UNIVERSITY COLLEGE OF ENGINEERING & TECHNOLOGY
B.Tech. (CBCS) 4-YEARS (8-SEMESTERS) REGULAR PROGRAMME
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING (CSE)

(Applicable for the batch admitted in Academic Year 2023-24 onwards)

Faculty of Engineering & Technology

Scheme of Instruction and Syllabus

For
B.Tech (CBCS)-VII & VIII Semesters

Of

Regulation - R23

In
COMPUTER SCIENCE & ENGINEERING
With Effect from Academic year 2023-2024

UNIVERSITY COLLEGE OF ENGINEERING & TECHNOLOGY
Mahatma Gandhi University
Nalgonda-508254, TG, India

UNIVERSITY COLLEGE OF ENGINEERING & TECHNOLOGY
B.Tech. (CBCS) 4-YEARS (8-SEMESTERS) REGULAR PROGRAMME
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING (CSE)
(Applicable for the batch admitted in Academic Year 2023-24 onwards)

SEMESTER-VII

S.No	Code	Course Title	Scheme of Instruction			Contact Hrs/week	Scheme of Examination			Credits
			L	T	P		Hrs	CIE	SEE	
THEORY										
1	PC701CS	Cloud Computing	3	0		3	3	30	45	3
2	PC702CS	Generative AI	3	0		3	3	30	45	3
3	PC703CS	Natural Language Processing	3	0		3	3	30	45	3
4	PC704CS	Reinforcement Learning	3	0		3	3	30	45	3
5	Professional Elective–IV		3	0		3	3	30	45	3
6	Open Elective–II		3	0		3	3	30	45	3
PRACTICALS										
7	PC751CS	Natural Language Processing Lab			2		2	20	30	1
8	PW756CS	Project Work–I			6		6	50	-	3
9	PW961CS	Summer Internship			4		4	50	-	2
Total			18	0	12	18	30	300	300	24

Professional Elective–IV

PE711CS	Scalable Architecture for Large Applications
PE712CS	Secure Coding Principles
PE713CS	Fundamentals of IOT
PE714CS	Big Data Analytics

L - Lecture

P - Practical

T - Tutorial

CIE-Continous Internal Evaluation

SEE-Semester End Examination

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Open Elective – II

OE701CS	Object Oriented Analysis and Design
OE702CS	Computer Vision
OE703MC	Principles of Management
OE704MC	Entrepreneurship Development
OE705EE	Fundamentals Of Embedded Systems
OE706EE	VLSI Design
OE707EC	Optimization Techniques
OE708EC	Non-Conventional Energy Sources

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PC701CS	CLOUD COMPUTING					
Pre-requisites	DISTRIBUTED SYSTEMS		L	T	P	C
			3	-	-	3
Evaluation	CIE	30 Marks	SEE		45 Marks	

Course Objectives:

- To introduce basic concepts cloud computing and enabling technologies
- To learn about Auto-Scaling, capacity planning and load balancing in cloud
- To introduce security, privacy and compliance issues in clouds
- 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

Portability and Interoperability Issues, Cloud Management and a Programming Model ,Case Study, Popular Cloud Services.

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

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What is Serverless Computing? Getting Started with AWS Lambda, Getting Started with Azure Functions, Getting Started with Google Cloud Functions

Suggested Reading:

1. *Cloud Computing*-Sandeep Bhowmik, Cambridge University Press,2017.
2. "*Cloud Native Micro services with Kubernetes: A Comprehensive Guide to Building, Scaling, Deploying, Observing, and Managing Highly-Available Microservices in Kubernetes*", 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

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PC702CS	GENERATIVE AI					
Pre-requisites	MACHINE LEARNING, DEEP LEARNING		L	T	P	C
			3	-	-	3
Evaluation	CIE	30 Marks	SEE		45 Marks	

Course Objectives :

- Understand and implement modern generative models for text, images, and other modalities
- Adapt foundation models using prompting and fine-tuning techniques
- Analyze scaling laws, attention mechanisms, and diffusion processes
- Develop applied generative AI solutions with real-world impacts
- 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 huma 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, an 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 Ger ReAct framework — for building agents using LLM, Evaluation Techniques : BLEU, ROUGE, BER Score, and newer factuality/hallucination metrics, Industry Use Cases: Customer support, documer 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,

CH. Sudha Rani

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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.

