Semester VI

Sl. No.	Category	Course Code	Course Title	L	T	P	Contact Hours/ week	Credit
1.	Programme core Course-15	AIPC601	Reinforcement Learning	3	0	0	3	3
2.	Programme core Course-16	AIPC602	Deep Learning	2	0	0	2	2
3.	Programme elective Course-4	AIPE603	1.Advance Computer Networks/ 2.Information Security/ 3.Network Forensics	3	0	0	3	3
4.	Humanities and Social Science Course	HSS604	Entrepreneurship and Start up's	3	1	0	4	4
5.	Open elective-2	OE605/1 OE605/2 OE605/3	4. Robotics 5. Environmental Pollution & Control 6. History of Indian Architecture	3	1	0	4	4
6.	Mandatory Course-2	AU606	Indian Constitution	2	0	0	2	0
7.	Major Project	AIPR607	Project part_II	0	0	6	6	3
8.	Seminar	AISE608	Seminar	2	0	0	2	1
Total :								20

Reinforcement Learning

Course Code	AIPE601
Course Title	Reinforcement Learning
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	-
Course Category	Programme elective course

Course Outcomes: -

After the completion of the course Student will be able to:

- Implementation of Reinforcement and Probability Concept(K1)
- Understanding of Markov Decision(K2)
- Implementation of Dynamic Programming(K2)
- Implementation of Model Free Prediction and Control(K2)
- Employ TD method in Decision making(K2)

Module- 1: Introduction and Probability Primer(6 hrs)

Course logistics and overview. Origin and history of Reinforcement Learning research, Brush up of Probability concepts - Axioms of probability, concepts of random variables, PMF, PDFs, CDFs, Expectation. Concepts of joint and multiple random variables, joint, conditional and marginal distributions. Correlation and independence.

Module- 2: Markov Decision Process(6 hrs)

Introduction to RL terminology, Markov property, Markov chains, Markov reward process (MRP). Introduction to Markov decision process (MDP), state and action value functions, Bellman expectation equations

Module- 3: Prediction and Control by Dynamic Programming(5 hrs)

Overview of dynamic programming for MDP, definition and formulation of planning in MDPs, principle of optimality, iterative policy evaluation, policy iteration, value iteration, Banach fixed point theorem.

Module- 4: Monte Carlo Methods for Model Free Prediction and Control(5 hrs)

Overiew of Monte Carlo methods for model free RL, First visit and every visit Monte Carlo, Monte Carlo control, On policy and off policy learning, Importance sampling.

Module- 5: TD Methods

Incremental Monte Carlo Methods for Model Free Prediction, Overview TD(0), TD(1) and TD(λ), k-step estimators, unified view of DP, MC and TD evaluation methods, TD Control methods - SARSA, Q-Learning and their variants.

Reference Books:

•Richard S. Sutton and Andrew G. Barto, "Reinforcement learning: An introduction", Second Edition, MIT Press, 2019

•Li, Yuxi. "Deep reinforcement learning." arXiv preprint arXiv:1810.06339 (2018).

•Wiering, Marco, and Martijn Van Otterlo. "Reinforcement learning." Adaptation, learning, and optimization 12 (2012): 3.

•Russell, Stuart J., and Peter Norvig. "Artificial intelligence: a modern approach."Pearson Education Limited, 2016.

•Goodfellow, Ian, Yoshua Bengio, and Aaron Courville. "Deep learning." MIT press, 2016

Deep Learning

Course Code	AIPC 602
Course Title	Deep Learning
Number of Credits 2 (L: 2, T: 0, P: 0)	3 (L: 3, T: 0, P: 0)
Prerequisites	AI and Machine Learning
Course Category	Programme core course

Course Outcome:

- This course introduces the capabilities and architecture of different learning techniques.
- The principles and structure of advanced deep architectures.
- To develop end-to-end models relying on deep networks.
- Students will learn to implement, train and debug their own neural networks

Module 1

Basics of artificial neural networks (ANN): Artificial neurons, Computational models of neurons, Structure of neural networks, Functional units of ANN for pattern recognition tasks

Module 2

Feedforward neural networks: Pattern classification using perceprton, Multilayer feedforward neural networks (MLFFNNs), Backpropagation learning, Empirical risk minimization, Regularization, Autoencoders

Module 3

Deep neural networks (DNNs): Difficulty of training DNNs, Greedy layerwise training, Optimization for training DNNs, Newer optimization methods for neural networks (AdaGrad, RMSProp, Adam), Second order methods for training, Regularization methods (dropout, drop connect, batch normalization)

Module 4

Convolution neural networks (CNNs): Introduction to CNNs – convolution, pooling, Deep CNNs, Different deep CNN architectures – LeNet, AlexNet, VGG, PlacesNet, Training a CNNs: weights initialization, batch normalization, hyperparameter optimization, Understanding and visualizing CNNs.

