Pika — include short case studies or lab demos, **Comparative Evaluation**: FID, CLIP Score, 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

PC704CS	**REINFORCEMENT LEARNING**					
CORE-IV						
Pre-requisites			**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, modeling 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 hyperparameter optimisation 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. Csaba Szepesvari.
3	Algorithms for Decision Making. Mykel J. Kochenderfer Tim A. WheelerKyle H. Wray.
4	Reinforcement Learning and Optimal Control. Dimitri Bertsekas.

PE711CS	AUGMENTED REALITY AND VIRTUAL REALITY					
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 Modeling ,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. Optimization Techniques

UNIT –V
Design Principles: Fundamental Design Principles, Spatial Design ConsiderationsUser 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

PE712CS	**SECURE CODING PRINCIPLES**					
Pre-requisites			**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives :	
1	To provide an understanding of the various security attacks
2	To impart knowledge to recognize and remove common coding errors that lead to vulnerabilities.
3	It gives an outline of the techniques for developing a secure application.

Course Outcomes :	
On completion of this course, the student will be able to:	
CO-1	Remember and Understand: Recall and explain the basics of secure programming.
CO-2	Understand: Describe the most frequent programming errors that lead to R/U software vulnerabilities.
CO-3	Analyze: Identify and analyze security problems in software to determine their Analyze root causes.
CO-4	Evaluate and Apply: Assess security threats and software vulnerabilities and Apply apply strategies to protect against them.
CO-5	Apply and Create: Utilize knowledge to design and construct secure software Apply systems effectively.

UNIT– I

Fundamentals of Secure Programming

Introduction to Security: Security and CIA Triad, Exploit, Threat, Vulnerability, Risk, and Attack Malware Overview: Viruses, Trojans, Worms, Rootkits, Trapdoors, Botnets, Keyloggers, Honeypots.

Types of Security Attacks: Active Attacks: IP Spoofing, Tear Drop, DoS,DDoS, XSS, SQL Injection, Smurf, Man-in-the-Middle, Format StringAttack, Passive Attacks: Eavesdropping, Traffic Analysis.

Principles of Software Security: Introduction to Software Security, Managing Software Security Risks, Selecting Secure Software Development Technologies, Guiding Principles for Secure Programming, OpenSource vs. Closed Source Software Security.

Need for Secure Systems : Importance of proactive security development, Secure Software Development Cycle (S-SDLC),

Security Issues in Different Phases : SRS (Software Requirement Specification), Design Phase Security, Development Phase Security, Test Phase Security, Maintenance Phase Security

UNIT – II

Programming Errors and Software Vulnerabilities

Introduction to Software Vulnerabilities: Software Security Fundamentals, Common Programming Errors and Their Security Implications.

Programming Errors Leading to Vulnerabilities: Buffer Overflows, Format String Problems, Integer Overflow, SQL Injection, Command Injection, Failure to Handle Errors Properly **Types of Security Vulnerabilities:** Invalidated Input, Race Conditions, Access-Control Problems, Weaknesses in Authentication and Authorization, Cryptographic Practice Vulnerabilities. **Access Control and Security Best Practices:** Role-Based Access Control, Principle of Least Privilege, Mitigating Privilege Escalation

UNIT – III
Security threats in Software & secure coding techniques **Introduction to Software Security:** Importance of security analysis, Overview of security techniques and best practices. **Security Issues and Countermeasures:** Anti-Tampering, DoS/DDoS Protection, Copy Protection Schemes, Client-Side Security, Database Security and SQL Injection Prevention. **Threat Modelling and Risk Assessment:** Threat Modelling and Attack Trees, DREAD Rating for threat evaluation, Risk Mitigation Techniques. **Authentication, Authorization, and Defense Strategies:** Authentication and Authorization Basics, Defense, in Depth and Least Privilege. **Secure Coding Techniques:** DoS Protection, Secure Java Coding, Preventing Application Failures and CPU Starvation. **Network and Remote Security:** ARP Spoofing, Socket Security, Securing RPC and Server Hijacking Prevention.