Agentic 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 models*** for Unit-IV topics
5. ***OpenAI Codex, DeepMind's Flamingo, Survey on Hallucination in LLMs*** for Unit-V topics
6. ***Transformers for Natural Language Processing*** by Denis Rothman
7. ***Toolkits- LangChain, AutoGen, Llama Index, Diffusers*** by Hugging Face

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PC703CS	NATURAL LANGUAGE PROCESSING					
Pre-requisites	Python, Mathematics & Statistics , Machine Learning		L	T	P	C
			3	-	-	3
Evaluation	CIE	30 Marks	SEE			45 Marks

Course Objectives:

- Understand linguistic foundations and statistical techniques for language modeling.
- Explore core NLP tasks such as parsing, tagging, sentiment analysis, and translation.
- Apply deep learning models including RNNs, Transformers, and attention mechanisms to textual data.
- Analyze recent advances in large language models (LLMs), prompting, and NLP agents.

- **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. Investigate ethical concerns like hallucinations, bias, and safety in language technologies.

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.

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UNIT-IV

Prompting, LLMs and NLP Agents :Prompt engineering: zero-shot, few-shot, chain-of-thought , In-context learning and function on 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

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PC704CS	REINFORCEMENT LEARNING					
Pre-requisites	Probability, Linear Algebra, Data Structures & Algorithms		L	T	P	C
			3	-	-	3
Evaluation	CIE	30 Marks	SEE		45 Marks	

Course Objectives :

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

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UNIT – II

RL in Discrete Action Spaces: Q-learning, function approximation and deep Q-learning; non stationarity 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.

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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. Wheeler Kyle H.Wray.
4. ***Reinforcement Learning and Optimal Control***. Dimitri Bertsekas.

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PE711CS	SCALABLE ARCHITECTURES FOR LARGE APPLICATIONS					
Pre-requisites	WEB PROGRAMMING,OOP,DBMS		L	T	P	C
			3	-	-	3
Evaluation	CIE	30 Marks	SEE		45 Marks	

Course Objectives :

- To introduce the idea of difference between implementing Machine learning algorithms and large scale Machine Learning.
- To understand and implement the specific libraries useful for Running ML applications using Spark.
- 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-understanding messaging requirements, Data ingestion , Fastdata & lowlatency ,Message Delivery Semantics, Distributing Messages.

UNIT-IV

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

UNIT-V

Sharing Stateful Streaming State, Data Driven Micro-services, State and Micro-services.

Deployment environments for Fast Data Applications, Application containerization, resource scheduling ,Apache Mesos, Kubernetes, Cloud Deployments.

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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.*

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PE712CS	SECURE CODING PRINCIPLES					
Pre-requisites	SOFTWARE ENGINEERING COMPUTER NETWORKS		L	T	P	C
			3	-	-	3
Evaluation	CIE	30 Marks	SEE		45 Marks	

Course Objectives :

- To provide an understanding of the various security attacks
- To impart knowledge to recognize and remove common coding errors that lead to vulnerabilities.
- 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)

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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

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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

References:

- https://owasp.org
- https://www.securecoding.cert.org
- https://tryhackme.com

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PE713CS	FUNDAMENTALS OF IOT					
Pre-requisites	BASIC PROGRAMMING, NETWORKS, BASIC ELECTRONICS		L	T	P	C
			3	-	-	3
Evaluation	CIE	30 Marks	SEE		45 Marks	

Course Objectives:

- Discuss fundamentals of IoT and its applications and requisite infrastructure
- Describe Internet principles and communication technologies relevant to IoT
- Discuss hardware and software aspects of designing an IoT system
- Describe concepts of cloud computing and Data Analytics
- Discuss business models and manufacturing strategies of IoT products

Course Outcomes: Student will be able to

CO-1 Understand the various applications of IoT and other enabling technologies.

CO-2 Comprehend various protocols and communication technologies used in IoT

CO-3 Design simple IoT systems with requisite hardware and C programming software

CO-4 Understand the relevance of cloud computing and data analytics to IoT

CO-5 Comprehend the business model of IoT from developing a prototype to launching a product.

UNIT- I

Introduction to Internet of Things: IOT vision, Strategic research and innovation directions, Iot Applications, Related future technologies, Infrastructure, Networks and communications, Processes, Data Management, Security, Device level energy issues.

UNIT- II

Internet Principles and Communication Technology: Internet Communications: An Overview – IP,TCP,IP protocol Suite, UDP. IP addresses – DNS, Static and Dynamic IP addresses, MAC Addressess, TCP and UDP Ports, Application Layer Protocols –HTTP,HTTPS, Cost Vs Ease of Production, Prototypes and Production, Open Source Vs Closed Source.

UNIT- III

Prototyping and programming for IoT :Prototyping Embedded Devices – Sensors, Actuators, Microcontrollers, SoC, Choosing a platform, Prototyping, Hardware platforms – Arduino, Raspberry Pi. Prototyping the physical design – Laser Cutting, 3D printing, CNC Milling.Techniques for writing embedded C code: Integer data types in C, Manipulating bits - AND,OR,XOR,NOT, Reading and

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writing from I/ O ports. Simple Embedded C programs for LED Blinking, Control of motor using switch and temperature sensor for arduino board.