Module 5

Recurrent neural networks (RNNs): Sequence modeling using RNNs, Back propagation through time, Long Short Term Memory (LSTM), Bidirectional LSTMs, Bidirectional RNNs, Gated RNN Architecture

Text Books / Reference Books

Deep Learning- By Ian Goodfellow, YoshuaBengio and Aaron Courville
Deep Learning: Methods and Applications- By Li Deng and Dong Yu

Advance Computer Networks

Course Code	AIPE603-1
Course Title	Advance Computer Networks
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	-
Course Category	Programme elective course

Course Outcomes: -

After the completion of the course Student will be able to

1) Implement of Network Layer Protocols. (K1)

2) Configure IPv6 Network (K3)

3) Choose Routing protocol in the given network situation (K2)

4) Implement of Network Layer Protocols. (K2)

5) Configure various Application Layer protocol. (K3)

Course Content: -

Module- 1: Network Layer and Protocol

Number of class hours: 6 Hrs

Suggestive Learning Outcomes: After completing this module student will be able to-

1) Understand the significance of the given field in the packet format of Internet Protocol. (K2)

2) Implement IP address for the given network. (K1)

3) Understand the significance of the given field in the packet format of ICMPv4. (K2)

4) Understand the given inefficiency in Mobile IP.(K1)

Detailed content of the unit: - IP Addressing, address space, notations, Classfull addressing, Classfull addressing, Network Address Translation(NAT), IP Datagram format, Fragmentation, ICMPv4 messages, Debugging tools, ICMP Checksum, Mobile IP addressing, Agents, Three phases, Inefficiency in Mobile IP, VPN Technology

Module- 2: Next Generation IP

Number of class hours: 6 Hrs

Suggestive Learning Outcomes: After completing this module student will be able to-

1) Map the given IPv4 Address to IPv6 Address. (K3)

2) Describe the function of given step in the stateless auto configuration process. (K2).

3) Outline the given strategy of Transition from IPv4 to IPv6. (K1)

4) Understand the significance of the given field in Datagram format of IPv6. (K2)

Detailed content of the unit: - IPv6 Addressing representation, address space, address space allocation, Autoconfiguration, Renumbering, Transition from IPv4 to IPv6, Duel stack, Tunneling, Header Translation, IPv6 Protocol packet format, Extension header.

Module- 3: Unicast and Multicast Routing Protocols

Number of class hours: 6 Hrs

Suggestive Learning Outcomes: After completing this module student will be able to-

1) Understand the relevant routing Protocol for the given network situation. (K2)

2) Compare Dynamic Routing and Static Routing on the given aspect. (K1)

3) Calculate shortest paths from a single source vertex to all the other vertices in the given weighted digraph. (K3)

4) Understand the functioning of the multicast routing protocol. (K1)

Detailed content of the unit: - Inter-domain, intra-domain Routing, Distance Vector Routing, Bellman-Ford Algorithm, Link state Routing, Path Vector Routing, Unicast Routing Protocols Internet structure, Routing Information Protocol (RIP), Open Shortest Path First(OSPF), Border Gateway Protocol Version 4 (BGP4), Unicast, Multicast, Broadcast, Multicast Distance Vector(DVMRP), Multicast Link State(MOSPF), Protocol Independent Multicast (PIM)

Module- 4: Transport Layer Protocols

Number of class hours: 6 Hrs

Number of class hours: 6 Hrs

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Understand the significance of the UDP Packet Format. (K2)

2) Understand the concept of State Transition of TCP. (K2)

3) Understand the significance of the TCP Packet Format. (K2)

4) Understand the significance of the SCTP Packet Format. (K2)

Detailed content of the unit: - User Datagram Protocol, UDP Services, UDP Applications, TCP Services, TCP features, Segment, A TCP Connection, State Transition Diagram, Windows in TCP, Flow Control, Error Control, TCP Congestion Control, TCP Timers, Options, SCTP Services, SCTP Features, Packet Format, An SCTP Association, Flow Control, Error Control.

Module- 5: Application Layer Protocols

Number of class hours: 6 Hrs

Suggestive Learning Outcomes: After completing this module student will be able to-

1) Understand the function of Application Layer Protocol. (K1)

2) Understand the function of FTP, Email architecture. (K2)

3) Understand the process of resolving the given host name into IP Address using DNS. (K3).

