striding and pooling, applications like image, and text classification.

Unit-III Sequence Modeling: Recurrent Nets: Unfolding computational graphs, recurrent neural networks (RNNs), bidirectional RNNs, encoder-decoder sequence to sequence architectures, deep recurrent networks.

Unit-IV Autoencoders: Undercomplete autoencoders, regularized autoencoders, sparse autoencoders, denoising autoencoders, representational power, layer, size, and depth of autoencoders, stochastic encoders and decoders.

Unit V: Generative Adversarial Networks (GANs): Introduction to Generative Adversarial Networks, GAN Architectures (DCGAN, CycleGAN), Applications of GANs (Image Generation, Style Transfer)

Unit VI: Large Language Models: Introduction to Natural Language Processing (NLP), Traditional NLP Techniques, Transformer Architecture, Pre-training and Fine-tuning Language Models, Ethical Considerations and Bias in Language Models, Applications of Large Language Models (Text Generation, Sentiment Analysis, Question Answering)

Unit-VII Structuring Machine Learning Projects: Orthogonalization, evaluation metrics, train/dev/test distributions, size of the dev and test sets, cleaning up incorrectly labelled data, bias and variance with mismatched data distributions, transfer learning, multi-task learning.

Readings:

1. Ian Goodfellow, **Deep Learning**, MIT Press, 2016.
2. Jeff Heaton, **Deep Learning and Neural Networks**, Heaton Research Inc, 2015.
3. Mindy L Hall, Deep Learning, VDM Verlag, 2011.
4. Li Deng (Author), Dong Yu, **Deep Learning: Methods and Applications (Foundations and Trends in Signal Processing)**, Now Publishers Inc, 2009.

MCSC203: INTERNETWORKING WITH TCP/IP [3-0-1]

Course Objectives:

This course is oriented to provide students, an understanding of the communication process of the Internet. This course will enable students to test and troubleshoot IP-based communications systems, and also the architecture, design and behaviors of the Internet and of the TCP/IP suite of protocols. Furthermore, this course will discuss various Flow , Error and Congestion control mechanisms of TCP and the principles of IPv6 Addressing ,IPv6 and ICMPv6 Protocols.

Course Learning Outcomes :

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

CO1: be able to explain the TCP/IP architecture and utility of different layers

CO2: Analyze IP addressing requirements, routing architecture and choose appropriate routing methods;

CO3: Understand the working of internetworking devices and their network configuration;

CO4: be able to determine and evaluate selection of applications and protocols for data communication

Syllabus

Unit-I: TCP/IP Architecture and IP Packet, IP Addressing, Subnetting, and Subnet Routing.

Unit-II: Classless Interdomain Routing (CIDR), ARP, Fragmentation and Reassembly, DHCP, NAT, IPv6

Unit-III: Transmission Control Protocol: UDP and TCP, TCP: Three-way Handshake, TCP Flow Control and Data Transfer, TCP Congestion Control, RTT-based Congestion Control for a Datacenter.

Unit-IV: Advanced Topics: Mobile IP, Multicast Routing, OpenFlow, SDN, and NFV, Network Security Threats

Readings:

1. Douglas E Comer, "Internetworking with TCP/IP Principles, Protocol, and Architecture" , Volume I, 6th Edition, Pearson Education, 2015.
2. Internetworking with TCP/IP Volume II: ANSI C Version: Design, Implementation, and Internals, Pearson Education India; 3rd edition, 2015.
3. William Stallings, "Data and Computer Communications", 9th Edition, Pearson Education, 2011

MCSC204: CLOUD COMPUTING [3-0-1]

Course Objectives: This course aims to provide students with a solid understanding of parallel and distributed computing and cloud computing. Students will learn about cloud computing's characteristics, benefits, and historical developments, including distributed systems, virtualization, and service-oriented computing. They'll also grasp cloud computing architecture, service models (IaaS, PaaS, SaaS), deployment models, and emerging paradigms like Edge Computing and Mobile Cloud Computing.

Course Learning Outcomes :

On completing this course, the student will be able to:

CO1: Understand cloud computing's characteristics, benefits, and historical developments, including distributed systems and virtualization.
CO2: Master cloud computing architecture, service models, deployment models, and practical application of cloud technologies.