UNIT- IV

Cloud computing and Data analytics :Introduction to Cloud storage models -SAAS, PAAS, IAAS.

Communication APIs, Amazon webservices for IoT, Skynet IoT Messaging Platform .Introduction to Data Analytics for IoT - Apache hadoop- Map reduce job execution workflow.

UNIT- V

IoT Product Manufacturing - From prototype to reality:Business model for IoT product manufacturing, Business models canvas, Funding an IoT Startup ,Mass manufacturing - designing kits, designing PCB,3D printing, certification, Scaling up software, Ethical issues in IoT- Privacy, Control, Environment, solutions to ethical issues.

Suggested Readings:

1. ***Internet of Things - Converging Technologies for smart environments and Integrated eco systems,***River Publishers.
2. ***Designing the Internet of Things*** , Adrian McEwen, Hakim Cassimally. Wiley India Publishers
3. ***Fundamentals of embedded software***: where C meets assembly by Daneil W lewies, Pearson.
4. ***Internet of things -A hands on Approach***, Arshdeep Bahga, Universities press.

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PE714CS	BIG DATA					
Pre-requisites	PYTHON,JAVA,DBMS		L	T	P	C
			3	-	-	3
Evaluation	CIE	30 Marks	SEE		45 Marks	

Course Objectives:

- To know about Big Data, to learn the technologies to handle Big Data
- To learn about Hadoop, Hadoop Ecosystem and the tools.
- To learn HDFS, Map reduce and HBase
- To learn about Big Data and Data Warehouse in data storage
- To learn about NoSQL databases

Course Outcomes:

Students will be able to

CO-1 Understand about Big Data and the technologies to handle Big Data
CO-2 Understand about Hadoop, Hadoop Ecosystem and various tools .
CO-3 Understand HDFS , Map reduce and HBase in Big Data Processing.
CO-4 Understand about Big Data and Data Warehouse in data storage.
CO-5 Understand about NOSQL databases
CO-6 Understand importance of Big Data in Social Media

UNIT - I

Getting an overview of Big Data: Introduction to Big Data, Structuring Big Data, Types of Data, Elements of Big Data, Big Data Analytics, advantages of Big Data Analytics.

Exploring the Use of Big Data in Business Context: Use of Big Data in Social Networking, Use of Big Data in Preventing Fraudulent Activities, Use of Big Data in Detecting Fraudulent Activities in Insurance Sector, Use of Big Data in Retail Industry.

Introducing Technologies for Handling Big Data: Distributed and Parallel Computing for Big Data, Introducing Hadoop, Cloud Computing and Big Data, and In-Memory Computing Technologies for Big Data.

UNIT – II

Understanding Hadoop Ecosystem: Introducing Hadoop, Hadoop Distributed File System- HDFS Architecture, Concept of Blocks in HDFS Architecture, Namenodes and Datanodes, Features of HDFS. MapReduce.Introducing HBase - HBase Architecture, Regions, Storing Big Data with HBase, Combining HBase and HDFS, Features of HBase.

Understanding MapReduce Fundamentals and HBase: The MapReduce Framework ,Exploring the features of MapReduce, Working of MapReduce, Techniques to optimize MapReduce Jobs, Hardware/Network Topology, Synchronization, File system, Uses of MapReduce, Role of HBase

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in Big Data Processing- Characteristics of HBase.Processing Your Date with MapReduce: Recollect the concept of MapReduce framework, Developing simple MapReduce application.

UNIT- III

Customizing MapReduce Execution and implementing MapReduce program: Controlling MapReduce Execution with input format, InputSplit, RecordReader, FileInputFormat, Implementing InputFormat for Compute Intensive Applications, Implementing InputFormat to Control the number of Maps, Implementing InputFormat for Multiple HBase Tables, Reading Data with Custom RecordReader, Organizing output Data with OutputFormat, Customizing data with RecordWriter, Optimizing MapReduce execution with Combiner, Controlling Reducer Execution with Partitioners.

Understanding Hadoop YARN Architecture: YARN Architecture, working of YARN, YARN Schedulers, Backward compatibility with YARN, YARN Configurations, YARN Commands, YARN Containers.

UNIT – IV

Exploring Hive: Introduction to Hive, Hive Services, Data types in Hive, Built-in Functions in Hive, Hive DDL, Data Manipulation in Hive, Data Retrieval Queries, Using Joins in Hive.

Analyzing Data with Pig: Introduction to Pig, Running Pig, Working with Operators in Pig, Debugging Pig, Working with functions in Pig.

Using Oozie: Introduction to Oozie, Oozie Coordinator, Oozie Bundle, Oozie Parameterization with EL, Oozie job Execution model, Oozie SLA.