4) Working with Remote Control Protocol. (K3)

Detailed content of the unit: - WWW, HTTP, FTP, TFTP, Email Architecture, Web based mail, Email Security, SMTP, POP, IMAP and MIME, SNMP, Concept of Domain space, DNS Operation, DHCP-Static and Dynamic Allocation, DHCP Operation, TELNET, SSH, Intrusion detection system (IDS), Intrusion prevention system (IPS)

References: -

1) Advanced Computer Network, BM Harwani and DT Editorial Services, Dreamtech

2) Computer Networks, Andrew S. Tanenbaum(Author), PHI Learning.

3) Internetworking with TCP/IP, Comer Douglas E., Prentice Hall of India Private Limited

4) Computer Networks, Natalia Olifer, Victor Olifer, Wiley.

Information Security

Course Code	AIPE603-2
Course Title	Information Security
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	-
Course Category	Programme elective course

Course Outcomes: -

After the completion of the course Student will be able to

1) Understand the concept of Information Security and CIA TRIAD. (K2)

2) Understand the concept of Application Security, encryption and Cryptography (K2)

3) Understand the concept of security measures and risk management (K2)

4) Understand the knowledge of Cyber laws in cases of various crimes. (K2)

Course Content: -

Module- 1: Introduction to Information Systems and Security

Number of class hours: 6 Hrs

Suggestive Learning Outcomes: After completing this module student will be able to-

1) Understand the concept of Information Security. (K1)

2) Understand the significance of CIA TRIAD. (K2)

3) Understand the need of cyber security. (K2)

4) Understand the threats to Information Systems. (K2)

Detailed content of the unit: - Information Systems, Types of IS, Development of IS, Introduction to Information Security, Need for Information Security,Understanding CIA TRIAD, Threats to Information Systems, Information Assurance, Cyber Security

Module- 2: Introduction to Application Security and Counter Measures

Number of class hours: 8 Hrs

Suggestive Learning Outcomes: After completing this module student will be able to-

1) Understand the concept of Application Security. (K1)

2) Understand the significance of the security threats to eCommerce and Digital payment system. (K2)

3) Understand the need of Cryptography and Encryption. (K2)

4)

Detailed content of the unit: - Introduction to Application Security, Data Security Considerations, Security Technologies, Security Threats, Security Threats to E-Commerce, E-Cash and Electronic Payment System, Credit/Debit/Smart Cards, Digital Signature, Cryptography and Encryption

Module- 3: Introduction to Security Measures

Number of class hours: 6 Hrs

Suggestive Learning Outcomes: After completing this module student will be able to-

5) Understand the role of risk management in the field of information security. (K2)

6) Understand the concept of security architecture and design. (K2)

7) Understand the concept of physical security and backup security. (K2)

Detailed content of the unit: - Secure Information System Development, Application Development Security, Information Security Governance and Risk Management, Security Architecture and Design, Security Issues in Hardware, Data Storage, and Downloadable Devices, Physical Security of IT Assets, Backup Security Measures

Module- 4: Introduction to Security Policies

Number of class hours: 4 Hrs

Suggestive Learning Outcomes: After completing this module student will be able to-

1) Understand the concept of security policy. (K2)
2) Understand the concept of security standards. (K2)

Detailed content of the unit: Need for an Information Security Policy, Information Security Standards - ISO, Introducing Various Security Policies and Their Review Process,

Module- 5: Cyber Laws

Number of class hours: 6 Hrs

Suggestive Learning Outcomes: After completing this module student will be able to-

1) Understand the significance of cyber law. (K1)
2) Knowledge of IT Act 2000 and Amendments in 2008. (K2)
3) Knowledge of Intellectual Property Issues, Patent Copyright. (K2)

Detailed content of the unit: - Introduction to Indian Cyber Law, Objective and Scope of the IT Act 2000 & Amendments in 2008, Need for Enactment of Information Technology Act, 2000, Objectives of IT Legislation in India, IT Act 2000 legislation deals with, Salient Features of I.T Act, Applicability of IT Act, Chapters in the Act, Schedules in the Act, Need for IT Amendment Act 2008 (ITAA), Case Studies as per selected IT Act Sections, Intellectual Property Issues, Overview of Intellectual-Property- Related Legislation in India, Patent, Copyright, Law Related to Semiconductor Layout and Design, Software License

References: -

1) Introduction to Information Security and Cyber Laws, Surya Prakash Tripathi, Ritendra Goel, Praveen Kumar Shukla, Dreamtech Press
2) Cryptography and Information Security, V. K. Pachghare, PHI Learning