UNIT– IV
Database and Web-Specific Security Issues, SQL Injection, Race Conditions, Time of Check vs Time of Use(TOC/TOU), Input Validation & Interposes Communication (IPC),Signal Handlers & File Operations, Cross-Site Scripting (XSS),Bypassing XSS Filters, Information Leakage, Poor Usability, Network Traffic Protection, Improper Use of PKI, Trusting Network Name Resolution.

UNIT –V
Testing Secure Applications Security code overview, secure software installation. The Role of the Security Tester, Building the Security Test Plan. Testing HTTP-Based Applications, Testing File-Based Applications, Testing Clients with Rogue Servers. **Secure Testing Tools:** Static Application Security Testing (SAST),Dynamic Application Security Testing (DAST), Interactive Application Security Testing (IAST), Vulnerability assessment & Penetration testing(VAPT).

Suggested Reading:

1	J. Viega, M. Messier. Secure Programming Cookbook, O'Reilly, 2003
2	Writing Secure Code, Microsoft, M. Howard, D. LeBlanc., 2002
3	J. Viega, G. McGraw. Building Secure Software, Addison Wesley, 2011
4	Buffer Overflow Attacks: Detect, Exploit, Prevent by Jason Deckar, Syngress, 2005
5	Threat Modeling, Frank Swiderski and Window Snyder, Microsoft Professional, 2004

<u>Reference:</u>

1. https://owasp.org
2. https://www.securecoding.cert.org
3. https://tryhackme.com

PE713CS	**FPGA BASED SYSTEMS DESIGN**					
	CORE					
Pre-requisites			**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**	40 Marks		

Course Objectives :	
1	Analyze the Digital Circuits for different applications
2	Understand the architectures of programmable logic devices for implementing digital systems
3	Design, develop and implement the digital circuits on FPGAs using VHDL and Verilog coding
4	Develop test strategies for Digital Systems
5	Design robust Digital Systems

Course Outcomes :	
On completion of this course, the student will be able to:	
CO-1	Understand the architecture, components, and performance factors of FPGAs and CPLDs.
CO-2	Write and simulate VHDL/Verilog code for various digital designs using different modeling techniques.
CO-3	Design and implement digital circuits such as ALUs, counters, and FSMs for FPGA systems.
CO-4	Apply RTL design, top-down methods, and ASM techniques for FPGA synthesis and optimization.
CO-5	Use design case studies, test vectors, and fault analysis to verify and optimize digital systems.

UNIT– I

INTRODUCTION:FPGAs/CPLDs: Evolutionofprogrammabledevices,FPGADesignflow,Commercially available FPGA/CPLD, Building blocks of FPGAs/CPLDs, Configurable Logic block functionality, Routing structures, Input/output Block, Impact of logic block functionality on FPGA performance, Model for measuring delay.

UNIT – II

DESIGN USING HDL's: VHDL and Verilog modeling concepts, Behavioral, Dataflow and Structural architecture descriptions: Concurrent and Sequential statements, Event driven Simulation.

UNIT – III

DIGITAL DESIGNS BUILDING BLOCKS: Tristate buffers, multiplexers, latches, flip-flops, registers, counters, arithmetic and logic circuits (ALU Design), Finite State Machines. Adder/Subtraction, Divisors, Multipliers, Parallel prefix adders using Signed Magnitude, Complement formats & IEEE Floating Point Arithmetic's.

UNIT– IV
DESIGN METHODOLOGY: Synchronous Systems, Top-Down Design, Register Transfer Level Design, Algorithmic State Machines, and Synthesis. Design Pitfalls. Concepts of CISC & RISC MIPS Processors.