UNIT –V

NoSQL Data Management: Introduction to NoSQL, Characteristics of NoSQL, Types of NoSQL Data Models- Key Value Data Model, Column Oriented Data Model, Document Data Model, Graph Databases, Schema-Less Databases, Materialized Views, Distribution Models, CAP Theorem.

Data Movement with Flume and Sqoop: Flume Architecture, Sqoop, Importing Data

Suggested Readings:

1. BIG DATA, Black Book TM, DreamTech Press, 2016 Edition.
2. Seema Acharya, Subhasni Chellappan , "BIG DATA and ANALYTICS", Wiley publications, 2016
3. Nathan Marz and James Warren, "BIG DATA- Principles and Best Practices of Scalable Real-Time Systems", 2010

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OE701CS	OBJECT ORIENTED ANALYSIS AND DESIGN					
Pre-requisites	Basic Knowledge of Programming & Data Structures		L	T	P	C
			3	-	-	3
Evaluation	CIE	30 Marks	SEE		45 Marks	

Course Objectives :

- To understand the fundamental concepts of object-oriented analysis and design.
- To analyze software requirements using object-oriented techniques.
- To model systems using UML diagrams such as use case, class, sequence, and activity diagrams.
- To design software systems based on object-oriented principles and methodologies.
- To apply design principles and patterns for developing reusable and maintainable systems.
- To develop problem-solving skills through object-oriented thinking.
- To transform analysis models into design and implementation.
- To understand the role of OOAD in the software development life cycle.

Course Outcomes :

On completion of this course, the student will be able to:

CO-1 Understand object-oriented concepts.

CO-2 Analyze requirements using OO techniques.

CO-3 Develop UML diagrams.

CO-4 Design object-oriented systems.

CO-5 Apply design principles and patterns.

CO-6 Implement OO-based solutions

UNIT – I

Introduction to UML: Importance of modeling, principles of modeling, Object oriented modeling, conceptual model of the UML, Architecture, Software Development Life Cycle.

UNIT – II

Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams.

Advanced Structural Modeling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages,Class and Object.

Diagrams: Terms, concepts, modeling techniques for Class and Object Diagrams.

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UNIT – III

Basic Behavioral Modeling-I: Interactions, Interaction diagrams.

Basic Behavioral Modeling-II: Use cases, Use case Diagrams, Activity Diagrams.

UNIT – IV

Advanced Behavioral Modeling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams.

Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams.

UNIT – V

Patterns and Frameworks, Artifact Diagrams,**Case Study**: The Unified Library application, ATM application.

Suggested Reading:

1. Grady Booch, James Rumbaugh, Ivar Jacobson: ***The Unified Modeling Language User Guide***, Pearson Education 2nd Edition.
2. ***Object-Oriented Analysis and Design with the Unified Process*** by John W. Seitzinger, Robert B Jackson and Stephen D Burd, Cengage Learning.

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OE702CS	COMPUTER VISION					
Pre-requisites	Python Programming, Mathematics, Machine Learning Concepts		L	T	P	C
			3	-	-	3
Evaluation	CIE	30 Marks	SEE		45 Marks	

Course Objectives :

- Understand the mathematical and algorithmic foundations of image formation, feature extraction, and vision-based perception
- Explore deep learning architectures such as CNNs, Vision Transformers, and segmentation models for solving computer vision tasks.
- Analyze and implement advanced techniques for object detection, video analysis, and 3D scene understanding.
- Develop practical applications and systems using real-time image/video data, model optimization, and edge deployment.
- 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,

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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.

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OE703MC	PRINCIPLES OF MANAGEMENT					
Pre-requisites	Business Economics And Financial Analysis		L	T	P	C
			3	-	-	3
Evaluation	CIE	30 Marks	SEE		45 Marks	

Course Objectives:

- Understand basic fundamentals and insights of management.
- Understand the nature and purpose of planning.
- Gain the knowledge about the frame work of organizing.
- Understand the essence and significance of directing.
- Recognize the importance of controlling and its outcomes .

Course Outcomes:

After the completion of this course, the student will be able

CO-1 Identify and evaluate the principles of management

CO-2 Demonstrate the ability to have an effective and realistic planning

CO-3 Identify the nature and the type of organization

CO-4 Apply the tools and techniques of directing

CO-5 Evaluate the necessity for controlling and further refinement of an organization

UNIT – I

Management: Concept of Management, Management- Science or Art, Manager vs Entrepreneur; Evolution of Management- Basic management theories by FW Taylor, Henry Fayol; Managerial Roles and Skills; Types of Business Organizations - Sole Proprietorship, Partnership, Company; How startups are built- An overview. Organization Culture and Environment; Contemporary Management Issues and Challenges.