3) Cyber Law & Cyber Crimes Simplified, Adv. Prashant Mali, Cyber Infomedia

Network Forensics

Course Code	AIPE603-3
Course Title	Network Forensics
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	-
Course Category	Programme elective course

Course Outcomes: -

After the completion of the course Student will be able to

1) Understand the concept of Network Forensics and its uses. (K1)
2) Understand the concept of Traffic Analysis for Network Forensics. (K2)
3) Understand the concept of Network Intrusion Detection and Analysis (K2)
4) Understand the concept of Wireless Network Forensics. (K2)
5) Understand the concept of Network Tunneling & Malware Forensics. (K2)

Course Content: -

Module- 1: Foundation of Network Forensic

Number of class hours: 6 Hrs

Suggestive Learning Outcomes: After completing this module student will be able to-

1) Understand the concept of Investigation Strategy. (K2)
2) Understand the concept of Digital Evidence Acquisition. (K1)
3) Understand the concept of Network Forensics Investigation Methodology. (K2)

Detailed content of the unit: - Practical Investigative Strategies, Real-World Cases, Footprints, Concepts in Digital Evidence, Challenges Relating to

Network Evidence, Network Forensics Investigative Methodology (OSCAR), Sources of Network-Based Evidence, Principles of Internetworking, Internet Protocol Suite, Physical Interception, Traffic Acquisition Software, Active Acquisition

Module- 2: Traffic Analysis
Number of class hours: 8 Hrs

Suggestive Learning Outcomes: After completing this module student will be able to-

1) Understand the concept Traffic analysis. (K1)

2) Understand the concept of packet analysis, Statically Flow Analysis. (K2)

3) Understand the concept of Wireless Network Forensics. (K2) Detailed content of the unit: - Packet Analysis, Protocol Analysis, Packet Analysis, Flow Analysis, Higher-Layer Traffic Analysis, Statistical Flow Analysis, Process Overview, Sensors, Flow Record Export Protocols, Collection and Aggregation, Analysis, IEEE Layer 2 Protocol Series, Wireless Access Points (WAPs), Wireless Traffic Capture and Analysis, Common Attacks, Locating Wireless Devices

Module- 3: Network Intrusion Detection and Analysis
Number of class hours: 6 Hrs

Suggestive Learning Outcomes: After completing this module student will be able to-

1) Understand the concept of NIDS. (K2)

2) Understand the concept of packet logging, Snort. (K2)

Detailed content of the unit: - Why Investigate NIDS/NIPS, Typical NIDS/NIPS Functionality, Modes of Detection, Types of NIDS/NIPSs, NIDS/NIPS Evidence Acquisition, Comprehensive Packet Logging, Snort.

Module- 4: Network Devices and Servers
Number of class hours: 4 Hrs

Suggestive Learning Outcomes: After completing this module student will be able to-

1) Understand the concept of Event Log Aggregation, Correlation, and Analysis. (K2)

2) Understand the concept of Network Log Architecture. (K2)

3) Clarify the knowledge of network devices(K1)

4) Uses of difference tools for analysis. (K3)

Detailed content of the unit: Event Log Aggregation, Correlation, and Analysis, Sources of Logs, Network Log Architecture, Collecting and Analysing Evidence, Storage Media, Switches, Routers, Firewalls, Interfaces, Logging, Why Investigate Web Proxies, Web Proxy Functionality, Evidence, Squid, Web Proxy Analysis, Encrypted Web Traffic

Module- 5: Network Tunneling & Malware Forensics

Number of class hours: 6 Hrs

Suggestive Learning Outcomes: After completing this module student will be able to-

1) Understand the concept of network tunnelling. (K2)
2) Understand the concept of Malware. (K1)
3) Understand the Network Behavior of Malware.(K2)

Detailed content of the unit: - Tunneling for Functionality, Tunneling for Confidentiality, Covert Tunneling, Trends in Malware Evolution, Network Behavior of Malware, The Future of Malware and Network Forensics

References: -

1) Network Forensics: Tracking Hackers through Cyberspace, Sherri Davidoff, Jonathan Ham, Pearson Prentice Hall
2) Learning Network Forensics, Samir Datt, Ingram
3) Fundamentals of Network Forensics, Joshi, R.C., Pilli, Emmanuel S., Springer
4) Network Forensics, Ric Messier, Wiley

Entrepreneurship and Start-ups

Course Code	HSS604
Course Title	Entrepreneurship and Start-ups
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	None
Course Category	HSS

Course Outcomes: -

After the completion of the course Student will be able to

1) Understand the basic concepts of Entrepreneurship and Start-ups.