UNIT –V
IMPLEMENTATIONISSUES: DesignCaseStudiesusingASM**,**HardwareTesting&Designfortestability, test vectors, fault analysis for Combinational and Sequential Circuits. Microprogramming

Suggested Reading:

1	Wayne Wolf, FPGA based digital system design, Published by Prentice-Hall.2015
2	Cem Ünsalan Yeditepe, The Ohio State University, Digital System Design with FPGA Implementation Using Verilog and VHDL, 2017,TMH Publishers

<u>Reference Books:</u>

1	John V. Old Field, Richrad C.Dorf, Field Programmable Gate Arrays, Wiley, 2008.
2	Charles H.Roth, Jr., LIzy Kurian John, Digital Systems Design.
3	William J Dally and John W Poulton ,Digital System Engineering Published by Cambridge University Press
4	Joseph Cavanaugh, Digital Design and Verilog fundamentals: Cambridge University Press Published by CRC Press
5	Franklin P Processer And David E Winkel, The Art of Digital Design: An Introduction to Top down design: Published by Prentice-Hall.

PE714CS	**SCALABLE ARCHITECTURES FOR LARGE APPLICATIONS**					
CORE						
Pre-requisites			**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**	40 Marks		

Course Objectives :	
1	To introduce the idea of difference between implementing Machine learning algorithms and large scale Machine Learning.
2	To understand and implement the specific libraries useful for Running ML applications using 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	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, Over view 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-Understandingmessagingrequirements,Dataingestion,Fastdata&lowlatency,Message Delivery Semantics, Distributing Messages.

UNIT-IV
ComputeEngines-MicroBatchProcessing,One-at-atimeProcessing,Choiceofprocessingengine, 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	Jan Kunigk, Ian Buss, Paul Wilkinso & Lars George, ”*Architecting Modern Data Platforms*”, O‟reilly, 2019.
2	Gerard Maas, Stavros Kontopoulos, Sean Glover, “*Designing Fast Data Application Architectures*”,O'ReillyMedia,Inc.,*June2018.*
3	Bill Chambers, MateiZaharia“*Spark-TheDefinitiveGuide*”,O'ReillyMedia,Inc.,*June2019.*

PE715CS	**NATURAL LANGUAGE PROCESSING**					
CORE						
Pre-requisites	Deep Learning		**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

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	arn 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	rceive the governing principles and functions of critical care equipments.
CO-5	arn 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 Health care: Basics of NLP and its significance in healthcare**.** Clinical text mining and named entity recognition (NER). Chat bots 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	Course Title						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.

Course Code	Course Title						Course Type
OE702CE	**PLUMBING 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.	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	**CLOUD COMPUTING**					
Pre-requisites	Distributed Systems		**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60Marks	**CIE**	40Marks		

Course Objectives:	
1	To introduce basic concepts cloud computing and enabling technologies
2	To learn about Auto-Scaling, capacity planning and load balancing in cloud
3	To introduce security, privacy and compliance issues in clouds
4	To introduce cloud management standards and programming models

Course Outcomes:	
On completion of this course, the student will be able to:	
CO-1	Understand the basic approaches and Core ideas of Cloud Computing.
CO-2	Understand the Challenges and approaches in the management of the Cloud environments.
CO-3	Familiarize with advanced paradigms and solutions necessary for building and managing Modern Cloud environments.
CO-4	Envision use of Cloud Native Micro services and Serverless Computing.

UNIT–I

Introduction, Benefits and challenges, Cloud computing services, Resource Virtualization, Resource pooling sharing and provisioning.

UNIT– II

Scaling in the Cloud, Capacity Planning, Load Balancing, File System and Storage,

UNIT– III

Multi-tenant Software, Data in Cloud, Database Technology, Content Delivery Network, Security Reference Model, Security Issues, Privacy and Compliance Issues

UNIT– IV

PortabilityandInteroperabilityIssues,CloudManagementandaProgrammingModelCaseStudy,PopularCloudServices

UNIT–V

Cloud Native Micro services: How and Why, Kubernetes Architecture Overview, Stateless and Stateful micro services. GitOps: Cloud Native Continuous Delivery, Creating CI/CD Pipelines for Micro services, CI/CD tools: Jenkins, Spinnaker, Argo CD, Git Hub Actions, Git Lab CI/CD
What is Serverless Computing?, Getting Started with AWS Lambda, Getting Started with Azure Functions, Getting Started with Google Cloud Functions

SuggestedReading:

1	Cloud Computing- Sandeep Bhowmik, Cambridge UniversityPress,2017.

2	“Cloud Native Micro services with Kubernetes: 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”, Kuldeep Chowhan, 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–I

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–II
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–III
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–IV
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–V
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 Map Reduce Paradigm,

Beyond Map Reduce, 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"* Pearson Education, 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.