UNIT - II

Planning:

Nature and Purpose of Planning, Planning Process, Types of Plans, Environmental Scanning – SWOT and PEST analysis, Objectives, Managing by Objectives (MBO), Strategies – Types of Strategies, The Strategic Planning Process, The TOWS (Threats, Opportunities, Weaknesses and Strengths) Matrix, Planning Tools and Techniques, Planning Plant Location and Layout. Policies- Types. Decision Making – Types of Decision, Decision Making Process.

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UNIT – III

Organizing:

Nature and purpose of Organizing, formal and informal organization, Organization Structure – Types, line and staff authority, Depart mentation, Span of Control, Centralization and Decentralization, Delegation of Authority. Human resource management- HR Planning, Recruitment selection, Training and Development, Performance Management, Career planning and Management.

UNIT – IV

Directing:

Principles and elements of direction, Requirement of Effective Direction – Functions of Direction – Supervisor and his Qualities – Supervisor's Role and Functions – Effective Supervision. Individual and group behaviour, motivation- Theories, leadership- Types and Theories of leadership, effective Communication.

UNIT - V

Controlling:

Concept, Process of Controlling, Types of control – Budgetary and non-budgetary control techniques – Requirements for effective control. Use of Computers and IT in Management control, Productivity Problems and Management, Control and Performance, Direct and Preventive control, Reporting.

Suggested Readings:

1. Andrew J. Dubrin, "***Essentials of Management***", 9th edition, Thomson Southwestern, 2012.
2. Harold Koontz and Heinz Weihrich, "***Essentials of management: An International & Leadership Perspective***", 9th edition, Tata McGraw-Hill Education, 2012.
3. Charles W.L Hill and Steven L McShane, "***Principles of Management***", Special Indian Edition, McGraw Hill Education, 2007.
4. Don Hellriegel, Susan E. Jackson and John W. Slocum, "***Management- A competency-based approach"***, 11th edition, Thompson South Western, 2008.
5. Harold Koontz and Cyril O'Donnell "***Principles of Management***'', Tata McGraw Hill, 2017. Stephen P. Robbins, David A.De Cenzo and Mary Coulter, "***Fundamentals of management***", Prentice Hall of India, 2012.

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OE704MC	ENTREPRENEURSHIP DEVELOPMENT					
Pre-requisites	-		L	T	P	C
			3	-	-	3
Evaluation	CIE	30 Marks	SEE		45 Marks	

Course Objectives:

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

Course Outcomes:

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

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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

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

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OE 705 EC	FUNDAMENTALS OF EMBEDDED SYSTEMS					
Pre-requisites	Computer Organization , Micro Processors		L	T	P	C
			3	-	-	3
Evaluation	CIE	30 Marks	SEE		45 Marks	

Course Objectives:

- Learn basics of Computer architecture, its working and types.
- Learn basics of Embedded Systems and their applications.
- Learn interfacing various components with Embedded Systems

Course Outcomes:

On completion of this course, the student will be able to :

CO1 Learn about the general principles of computer architecture

CO2 Understand the working of a simple embedded system and embedded system applications

CO3 Understand the hardware aspects of embedded systems

C04 Understand the sensors, ADCs and actuators used in embedded systems

CO5 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:

UNIT–III

Embedded systems-The hardware point of view: Microcontroller unit(MCU), a popular 8-bit

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.

MCU, memory for embedded systems, low power design, pull up and pull down resistors

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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.

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OE 706 EC	VLSI DESIGN					
Pre-requisites	Basic Electronics, VHDL		L	T	P	C
			3	-	-	3
Evaluation	CIE	30 Marks	SEE		45 Marks	

Course Objectives:

- To provide a perspective on Digital Design in the Deep Sub-micron Technology
- To focus on CMOS and Bi CMOS Short-channel Transistor Models
- To Study CMOS Inverter elaborately
- To explore static and dynamic implementations of combinational and sequential circuit designs
- Introduce Testability of VLSI circuits.

Course Outcomes:

On completion of this course, the student will be able to:

CO-1 Have an understanding of the Fabrication processes and the comparison between different state-of-the-art CMOS technologies

CO-2 Acquire the knowledge in understanding CMOS Inverter characteristics. Illustrate circuit diagrams, stick diagrams and layouts

CO-3 Design and analyze various Combinational Logic circuits in different models

CO-4 Design and analyze various Arithmetic Blocks and Memory structures

CO-5 Understand various fault models and testing methods

UNIT–I

Design Abstraction in Digital circuits, Fabrication process flow of NMOS and PMOS transistors, Overview of CMOS and BiCMOS technologies, MOSFET Transistor under static conditions, channel Length Modulation, Velocity Saturation, Sub-threshold Condition, Threshold variations variations, MOS structure Capacitance, CMOS Latch up, Technology scaling.