2) Illustrate skills of discovering business ideas, visualizing and planning a business.

3) Analyse market and business risk for strategy development.

4) Demonstrate skills of organizational management.

5) Exhibit knowledge of financing methods, institutions and skills for communication of ideas.

Course Content:

Module 1-Introduction and Basics of Entrepreneurship and Start–Ups

Outcomes:

(1) Describe the Basic Elements of Entrepreneur and Entrepreneurship

(2) Distinguish between Entrepreneur, Manager and Intrapreneur

Content:

• Definitions, Traits of an entrepreneur, Factors influencing entrepreneurship, Types and Functions of Entrepreneurs, Need for promotion of entrepreneurship, Intrapreneur, Motivation

• Role of Entrepreneurs in Economic Development

• Similarities/differences between - Entrepreneur and Manager, Entrepreneur and Intrapreneur.

Module 2–Business Ideas and their implementation

Outcomes:

(1) Illustrate different Types of Business Planning and Business Structure

(2) Select specific Institutions Assisting Entrepreneur

Content:

• Discovering ideas

- Visualizing the business
- Business Plan, - Types of planning, Importance of planning, Steps in planning
- Types of Business Structures
- Institutions assisting entrepreneur

Module 3–Idea to Start-up
Outcomes:

(1) Identify Steps for Starting a SSI
(2) Predict the Target Market and Associated Risk
Content:
- Market analysis – Identifying the target market
- Competition evaluation and Strategy Development
- Steps for starting a small enterprise
- Risk analysis

Module 4–Management of Enterprise
Outcomes:

(1) Apply the Basic Accounting Concepts in Business
(2) Demonstrate Knowledge of Pricing, Positioning and Advertising of Products

Content:
- Recruitment and management of talent.
- Determinants of Price, Pricing methods in practice.
- Market Positioning, Advertising and Sales Promotion
- Accounting - Understanding basics of Transaction, Journal, Ledger, Cashbook, Trial Balance, Cost Sheet and Final Accounts through simple problems

Module 5-Financing and Communication of Ideas
Outcomes:
(1) Exhibit Knowledge of various Financial Institutions and Financing Methods
(2) Illustrate Business Ideas through Communication Skills
Content:
- Financial Institutions
- Financing methods available for start-ups in India
- Communication of Ideas to potential investors–Investor Pitch

SUGGESTED LEARNING RESOURCES:

S.No.	Title of Book	Author
1	The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company	Steve Blank and Bob Dorf
2	The Lean Startup: How Today's Entre-preneurs Use Continuous Innovation to Create Radically Successful Businesses	Eric Ries
3	Demand: Creating What People Love Before They Know They Want It	Adrian J. Slywotzky with Karl Weber
4	Entrepreneurship	Alpana Trehan

Robotics

Course Code	OE605/1
Course Title	Robotics
Number of Credits	0 (L: 2, T: 1, P: 0)
Prerequisites	NIL
Course Category	OE

Course Outcomes: -

By the end of the course, the students are expected to

CO1: Explain robot anatomy, classification, characteristics of robot.(K1)

CO2: Explain the various robotic actuators on hydraulic, pneumatic and electrical drives.(K2)

CO3: Describe various types of sensors and concepts on robot vision system.(K2)

CO4: Explain the concepts of robot programming languages(K2)

CO5: Understand to adopt robot to various industrial applications.(K1)

Course Content:-

Module- 1:

Fundamentals of Robotics

Number of class hours: 8Hrs.

Suggestive Learning Outcomes:

1) Know the basic concepts of robots.

2) Understand the robot components.

3) Know the effects of structure on control work envelope and work volume.

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Detailed content of the unit: -

Introduction; Definition; Robot anatomy (parts) and its working; Robot Components:

Manipulator, End effectors; Construction of links, Types of joints; Classification of robots;

Cartesian, Cylindrical, Spherical, Scara, Vertical articulated; Structural Characteristics of

robots; Mechanical rigidity; Effects of structure on control work envelope and work Volume;

Robot work Volumes, comparison; Advantages and disadvantages of robots.

Module- 2: Robotic Drive System and Controller

Number of class hours:8 Hrs.

Suggestive Learning Outcomes:

1) Familiar with the various drive systems for robot

2) Understand the robot controller

3) Describe various types of path control

Detailed content of the unit: -

Actuators; Hydraulic, Pneumatic and Electrical drives; Linear actuator; Rotary drives; AC

servo motor; DC servo motors and Stepper motors; Conversion between linear and rotary

motion; Feedback devices; Potentiometers; Optical encoders; DC tachometers; Robot

controller; Level of Controller; Open loop and Closed loop controller; Microprocessor based

control system; Robot path control: Point to point, Continuous path control and Sensor based

path control; Controller programming.