<table>
<tr><th>Course Code</th><th colspan="4">Course Title</th><th colspan="2"></th><th>Course Type</th></tr>
<tr><td>OE702EC</td><td colspan="6">INTRODUCTION TO INTERNET OF THINGS</td><td>Elective</td></tr>
<tr><td rowspan="3">Prerequisite</td><td colspan="3">Contact hours per week</td><td rowspan="2">Duration of SEE (Hours)</td><td colspan="2">Scheme of Evaluation</td><td rowspan="2">Credits</td></tr>
<tr><td>L</td><td>T</td><td>P</td><td>CIE</td><td>SEE</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>40</td><td>60</td><td>3</td></tr>
</table>

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 Raspberry Pi.

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	"Make sensors":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, Arshdeep Bahga, 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, Hwaiyu Geng, P.E, Wiley Publications, 2017

Course Code	Course Title						Course Type
OE701EE	OPTIMIZATION TECHNIQUES						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 need and basic concepts of operations research and classify the 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 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
Linear Programming: Definitions and Formulation of the LPP, Construction of L.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)."Operations Research, Pearson Education India."NewDelhi, India.
3	RandyL. Hauptand Sue Ellen Haupt, "Practical genetic algorithms" second edition, a John Wiley & sons, inc., publication -2004.
4	Sharma J.K.(2013)."Operation Research: Theory and Applications."Fifth Edition, Macmillan Publishers, New Delhi, India.
5	J.DreoA. Petrowski, P.Siarry E.Taillard. "Meta heuristics for Hard Optimization" 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 devicesused in the energy production and their applications.
CO-4	Appreciate the need of Wind Energy and their classification and various componentsused in energy generation and working of different electrical wind energy system.
CO-5	Understand the concept of OTEC technology, Biomass energy resources and differenttypes 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	RaiG.D, Non-Conventional Sourcesof Energy,Khandala Publishers, NewDelhi,1999.
2	M.M.El-Wakil,Power Plant Technology. McGraw Hill,1984.

<table>
<tr><th>Course Code</th><th colspan="4">Course Title</th><th colspan="2"></th><th>Course Type</th></tr>
<tr><td>OE701ME</td><td colspan="6">NANO TECHNOLOGY</td><td>Elective</td></tr>
<tr><td rowspan="3">Prerequisite</td><td colspan="3">Contact hours per week</td><td rowspan="2">Duration of SEE (Hours)</td><td colspan="2">Scheme of Evaluation</td><td rowspan="2">Credits</td></tr>
<tr><td>L</td><td>T</td><td>P</td><td>CIE</td><td>SEE</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>40</td><td>60</td><td>3</td></tr>
</table>

Course Objectives:	
The course is taught with the objectives of enabling the student to:	
1	To familiarize Nano materials and technology.
2	To understand Nano structures, fabrication and special Nano materials.

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

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

<table>
<tr><th>Course Code</th><th colspan="3">Course Title</th><th></th><th></th><th></th><th>Course Type</th></tr>
<tr><td>OE702ME</td><td colspan="6">START UP ENTREPRENEURSHIP</td><td>Elective</td></tr>
<tr><td rowspan="3">Prerequisite</td><td colspan="3">Contact hours per week</td><td rowspan="2">Duration of SEE (Hours)</td><td colspan="2">Scheme of Evaluation</td><td rowspan="2">Credits</td></tr>
<tr><td>L</td><td>T</td><td>P</td><td>CIE</td><td>SEE</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>40</td><td>60</td><td>3</td></tr>
</table>