UNIT–II

Digital CMOS Design: Static CMOS inverter-switching threshold, Noise margins, Voltage Transfer Characteristics, CMOS inverter Dynamic behavior- computing capacitance and propagation delay, Static and Dynamic Power Consumption . Complementary CMOS, Ratioed Logic, Pass Transistor Logic, Full Adder and carry save multiplier design Considerations, Dynamic CMOS design -basic principle, Signal integrity. Issues in Dynamic Design, cascading dynamic gates. Designing sequential logic circuit- Bi stability Principle, Multiplexer based latch, Dynamic latches and registers.

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UNIT–III

Analog CMOS design: Significance of analog integrated circuits, Suitability of CMOS for analog IC design, , biasing styles, single stage amplifier with resistive load, single stage amplifier with diode connected load, CS, CD, CG amplifiers, current sources and sinks, limitations of single stage amplifier, gain boosting techniques, current mirror principles, introduction to differential amplifier

UNIT-IV

Designing Memory and Array architectures: Memory classification, Architecture and building blocks, Memory Core-Rom, Non volatile RWM, RAM-Static RAM, Dynamic RAM, Memory Peripheral Circuitry-Address decoders-Row decoders-static and dynamic, column and block decoders, sense amplifiers-differential and single ended sensing, voltage references, Timing and control.

UNIT – V

Implementation of strategies for Digital ICs, Testing of VLSI circuits: VLSI Chip Yield, Test procedures; Design for Testability- Ad Hoc Testing, Scan Based testing, Boundary Scan Design, Built in Self-Test, Built-in logic block observer, Test Pattern Generator, Automatic Test Pattern Generation (ATPG)

Suggested Reading:

1 JAN.M. Rabaey, A. Chandrakasan and B. Nikholic, *"Digital Integrated Circuits – A Design Perspective"*, 2nd Edition, PHI, 2007.

2 David A Hodges, H. Jackson and R. A. Saleh, "*Analysis and Design of Digital Integrated Circuits in Deep Submicron Technology"*, 3rd Edition, Tata McGraw Hill, 2007.

3 John. P. Uymera, "*Introduction to VLSI Circuits and system"*, student edition, John Wiley and Sons, 2003

4 Douglas A. Pucknell, Kamran Eshraghian, " ***Basic VLSI design***", 3rd Edition, PHI, 2003

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OE707EE	OPTIMIZATION TECHNIQUES					
Pre-requisites	Linear algebra , Basic Programming Skills		L	T	P	C
			3	-	-	3
Evaluation	CIE	30 Marks	SEE		45 Marks	

Course Objectives:

- To understand the need and basic concepts of operations research and classify the optimization problems.
- To study about the linear programming and non-linear programming concepts and their applications.
- To understand various constrained and un-constrained optimization techniques and their applications.
- To understand the concepts and implementation of Genetic Algorithms to get the optimum solutions.
- 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.

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Ravi

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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

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.
and Convergence, Components of a Continuous Genetic Algorithm.

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.

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PE708EE	NON-CONVENTIONAL ENERGY SOURCES					
Pre-requisites	Maths,Physics,Basic Engineering Principles		L	T	P	C
			3	-	-	3
Evaluation	CIE	30 Marks	SEE		45 Marks	

Course Objectives:

- To understand the different types of energy sources.
- To understand the need of non-conventional energy sources and their principles.
- To understand the limitations of non-conventional energy sources.
- To outline division aspects and utilization of renewable energy sources for diriment application.
- To analyze the environmental aspects of renewable energy resources.

Course Outcomes:

On completion of this course, the student will be able to :

CO-1 Know the different energy resources and need of renewable energy resources.

CO-2 Understand the concepts of working of fuel cell systems along with their applications.

CO-3 Describe the use of solar energy and the various components and measuring Devices used in the energy production and their applications.

CO-4 Appreciate the need of Wind Energy and their classification and various components used in energy generation and working of different electrical wind energy system.

CO-5 Understand the concept of OTEC technology, Biomass energy resources and different types of biogas Plants used in India.

UNIT–I

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

UNIT–II

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

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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 Sources of Energy***, Khandala Publishers,NewDelhi,1999.
2. M.M.El-Wakil,***Power Plant Technology***. McGraw Hill,1984.

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PC751CS	NATURAL LANGUAGE PROCESSING LAB					
Prerequisites			L	T	P	C
			0	0	2	1
Evaluation	CIE	20 Marks	SEE		30 Marks	

Problem Statements

In this lab 14 NLP Lab problem statements aligned. These labs provide hands-on exposure to classical NLP, deep learning, transformer models, prompting, and ethical AI evaluation.

Unit I – Classical NLP and Language Modeling

1. Text Preprocessing and Analysis:

   Write a Python program that performs tokenization, stemming, lemmatization, and frequency analysis on a large text corpus. Visualize the most frequent tokens using a word cloud.