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Module- 3: Sensors

Number of class hours:8 Hrs

Suggestive Learning Outcomes:

1) Explain the purposes of a sensor in robot.

2) Describe the application of various types of sensors.

3) Understand the applications of robot vision system.

Detailed content of the unit: -

Requirements of a sensor; Principles and Applications of the following types of sensors:

Position sensors (Encoders, Resolvers, Piezo Electric); Range sensors (Triangulation

Principle, Structured lighting approach); Proximity sensing; Force and torque sensing.

Introduction to Machine Vision: Robot vision system (scanning and digitizing image data);

Image processing and analysis; Cameras (Acquisition of images); Videocon camera

(Working principle &construction); Applications of Robot vision system: Inspection,

Identification, Navigation & serving.

Module- 4: Robot kinematics and Robot Programming

Number of class hours:8 Hrs

Suggestive Learning Outcomes:

1) Differentiate between forward kinematics and reverse kinematics of manipulators.

2) Explain deviations and problems.

3) Understand the basics of robot programming languages.

Detailed content of the unit: -

Forward Kinematics; Inverse Kinematics and Differences; Forward Kinematics and Reverse

Kinematics of Manipulators with Two Degrees of Freedom (In 2 Dimensional); Deviations

and Problems. Teach Pendant Programming; Lead through programming; Robot

programming Languages; VAL Programming; Motion Commands; Sensor Commands; End

effecter commands; and Simple programs.

Module- 5: Robot Applications in Manufacturing

Number of class hours: 8 Hrs

Suggestive Learning Outcomes:

1) Describe the application of robot in material handling, machine tool loading and

unloading and in various types of welding.

2) Know the requisite and non requisite robot characteristics.

3) Describe the safety considerations and social implications for robot operations.

Detailed content of the unit: -

Robot applications – Material handling – Press loading and unloading – Die casting –

Machine tool loading and unloading -Spot welding – Arc welding – Spray painting –

Assembling -Finishing – Automatic Guided Vehicle – Adopting robots to workstations –

Requisite robot characteristics and Non requisite robot characteristics – Stages in selecting

robots for industrial applications – Safety considerations for robot operations – Robotics in

the future and characteristics task- Economical analysis of robots – Social implications

Reference Books:

1. Introduction to Robotics: Analysis, Systems, Applications – Saeed B. Niku, Pearson

EducationInc. New Delhi 2006.

2. Industrial Robotics: Technology, Programming and Applications – M.P. Groover, Tata

McGrawHill Co, 2001.

3. Robotics Control, Sensing, Vision and Intelligence – Fu.K.S. Gonzalz.R.C and Lee C.S.G,

Mc-Graw Hill Book Co, 1987.

4. Robotics for Engineers – Yoram Koren, McGraw Hill Book Co, 1992.

5. A Text book on Industrial Robotics – Ganesh S. Hedge, Laxmi Publications Pvt. Ltd., New

Delhi,2008.

6. Elements of Robotics Process Automation, Mukherjee, Khanna Publishing House, Delhi,

2016

Environmental Pollution and Control

Course Code	OE605/2
Course Title	Environmental Pollution and Control
Number of Credits	0 (L: 2, T: 1, P: 0)
Prerequisites	NIL
Course Category	OE

Course outcomes:-

After completing this course, student will be able to:

1) Know the global importance of clean environment.

2) Classify the pollutants.

3) Know the sources of pollutants.

4) Understand effect of pollutants on environment & economy.

5) Knowaboutenvironment&controlacts&ISO14000standards & Operate pollution

control devices.

Course Contents:

Module - 1: Introduction

Number of class hours: 05

Suggestive Learning Outcomes:

1. Understand the importance of clean environment.

2. Know about the control acts & ISO 14000 standards.

Detailed content of the unit:

Environment, Ecosystem, Classification of pollution & pollutants, Environment & pollution

control acts, ISO14000standards, Kyototreaty/protocol, carbonunits.

Module - 2: Air Pollution

Number of class hours: 05

Suggestive Learning Outcomes:

1.Describe the classification of pollutants.