Course Objectives:	
The course is taught with the objectives of enabling the student to:	
1	To motivate students to take up entrepreneurship in future
2	To learn nuances of starting an enterprise & project management
3	To understand the behavioural aspects of entrepreneurs and time management

Course Outcomes:	
On completion of this course, the student will be able to :	
CO-1	Understand the behavioral aspects of entrepreneurs and time management
CO-2	Creative thinking and transform ideas into reality
CO-3	Importance of innovation in new business opportunities
CO-4	Create a complete business plan and workout the budget plan.
CO-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

PC751CS	COMPUTER VISION LAB					
Prerequisites	**Deep Learning**		**L**	**T**	**P**	**C**
			0	**0**	**2**	**1**
Evaluation	**CIE**	**25 Marks**	**SEE**		**50 Marks**	

During the Lab sessions, students are expected to complete these experiments:

1. Image Filtering and Enhancement:
   Apply convolution, edge detection (Sobel, Canny), blurring, and histogram equalization to enhance and analyze grayscale/color images.
2. Color Space Transformations:
   Convert images between RGB, HSV, Lab color spaces and extract features for segmentation using k-means clustering.
3. CNN Basics for Image Classification:
   Build a simple CNN from scratch using PyTorch to classify images from the CIFAR-10 dataset. Train and evaluate the model.
4. Visualizing CNN Filters and Activations:
   Visualize learned filters and activation maps for different layers of a trained CNN. Analyze what each filter captures.
5. Comparing Classical vs. Deep Features:
   Extract SIFT, ORB features and compare with CNN feature embeddings for matching similar images in a dataset.
6. Transfer Learning for Image Classification:
   Use VGG16 or ResNet (pretrained) for fine-tuning on a custom image dataset (e.g., medical, fashion, plants). Compare feature extraction vs. fine-tuning.
7. Contrastive Learning with SimCLR:
   Implement a basic SimCLR pipeline for self-supervised feature learning on a small dataset like STL-10. Visualize embeddings with t-SNE.
8. Object Detection using YOLOv5:
   Train a YOLOv5 model on a custom dataset (e.g., traffic signs, plant diseases). Evaluate using mAP and precision-recall curves.
9. Semantic Segmentation using U-Net:
   Implement and train a U-Net model on a dataset like Oxford-IIIT Pet or medical image segmentation. Visualize predicted masks.
10. Instance Segmentation with Mask R-CNN:
    Use Detectron2 or Torchvision’s Mask R-CNN to perform instance-level segmentation on the COCO or custom dataset.
11. Vision Transformer for Image Classification:
    Fine-tune a ViT (e.g., from Hugging Face or timm) for CIFAR-100 classification. Compare accuracy and training time with ResNet.
12. Video Action Recognition using I3D:
    Implement or use a pretrained I3D or SlowFast model to classify actions in videos (e.g., UCF101). Analyze temporal features.
13. Deploying a Vision Model on Edge (Jetson Nano or ONNX):
    Convert a trained model (YOLO or MobileNet) to ONNX or TensorRT and deploy it on an edge device. Measure FPS and inference time.
14. Image Generation using Stable Diffusion:
    Use Hugging Face’s Diffusers library or InvokeAI to generate images from text prompts. Modify prompts and analyze model creativity and limitations.

<table>
<tr><td>PW761CS</td><td colspan="6">PROJECT WORK-I</td></tr>
<tr><td rowspan="2">Prerequisites</td><td colspan="2" rowspan="2"></td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>0</td><td>0</td><td>6</td><td>3</td></tr>
<tr><td>Evaluation</td><td>CIE</td><td>50 Marks</td><td colspan="2">SEE</td><td colspan="2">-</td></tr>
</table>

Course Objectives:

- To enhance practical and professional skills.
- To familiarize tools and techniques of systematic Literature survey and documentation
- To expose the students to industry practices and team work.
- To encourage students to work with innovative and entrepreneurial ideas

Course Outcomes: Student will be able to:

1. Demonstrate the ability to synthesize and apply the knowledge and skills acquired in the academic program to real-world problems
2. Evaluate different solutions based on economic and technical feasibility
3. Effectively plan a project and confidently perform all aspects of project management
4. Demonstrate effective written and oral communication skills

The department can initiate the project allotment procedure at the end of VI semester and finalize it in the first two weeks of VII semester.