2. POS Tagging and Named Entity Recognition:

   Implement rule-based and statistical POS tagging and NER using NLTK and spaCy. Compare the performance across multiple datasets (news, legal, tweets).

3. N-gram Language Modeling:

   Build a unigram and bigram language model from a given text corpus. Evaluate the models using perplexity and generate random sentences.

4. Text Classification using Traditional ML:

   Design a text classification pipeline using TF-IDF and Logistic Regression or Naive Bayes for spam detection or sentiment analysis.

Unit II – Deep Learning for NLP

5. Sequence Modeling with RNN and LSTM:

   Train an LSTM model for next-word prediction using a Shakespeare or Wikipedia dataset. Visualize training loss and sample predictions.

6. Neural Machine Translation:

   Implement a sequence-to-sequence model with attention to translate English to a low-resource language (e.g., Hindi or Telugu). Use BLEU score for evaluation.

7. Text Summarization using Encoder-Decoder:

   Build a simple abstractive text summarizer using an attention-based encoder-decoder model. Compare with extractive summaries using ROUGE.

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Unit III-Transformers and Pretrained Models

8. Fine-tuning BERT for Text Classification:

   Fine-tune a pretrained BERT model using Hugging Face Transformers for sentiment classification on IMDB or Amazon Reviews dataset.

9. Question Answering with Transformer Models:

   Build a QA system using SQuAD dataset with a fine-tuned BERT or DistilBERT model. Evaluate accuracy and response time.

10. Named Entity Recognition with Transformer Embeddings:

    Compare spaCy NER with BERT-based NER fine-tuned on the CoNLL-2003 dataset. Visualize token importance using attention heatmaps.

Unit IV – LLMs, Prompting, and NLP Agents

11. Prompt Engineering for Few-shot Classification:

    Use OpenAI GPT or similar LLM to classify short texts (e.g., political speeches or tweets) using prompt templates (zero-shot, few-shot, CoT prompts). Analyze accuracy vs. prompt complexity.

12. Retrieval-Augmented Question Answering (RAG):

    Implement a domain-specific question-answering system (e.g., Medical or Legal FAQs) using LangChain + OpenAI + vector database (FAISS). Test different retrieval strategies.

Unit V-Ethics, Multimodal NLP, and Explainability

13. Hallucination and Bias Analysis in LLMs:

    Evaluate generated text from LLMs (GPT-3.5 or Claude) on a set of prompts for hallucination, stereotypes, or toxicity. Document findings using PromptEval or similar tools.

14. Image Captioning using CLIP or BLIP:

    Build a basic multimodal model that generates image captions or performs text-based image retrieval using CLIP embeddings. Extend it to detect mismatched captions.

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PW761CS	PROJECT WORK-I					
Prerequisites	-		L	T	P	C
			0	0	6	3
Evaluation	CIE	50 Marks	SEE		-	

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:

1. Collection of project topics/descriptions from faculty members(Problems can also be invited from the industries)
2. Grouping of students (max3 in a group)
3. 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.

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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.

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PW961CS	SUMMER INTERNSHIP					
Prerequisites			L	T	P	C
			0	0	4	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. Award of sessional 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 overall 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.

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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

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UNIVERSITY COLLEGE OF ENGINEERING & TECHNOLOGY

B.Tech. (CBCS) 4-YEARS (8-SEMESTERS) REGULAR PROGRAMME

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING (CSE)

(Applicable for the batch admitted in Academic Year 2023-24 onwards)

SEMESTER-VIII

S.No	Code	Course Title	Scheme of Instruction			Contact Hrs/week	Scheme of Examination			Credits
			L	T	P		Hrs	CIE	SEE	
THEORY										
1	Mandatory Course-I		3	0		3	3	30	45	0
2	Mandatory Course–II		3	0		3	3	30	45	0
3	Mandatory Course-III		3	0		3	3	30	45	0
PRACTICALS										
4	PW856CS	Project Work–II			12			50	100	6
		Total	9	0	12	9	9	140	235	6

Mandatory Course

MC801HS	Environmental Science
MC802HS	Intellectual Property Rights
MC803HS	English for Technical Paper Writing
MC804HS	Constitution of India
MC805HS	Essence of Indian Traditional Knowledge
MC806HS	Stress Management By Yoga
MC807HS	Sports

L – Lecture

T - Tutorial

P - Practical

CIE-Continous Internal Evaluation

SEE-Semester End Examination

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MC801HS	ENVIRONMENTAL SCIENCE					
Pre-requisites	Water Resources Engineering Subjects		L	T	P	C
			3	-	-	0
Evaluation	CIE	30Marks	SEE			45Marks

Course Objectives:

- Comprehend the need of environmental science, ethics and issues
- Realize the availability and utilization of various natural resources
- Illustrate the characteristics and functions of Ecosystem
- Study various environmental pollution effects, prevention and control acts
- 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,

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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

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Suggested readings:

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 Sanoop Gopi 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.