2. Know the causes of pollution due to Automobile design.

Detailed content of the unit:

Sources & classification of air pollution, Effects of air pollution on human health, Effects of

Air pollution on economy, Photochemical air pollution, Air pollution from major Industrial

operations e.g. Fertilizer industries aluminium manufacturing plants,

Acidplants,Cementindustries,Coal&tarindustries,paperindustries,Refinery&petrochemicalind

Us tries. Air pollution due to Automobiles-design and operating parameters and methods of

control Pollution due to S. I. Engines, Design & operating parameters responsible for

emission and

methodsofpollutioncontrol.PollutionduetoC.I.Engines.Design&operatingparametersresponsib

leforemissionandmethodsofpollutioncontrol.Airquality&emissionstandardsofIndia&Europe.

Air pollution in Indian metro cities-Delhi, Mumbai, Chennai, Kolkata

Module - 3: Water Pollution

Number of class hours: 05

Suggestive Learning Outcomes:

1. Analyse the causes & effects of water pollution.

2. Describe the steps of water treatment.

Detailed content of the unit:

Sources of waterpollution: Effects of waterpollution.

Waterpollutionanalysis,Physicalexaminationofwater.Chemicalcharacteristicsof water,

Biologicalinvestigationofwater.DefinitionsofImportanttermsusedinwaterpollution–

Dissolved02 .Chemical02demand, Biological 02 demand, Theoretical 02demand,Total solids,

Total suspended solids,Totaldissolvedsolids,Turbidity,Alkalinity,Acidity,Waterquality

standards, Stepsin Watertreatment, Sampling & analysis of waterpollution.

Module - 4: Noise Pollution

Number of class hours: 04

Suggestive Learning Outcomes:

1. Describe the types of noise pollution.

2. Know the effects of noise pollution on health.

Detailed content of the unit:

Definitionofnoise. Sources of noise. Types of noise –Impulsive & sonic noise. Effects of noise

on health. Noise measurement. Noise mapping.

Module - 5: Other Types of Pollution

Number of class hours: 05

Suggestive Learning Outcomes:

1. Define the causes of soil, chemical pollution.

2. Understand Greenhouse effect & Acid rain & Ozone depletion.

Detailed content of the unit:

Solid waste:

Classificationofsolids,Solidwastemanagement,Methodofsolidwastedisposal,Reuse,Recycling&

recoveryofmaterialsfromrefuse,Soilpollution, Chemistry of soil,

Soilirrigationbyeffluents. Agricultural pollution, Radiation pollution,

Sources&effectsofradiation,Radiationexposurestandards,Radiationprotection,Treatment&

disposalofradiation waste.

Global pollution

Green house effect. Acid rain. Ozone depletion problem.

References: -

1) M.N.Rao&H.V.N.Rao, “Airpollution” TataMcGrawHill.

2) P.Meenakshi, “ElementsofEnvironmentScience&Engineering” Prentice-Hall.

3) S.Deswal&A.Deswal, “Abasiccourseinenvironmentalstudies” DhanpatRaiandSons

History of Indian Architecture

Course Code	OE605/3
Course Title	History of Indian Architecture
Number of Credits	0 (L: 2, T: 1, P: 0)
Prerequisites	None
Course Category	OE

Content:

● To provide an insight into the architecture of early civilizations of India

● To understand the development process of architecture from ancient times.

● To learn how the Social, religious and political character, construction methods, building

materials and climate have influenced the built form and settlement patterns of India.

Expected Course outcome: By the end of the course, the students are expected

CO-1: To understand the evolution of architecture (K1)

CO-2: To identify the various type of Architecture in India (K2)

CO-3: To summarize the governing factors influencing the architectural development (K2)

CO-4: To compare the primary construction techniques developed in different times (K2)

CO-5: To be able to explain various ornamentation and built forms through sketches. (K3)

Module-1:- Primitive Architecture; Introduction to ancient Indian architecture; Mansara Shilpa

shastra and settlement planning; Indus Valley civilization; Architecture and town planning of

Harappa, Lothal, Mohenjo-Daro, Kalibanga etc. Understanding of Vedic architecture and settlements.

Number of class hours: 4

Suggestive Learning Outcomes

1) Student will be introduced to primitive architecture

2) Student will learn about the elements of planning of ancient time.

3) Students will understand the initial stages of Architectural development in ancient India.

Module 2:- Outline of Buddhist architecture, Architectural examples of Mahayana and Hinayana

period; Rock-cut and free standing. Study of caves, stupas, and viharas of places like Sanchi,

Amravati etc. Medieval Jain-temple architecture of western India.

Number of class hours: 6

Suggestive Learning Outcomes

1) Student will be introduced to the philosophies and forms of Buddhist and Jain Architecture.

2) Student will be able to distinguish the unique characteristics of rock-cut architecture.