The department will appoint a project coordinator who will coordinate the following:

- Collection of project topics/descriptions from faculty members(Problems can also be invited from the industries)
- Grouping of students (max3 in a group)
- Allotment of project guides

The aim of project work is to develop solution store a list ic problems applying the knowledge and skills obtained in different courses, new technologies and current industry practices. This requires students to understand current problems in their domain and methodologies to solve these problems. To get awareness on current problems and solution techniques, the first 4 weeks of VII semester will be spent on special lectures by faculty members, research scholars, post graduate students of the department and invited lectures by engineers from industries and R&D institutions. After completion of these seminars each group has to formalize the project proposal based on their own ideas or as suggested by the project guide.

Seminar schedule will be prepared by the coordinator for all the students from the 5th week to the last week of the semester which should be strictly adhered to.

Each group will be required to:

1. Submit a one page synopsis before the seminar for display on notice board.
2. Give a 30 minutes presentation followed by10 minutes discussion.
3. Submit a technical write-up on the talk.

PW961CS	SUMMER INTERNSHIP					
Prerequisites			**L**	**T**	**P**	**C**
			0	**0**		**2**
Evaluation	**CIE**	**50 Marks**	**SEE**		**-**	

Course Objectives:

- To train and provide hands-on experience in analysis, design, and programming of information systems by means of case studies and projects.
- To expose the students to industry practices and team work.
- To provide training in soft skills and also train them in presenting seminars and technical report writing.

Course Outcomes: Student will be able to :

1. Get Practical experience of software design and development, and coding practices with in Industrial / R&D Environments.
2. Gain working practices within Industrial / R&D Environments.
3. Prepare reports and other relevant documentation.

Summer Internship is introduced as part of the curricula of encouraging students to work on Problems of interest to industries. A batch of three students will be attached to a person from the Computer Industry / Software Companies / R&D Organization for a period of 8 weeks. This will be during the summer vacation following the completion of the III year Course. One faculty coordinator will also be attached to the group of 3 students to monitor the progress and to interact with the industry co-ordinate (person from industry).

After the completion of the project, student will submit a brief technical report on the project Executed and present the work through a seminar talk to be organized by the Department. A ward of sessionals are to be based on the performance of the students, to be judged by a committee constituted by the department. One faculty member will co-ordinate the over all activity of Industry Attachment Program. At least two teacher s will 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.

The seminar presentation should include the following components of the project:

*Problem definition and specification

*Literature survey

*Broad knowledge of available techniques to solve a particular problem.

*Planning of the work, preparation of bar (activity) charts

*Presentation- oral and written

PROPOSED SCHEME OF INSTRUCTION AND EXAMINATION B.E(CSE)

VIII—Semester

S No	Code	Course Title	Scheme of Instruction			Contact Hrs/ we	Scheme of Examination			Credits
			L	T	P		Hrs	CIE	SEE	
			Theory							
1	MC80XXX	Mandatory Course-1	3	0	-		3	40	60	0
2		Mandatory Course—II	3	0			3	40	60	0
3		Mandatory Course-III	3	0			3	40	60	0
Practical										
4	PW861CS	Project Work—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 Course

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
Multi disciplinary 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.	Erach Bharucha., Textbook of Environmental Studies, UGC, New Delhi and Bharathi Vidyapeeth Institute of Environment Education and Research, Pune.
2.	Mahua Basu and Xavier Savarimuthu SJ., 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:

Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective
To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role
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:*

Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru
The eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
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	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE					
Pre-requisites			**L**	**T**	**P**	**C**
			3	-	-	0
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives :	
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.