1. Adrian Wallwork ***English for Writing Research Papers***, Springer New York Dordrecht Heidelberg London. 2011.

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MC802HS	INTELLECTUAL PROPERTY RIGHTS					
Pre-requisites	Basic Knowledge Of Law		L	T	P	C
			3	-	-	3
Evaluation	CIE	30 Marks	SEE		45 Marks	

Course Objectives :

- Acquaint the students with basics of intellectual property rights with special reference to Indian Laws and its practices.
- Compare and contrast the different forms of intellectual property protection in terms of their key differences and similarities.
- 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.

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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

CH. Siddaiah

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MC803HS	ENGLISH FOR TECHNICAL PAPER WRITING					
Pre-requisites -			L	T	P	C
			3	-	-	0
Evaluation	CIE	30 Marks	SEE		45 Marks	

Course Objectives:

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

Course Outcomes:

CO-1 Able to plan and prepare paragraphs, avoiding ambiguity and grammatical errors

CO-2 Writing of abstracts, paraphrasing and plagiarism

CO-3 Providing critical and thorough review of literature, discussions and conclusions

CO-4 Able to exhibit key skills for writing titles, introduction, abstract.

CO-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, Cliché.

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

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CSE, Vignana Bharathi

Suggested Reading:

2. Norman Lewis, *Word Power Made Easy*, Anchor Books, New York, Reprint Edition,2014.
3. C.R. Kothari and Gaurav Garg, *Research Methodology: Methods and Techniques*, 4th Edition, New Age International Publishers, New Delhi, 2019.
4. 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.
5. Goldbort R, *Writing for Science*, Yale University Press (available on Google Books), 2006.
6. Day R, *How to Write and Publish a Scientific Paper*, Cambridge University Press,2006.
7. Highman N *Handbook of Writing for the Mathematical Sciences*, SIAM. Highman's book 1998

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MC804HS	CONSTITUTION OF INDIA					
Pre-requisites			L	T	P	C
			3	-	-	0
Evaluation	CIE	30 Marks	SEE		45 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:*

CO-1 Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.

CO-2 Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.

CO-3 Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru

CO-4 The eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.

CO-5 Discuss the passage of the Hindu Code Bill of 1956.

UNIT – I

History of Making of the Indian Constitution: History, Drafting Committee, (Composition & Working) Philosophy of the Indian Constitution: Preamble, Salient Features.

UNIT – II

Contours of Constitutional Rights & Duties: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT – III

Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications. Powers and Functions.

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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.

Suggest reading:

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.

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MC 805HS	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE					
Pre-requisites			L	T	P	C
			3	-	-	0
Evaluation	CIE	30 Marks	SEE		45 Marks	

Course Objectives :

The course aims at enabling the students to

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

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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 Readings :

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 Found Velliamad. Amaku.am

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Yoga Sutra of Patanjali, Ramakrishna Mission. Kolkatta

GNJha(Eng.Trans.) Ed.RNJha,Yoga-darshanam with Vyasa Bhashya.Vidyanidhi Prakasham, De
2016

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MC 806HS	STRESS MANAGEMENT BY YOGA					
Pre-requisites			L	T	P	C
			3	-		0
Evaluation	CIE	30Marks	SEE		45Marks	

Course Objectives:

The course is taught with the objectives of enabling the student to:

- Creating awareness about different types of stress and the role of yoga in the management of stress.
- Promotion of positive health and overall well being (Physical, mental, emotional, social and spiritual).
- 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-TypesofstressEustressandDistress.Anticipatory Anxiety 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-

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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:

- "Yogic Asanas for Group Training -Part-I":Janardhan Swami Yogabhyasi Mandal Nagpur
- "Rajayogaor Conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department),Kolkata
- 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

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MC 807HS	SPORTS					
Pre-requisites			L	T	P	C
			3	-		0
Evaluation	CIE	20 Marks	SEE		30 Marks	

Course Objectives:

- To develop an understanding of the importance of sport in the pursuit of a healthy and active lifestyle at the College and beyond.
- To develop an appreciation of the concepts of fair play, honest competition and good sportsmanship.
- To develop leadership skills and foster qualities of co-operation, tolerance, consideration,trust and responsibility when faced with group and team problem-solving tasks.
- To develop the capacity to maintain interest in a sport or sports and to persevere in order to achieve success.
- 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

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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

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PW856CS	PROJECT WORK -II					
Prerequisites			L	T	P	C
			0	0	12	6
Evaluation	CIE	50	SEE		100 Marks	

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 teamwork.
- 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

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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. The students are required to submit draft copies of their project report within one week after completion of instruction.

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