Module 3:- Study of chronological development of Hindu architecture, Early examples of monolithic

and rock-cut architecture. Classification of Hindu Temples; Characteristic features of Indian temple

architecture for form, plan, shikhara, pillars, decoration, sculpture, master-planning etc.

Number of class hours: 8

Suggestive Learning Outcomes

1) Student will be introduced to the various regional concepts of temple architecture

2) Student will be able to learn the techniques and usage of appropriate materials in construction

Module 4:- History of Islam and its principles – Advent of Islam into the Indian subcontinentarchitectural character of the Indo-Islamic style-Development of basic mosque and tomb prototypes;-

Imperial style, Delhi Sultanate, Pre-Mughal regional Architecture, Mughal Architecture.

Number of class hours: 6

Suggestive Learning Outcomes

1) Student will be introduced to the indo-Islamic styles spread over different region in India.

2) Student will be able to apply the forms and features of Islamic Architecture in design process.

Module 5:- English, French, Dutch and Portuguese Colonial architecture in Indian subcontinent. PostIndependence architecture and planning examples and Important architectural works in India.

Number of class hours: 8

Suggestive Learning Outcomes

1) Student will be introduced to the foreign contribution on Indian architecture.

2) Student will be able to learn the features of modern Cities.

3) Student will be introduced to the important and iconic structures of India.

References:

- Percy Brown, Indian Architecture (Buddhist and Hindu period)
- Brown Percy, Indian Architecture (Islamic Period).
- Satish Grover, The Architecture of India (Buddhist and Hindu period)
- Satish Grover, The Architecture of India (Islamic)
- Nath – History of Mughal Architecture
- Banister Fletcher, History of Architecture
- G. K. Hiraskar,The great ages of World Architecture

Indian Constitution

Course Code	AU 606
Course Title	Indian Constitution
Number of Credits	0 (L: 2, T: 1, P: 0)
Prerequisites	None
Course Category	AU

Course Outcomes:
CO1. Illustrate Preamble, Basic Structure, Fundamental Rights and Duties of Indian Constitution(K3).
CO2. Discuss the Structure of The Indian Union Government (K2).
CO3. Memorize the Role and Power of Governor, Chief Minister and Council of Ministers and explain the role of State Secretariat (K2).
CO4. Describe the role of Local Administration (K2).
CO5. Explain the Role and Functioning of Election Commission (K2).

Course Content:

Module: 1 – The Constitution – Introduction
Number of Class hours:06

Learning Outcomes:
1. Describe the History of the Making of the Indian Constitution (K2)
2. Illustrate Preamble and the Basic Structure of Indian Constitution (K3)
3. Illustrate the Fundamental Rights and Duties set by Indian Constitution (K3)

content :
1. The History of the Making of the Indian Constitution
2. Preamble and the Basic Structure, and its interpretation
3. Fundamental Rights and Duties and their interpretation
4. State Policy Principles

Module: 2 – Union Government
Number of Class hours:06
Learning Outcomes:
1. Discuss the Structure of the Indian Union Government (K2).
2. Memorize the Role and Power of President, Prime Minister and Council of Ministers of India (K1)
3. Explain the role of Lok Sabha and Rajya Sabha (K2)

content:

1. Structure of the Indian Union
2. President – Role and Power
3. Prime Minister and Council of Ministers
4. Lok Sabha and Rajya Sabha

Module: 3 – State Government

Number of Class hours:06

Learning Outcomes:

1. Memorize the Role and Power of Governor, Chief Minister and Council of Ministers of a state(K1)
2. Explain the role of State Secretariat (K2)

content :

1. Governor – Role and Power
2. Chief Minister and Council of Ministers
3. State Secretariat

Module: 4 – Local Administration

Number of Class hours:06

Learning Outcomes:

1. Describe the role of District Administration (K2)
2. Explain the role of Municipal Corporation (K2)
3. Discuss the role of Zila Panchayat (K2)

content:

1. District Administration
2. Municipal Corporation
3. Zila Panchayat

Module: 5 – Election Commission

Number of Class hours:06

Learning Outcomes:

1. Explain the Role and Functioning of Election Commission (K2)
2. Classify the role and functioning of Chief Election Commissioner and State Election Commissioner (K2).

content:

1. Role andFunctioning of Election commission
2. Chief Election Commissioner
3. State Election Commission

SUGGESTED LEARNING RESOURCES:

S.No.	Title of Book	Author
1	Ethics and Politics of the Indian Constitution	Rajeev Bhargava
2	The Constitution of India	B.L. Fadia
3	Introduction to the Consti- tution of India	DD Basu

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