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

Suggested Books for Reference:

1	V.Sivaramnkrishna(Ed.).Cultural Heritage of India-Course Material, Bharatiya Vidya Bhavan, Mumbai. 5th Edition, 2014
2	Swami Jirntmanand. Modern Physics and Vedant, Bharatiya Vidya Bhavan
3	Fritz of Capra.Tao of Physics
4	Fritz of Capra, The wave of Life
5	VNJba(Eng.Trans.).Tarkasangraha of Annam Bhana, Inernational Chinmay Foundation, Velliamad. Amaku.am
6	Yoga Sutra of Patanjali, Ramakrishna Mission. Kolkatta
7	GNJha(Eng.Trans.) Ed.RNJha,Yoga-darshanam with Vyasa Bhashya.Vidyanidhi Prakasham, Delhi, 2016
8	RNJha.ScienceofConsciousnessPsychotherapyandYogaPractices.VidyanidhiPrakasham,Delhi.2016
9	PRSha.min (English translation). Shodashang Hridayam

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

Course Objectives:	
The course is taught with the objectives of enabling the student to:	
1	Creating awareness about different types of stress and the role of yoga in the management of stress.
2	Promotion of positive health and overall well being (Physical, mental, emotional, social and spiritual).
3	Prevention of stress related health problems by yoga practice.

Course Outcomes:	
On completion of this course, the student will be able to:	
CO-1	To understand yoga and its benefits.
CO-2	Enhance Physical strength and flexibility.
CO-3	Learn to relax and focus.
CO-4	Relieve physical and mental tension through Asanas
CO-5	Improve work performance and efficiency.

UNIT– I
Meaning and definition of Yoga-Historical perspective of Yoga-Principles of Astanga Yoga by Patanjali.

UNIT– II
MeaninganddefinitionofStress-Typesofstress-EustressandDistress.AnticipatoryAnxiety And Intense Anxiety and depression. Meaning of Management-Stress Management.

UNIT– III
Concept of Stress according to Yoga-Stress assessment methods-Role of Asana, Pranayama And Meditation in the management of stress.

UNIT– IV
Asanas-(5Asanasin each posture)-Warmup –Standing Asanas-Sitting Asanas-Prone Asanas-Supine asanas-Surya Namaskar.

UNIT– V
Pranayama-Anulom and Vilom Pranayama -Nadishudhi Pranayama–Kapalabhati-Pranayama- Bhramari Pranayama-Nadanusandhana Pranayama.
Meditation techniques: Om Meditation-Cyclic meditation: Instant Relaxation technique (QRT), Quick Relaxation Technique(QRT),Deep Relaxation Technique(DRT).

SuggestedReading:

1	"Yogic Asanas for Group Training -Part-I":Janardhan Swami Yogabhyasi Mandal, Nagpur
2	"Rajayogaor Conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department),Kolkata
3	Nagendra H.Rnad Nagaratna R,"Yoga Perspective in Stress Management", Bangalore, Swami Vivekananda Yoga Prakashan

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:	
CO-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.
CO-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.
CO-3	Special attention was paid to team sports. Our male and female games and sports have achieved remarkable progress at a number of competitions.
CO-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.
CO-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

PW861AI	PROJECT WORK -II					
Prerequisites			**L**	**T**	**P**	**C**
			0	**0**	**12**	**6**
Evaluation	**CIE**	**50**	**SEE**		**100 Marks**	

Course Objectives:	
1	To enhance practical and professional skills
2	To familiarize tools and techniques of systematic Literature survey and documentation.
3	To expose the students to industry practices and teamwork.
4	To encourage students to work with innovative and entrepreneuri all ideas.

Course Outcomes:	
After completion of this course, the students shall be able to	
CO-1	Demonstrate the ability to synthesize and apply the knowledge and skills acquired in The academic program to real-world problems.
CO-2	Evaluate different solutions based on economic and technical feasibility.
CO-3	Effectively plan a project and confidently perform all aspects of project management.
CO-4	Demonstrate effective written and oral communication skills.

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.

The department will appoint a project coordinator who will coordinate the following:

1. Re-grouping of 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 awarded by 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.